

COURSE OUTLINE: BC2402 Designing and Developing Databases

Academic Year	2022/23	Semester	1
Course Coordinator	Assistant Professor Ben Choi		
Course Code	BC2402		
Course Title	Designing and Developing Databases		
Pre-requisites	Nil		
No of AUs	4		
Contact Hours	4 x 13 = 52 hours		
Proposal Date	7 Apr 2022		

A) Course Aims

The course aims to equip you with skills in solving data-related problems and making business decisions related to data issues in organizations. After the completion of this course, you should be equipped with a strong conceptual and technical knowledge in database designing and implementation. Students should understand how databases support business processes and gather information for business analytics. You should be able to apply your knowledge and skills to analyze a variety of business processes, identify data requirements, and create corresponding data management strategies.

B) Intended Learning Outcomes (ILO)/Objectives

By the end of this course, you should be able to:

1. Appraise the nature and limitations of both relational and non-relational database design
2. Explain and distinguish the key concepts, methodologies, and characteristics of database design and management
3. Adapt database modeling techniques to document business processes
4. Devise database management plans relevant to organizational requirements
5. Construct deployable database implementations

C) Course Content

The class is organized along the following themes:

1. Introduction to relational databases
2. Relational database design concepts
3. Relational database implementation
4. Introduction to non-relational databases
5. Non-relational database design concepts
6. Non-relational database implementation
7. Data governance and ethical issues

D) Assessment (includes both continuous and summative assessment)

Component	ILO Tested	NBS Learning Goal (Refer to Annex E for list)	Weighting	Team/Individual	Assessment Rubrics (Please insert rubrics as Appendix)
1. Class Participation	ILO1, ILO2, ILO3	Acquisition of Knowledge, Critical Thinking & Creative Thinking, Problem Solving & Decision Making, Oral Communication & Written Communication	20%	Individual	Annex B1
2. Quizzes	ILO1, ILO2, ILO3	Acquisition of Knowledge, Critical Thinking & Creative Thinking, Problem Solving & Decision Making	20%	Individual	N.A.
3. Class Exercises	ILO1, ILO2, ILO3	Acquisition of Knowledge, Critical Thinking & Creative Thinking, Problem Solving & Decision Making	20%	Individual	N.A.
4. Individual Assignment	ILO1, ILO3, ILO4, ILO5	Problem Solving & Decision Making, Planning & Execution	10%	Individual	Annex B2
5. Group Project (database implementation, written report, and presentation)	ILO1, ILO3, ILO4, ILO5	Problem Solving & Decision Making, Planning & Execution, Oral Communication & Written Communication, Teamwork & Interpersonal Skills	30%	Team	Annex B2, B3, B4
Total			100%		

Note 1: All members are expected to present as part of the assessment of the group project.

Note 2: Details on the individual assignment will be made available at a later date.

Note 3: The group project consists of three key deliverables, namely (i) one instance of database implementation, (ii) a project report, and (iii) a recorded presentation. The specific breakdown of marks allocation is as follows:

- (i) An instance of database implementations: 15% (7.5% team-based evaluation, 7.5% individual-based evaluation)
- (ii) The project report: 5% (team-based evaluation: 2.5%, individual-based evaluation: 2.5%)
- (iii) The presentation: 10% (team-based evaluation: 5%, individual-based evaluation: 5%)

Since the deliverables are evaluated on both the team-basis and individual-basis, it is essential that the team provide a clear report on task-responsibility. For details, please consult the group project document.

Note 4: Peer evaluation is mandatory for the group project. Specifically, two peer evaluations will be conducted (i.e., during the recess week and after project submission deadline). The first peer evaluation will be conducted during the recess week and the second will be conducted in the last teaching week of the

semester. The first peer evaluation is an interim evaluation, which focuses on B2 and B4, whereas the second peer evaluation considers B2, B3 and B4.

Note 5: Evaluation of the group project will be conducted after the submission deadline. In the event of unequal contributions, the overall project marks can be pro-rated based on individual member contribution. For details, please consult the group project document.

E) Formative feedback

I will employ several strategies to provide constructive and timely feedback to you. For class exercises, upon the completion of each, I will perform immediate assessment and provide verbal feedback. On a weekly basis, I will provide a summary of observations and suggested solutions to class exercises.

For the group project, I will provide both feedback at the intermediate period and at project completion. Intermediate feedback will be provided through project consultation sessions, whereby your group will be provided with consultation sessions and email responses.

F) Learning and Teaching approach

Approach	How does this approach support you in achieving the learning outcomes?
Pre-session videos	<p>The slide deck and other course materials relevant for a week will be published on NTULearn one week prior to the session. Prior to each weekly session, you are expected to complete a short video that provides introduction to the week's topic and complete an online quiz.</p> <p>This will permit flexibility of access to learning materials and assessments and can help you develop independent learning and critical thinking skills.</p>
Interactive discussion and activities	<p>Through interactive discussion and activities, you will get to exercise your acquired knowledge in solving database related problems. Additionally, you will get to practice your oral communications in presenting your solutions and engaging in interactive online discussion. We will also conduct in-depth discussion on the week's content.</p>
Group project	<p>This will provide opportunity for you to learn from one another and to become active participants in others' learning. The project requires careful collaboration among members to develop a working database solution for a real-life business data problem. The group setting will help you develop skills valued by employers, such as problem solving, decision making, planning and execution, oral communication and written communication, as well as teamwork and interpersonal skills.</p> <p>Details will be announced in the group project document at a later date.</p>

G) Reading and References

Main Readings

1. Carlos Coronel and Steven Morris (C&M). Database Systems: Design, Implementation, & Management, 13th, 2018, Cengage.

Supplementary Readings

1. Harry J. Rosenblatt. Systems Analysis and Design, 10e 2014 or later, Cengage
2. Whitten, Jeffery L. and Bentley, Lonnie D. Systems Analysis and Design Methods, 7e 2008 or later, McGraw-Hill

H) Course Policies and Student Responsibilities**(1) General**

You are expected to complete all assigned pre-session videos, pre-class readings and activities, attend all sessions punctually and take all scheduled assignments and quizzes by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for discussions and activities that you have missed. You are expected to participate in all discussions and activities.

(2) Absenteeism

Absence from online discussion and activities without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

If you miss a session, you must inform the course instructor via email prior to the start of the class.

I) Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

J) Course Instructors

Instructor	Office Location	Phone	Email	Consultation Hours
Assistant Professor Ben Choi	S3-B2A-32	6790 5654	benchoi@ntu.edu.sg	<i>By prior appointment via email</i>
Dr Teoh Teik Toe	S3-B2C-110	6514 8988	ttteoh@ntu.edu.sg	<i>By prior appointment via email</i>
Mr Chan Wai Xin	-	-	waixin.chan@ntu.edu.sg	<i>By prior appointment via email</i>

K) Planned Weekly Schedule

Week	Topic	ILO	Readings/ Activities
1 <i>(e-learning)</i> <i>Aug-9 is a public holiday</i>	Introduction to Relational Databases Process & Data Modelling	ILO1 and 2	Complete videos (CP: 2%) and an online quiz (Q:2%)
2	Relational Data Model Normalization	ILO 3 and 4	Before the session Complete pre-session videos During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:1%) C&M Chapter 3, 4, 5, 6, 9 Appendix E, H, D
3	Fundamental Query Language: Basic Topics in Structured Query Language (SQL)	ILO5	Before the session Complete pre-session videos During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:1%) C&M Chapter 7, 8 Appendix N
4	Fundamental Query Language: Basic Topics in Structured Query Language (SQL)	ILO5	Before the session Complete pre-session videos During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:1%) C&M Chapter 7, 8 Appendix N
5	Fundamental Query Language: Advanced Topics in Structured Query Language (SQL)	ILO5	Before the session Complete pre-session videos During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:1%) C&M Chapter 7, 8 Appendix N

6	Fundamental Query Language: Advanced Topics in Structured Query Language (SQL)	ILO5	<p>Before the session Complete pre-session videos</p> <p>During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:1%)</p> <p>C&M Chapter 7, 8 Appendix N</p>
7	Ethics and Data Management - Case Discussions	ILO1, ILO2, ILO3, and 4	<p>During the session Discuss and present data management cases; post-class submission (CE: 5%, CP:4%)</p>
Recess Week	Individual Assignment submission due: Sep-30 2022, 2359		
8	Contemporary Query Language: Basic Topics in noSQL	ILO1, ILO2, ILO3, and 4	<p>Before the session Complete pre-session videos</p> <p>During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:1%)</p> <p>C&M Chapter 14 and additional readings</p>
9	Contemporary Query Language: Basic Topics in noSQL	ILO5	<p>Before the session Complete pre-session videos</p> <p>During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:1%)</p> <p>C&M Chapter 14 and additional readings</p>
10	Contemporary Query Language: Advanced Topics in noSQL	ILO5	<p>Before the session Complete pre-session videos</p> <p>During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:1%)</p> <p>C&M Chapter 14 and additional readings</p>

<p>11 <i>(e-learning)</i> <i>Oct-24 is a public holiday</i></p>	<p>Introduction to Non-Relational Databases</p> <p>HBase and Hadoop</p> <p>Expert Topics in noSQL: Next-Gen Data Modeling</p> <p>Expert Topics in noSQL</p>	<p>ILO1, ILO2, ILO3, and 5</p>	<p>Before the session Complete pre-session videos</p> <p>During the session Complete a check-in quiz (to be held during sessions) (Q: 2%) Attempt and discuss in-class exercises (CE: 1%, CP:2%)</p> <p>C&M Chapter 14 and additional readings</p>
<p>12</p>	<p>Strategy Data Management – Case Discussions</p>	<p>ILO1, ILO2, ILO3, and 4</p>	<p>During the session Discuss and present data management cases; post-class submission (CE: 6%, CP:4%)</p>
<p>13</p>	<p>Project Consultation (details to be advised)</p>	<p>Group Project submission due: Nov-18 2022, 2359.</p>	
<p>Notes: CP: assessment weightage on class participation, Q: assessment weightage on quizzes, CE: assessment weightage on class exercises</p>			

ANNEX A: ASSESSMENT CRITERIA FOR CLASS PARTICIPATION**Class Participation Rubric**

Traits	Performance		
	1	2	3
Engagement	Hardly focuses in class (e.g. using mobile phone, unnecessary chatting)	Occasionally engages in distracting activities (e.g. using mobile phone, unnecessary chatting) in class.	Engages fully in class
Contribution frequency	Does not speak up/contribute in class	Occasionally speaks up/contributes in class	Speaks up/contributes in all classes
Contribution quality	No contributions/Contributions lack substance	Contributions demonstrate knowledge of subject matter	Contributions are constructive and insightful

ANNEX B: ASSESSMENT CRITERIA FOR INDIVIDUAL ASSIGNMENT & GROUP PROJECT

Problem Solving & Decision Making and Planning & Execution Rubric

Traits	Performance	
Define the Problem	Not Yet Does not identify the problem clearly; demonstrates limited understanding of the problem or related contextual factors.	Substantially Developed Identifies the problem clearly and thoroughly; demonstrates the ability to construct a clear and insightful problem statement with evidence of all relevant contextual factors.
	Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed	
Devise Strategies to Solve the Problem	Not Yet Selects a strategy without regard to fit; does not demonstrate the ability to consider new strategies even if his/her approach is clearly not appropriate; identifies alternatives that reflect limited understanding of the situation.	Substantially Developed Identifies multiple strategies for solving the problem that apply within a specific context; demonstrates the ability to invent a process to form a plan and clearly articulates his/her decision making process; identifies alternatives that reflect an in depth understanding of the situation.
	Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed	
Defines milestones for implementation and criteria for evaluation of task results	Not Yet Does not schedule time and resources to meet objectives; or provide criteria for evaluation of task results.	Substantially Developed Provides a clear and easy to understand schedule, including steps, time and resources to meet objectives; including criteria for evaluating task results.
	Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed	
Evaluates results	Not Yet Does not align criteria to judge the quality of results. Does not provide sufficient reflection on the recommendations for future planning and execution.	Substantially Developed Examines retrospectively if the executed plans achieved the desired effects according to the intentions and executed actions and plan effects. Makes use of task evaluation criteria.
	Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed	

ANNEX C: ASSESSMENT CRITERIA FOR GROUP PROJECT
Oral Communication Rubric

Traits		Performance										
Communication Outcome	<ul style="list-style-type: none"> Has a clear message for audience Maximizes likelihood of audience accepting the message 	Not Yet Central message is not explicitly stated in the presentation. Main points are not clearly identified, audience unsure of the direction of the message.	Substantially Developed Central message is precisely stated; main points are clearly identified.									
		Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed										
Situational Factors	<ul style="list-style-type: none"> Addresses audience needs Builds rapport with audience 	Not Yet Topic is irrelevant to audience needs and interest. No attempt made to connect topic to audience.	Substantially Developed Connection of topic to audience needs and interest is stated with sophistication. Identifies and expresses a deep understanding of the target audience.									
		Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed										
Design Factors	Content	<ul style="list-style-type: none"> Presents relevant information Supports main points with strong evidence 	Not Yet Content is erroneous or irrelevant; references and supporting materials are absent. Lacks of depth in content and little insights are exhibited. Presentation falls outside set time parameters.	Substantially Developed Content is accurate, thorough, and directly on point; strong support and references are provided. Exhibits depth and insight in content. Effective use of time and stays within time parameters.								
			Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed									
	Structure	<ul style="list-style-type: none"> Organises content coherently Signals transitions between points 	Not Yet Organizational pattern (specific introduction and conclusion, sequenced materials within the body, and transitions) is not observable.	Substantially Developed Organizational pattern is clearly and consistently observable and makes the content of the presentation cohesive.								
			Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed									
	Verbal	<ul style="list-style-type: none"> Speaks at appropriate speed and volume Uses correct grammar and pronunciation 	Not Yet Grammar, pronunciation and word choice are deficient. Vocal delivery is too soft or too fast to understand; gap-fillers interfere with expression.	Substantially Developed Free of errors in grammar and pronunciation; good choices of word enhance clarity of expression. Vocal delivery is varied and dynamic. Speech rate, volume, and tone facilitate audience comprehension. Minimal gap fillers.								
			Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed									
	Non-Verbal	<ul style="list-style-type: none"> Establishes eye contact Uses gestures and movement to convey energy and confidence 	Not Yet Eye contact, posture, gestures, movement and facial expressions are inappropriate and significantly distracting.	Substantially Developed Eye contact, posture, gestures, movement and facial expressions make the presentation compelling, and speaker appears polished and confident.								
			Evaluation: Not Yet 1 2 3 4 5 6 7 8 9 10 Substantially Developed									

ANNEX D: ASSESSMENT CRITERIA FOR GROUP PROJECT
Teamwork & Interpersonal Skills Rubric

Traits	Performance	
<p><u>Roles and Responsibility</u> Behaves professionally by upholding responsibility and assuming accountability for self and others in progressing towards the team's goal.</p>	<p>Not Yet Unclear about his/her own role; refuses to take a role in the group; insists to work individually and has limited coordination or communication with others.</p>	<p>Substantially Developed Always fulfills responsibilities; performs his/her role within the group with enthusiasm and demonstrates willingness to work collaboratively.</p>
<p>Evaluation: Not Yet <u>1 2 3 4 5 6 7 8 9 10</u> Substantially Developed</p>		
<p><u>Communication</u> Identifies appropriate mechanisms to coordinate and correspond with team members.</p>	<p>Not Yet Modes of communication are not appropriate, causing confusion and miscommunication among team members.</p>	<p>Substantially Developed Modes of communication are appropriate, and maintain timely communication and correspondence with team members.</p>
<p>Evaluation: Not Yet <u>1 2 3 4 5 6 7 8 9 10</u> Substantially Developed</p>		
<p><u>Contributions</u> Contributes positive input for the team; effectively utilizes one's knowledge and expertise.</p>	<p>Not Yet Largely disinterested in working in a group and refuses to participate; observes passively or is unwilling to share information with other team members.</p>	<p>Substantially Developed Actively attends and participates in all activities and provides meaningful contribution in articulating ideas and opinions.</p>
<p>Evaluation: Not Yet <u>1 2 3 4 5 6 7 8 9 10</u> Substantially Developed</p>		