DATABASE DESIGN

BITP 2313	SEMESTER 1	SESSION 2023/2024

BITP 2313DATABASE DESIGN (3, 2, 2)
TYPE OF COURSE: K
EDITION: 4
UPDATED: 30-08-2018

1.0 COURSE LEARNING OUTCOMES

Upon completing this course, students will be able to:

i. Explain the database design process in the database system development life cycle. (PLO2, P2, CTPS3)
ii. Construct a data model using relational and non-relational data modeling techniques. (PLO6, C3, TS2)
iii. Explain database design issues in applications such as DSS and E-Commerce. (PLO7, A3, CS3)

2.0 SYNOPSIS

This subject emphasizes the importance of database design and presents the fundamental principles of relational and non-relational data models which include object-oriented and object-relational data models together with the enhanced features of an entity-relationship diagram. A practical database design methodology is used to demonstrate the design process which involves not only constructing the data model but also checking and validating the accuracy of the model in line with the user transaction requirements. Design issues related to distributed databases such as data fragmentation, allocation, transparency, and replication are also discussed. This subject also discusses database design issues in specialized database applications such as data warehousing, data mining, online analytical processing, decision support systems, and electronic commerce.

3.0 PRE-REQUISITE

BITP1323 Database

4.0 PRACTICAL

Hands-on practices in designing object-oriented and object-relational data models, data fragmentation, and data warehouse schema.

5.0 REFERENCES

[1] Connolly, T. and Begg, C., (2021) Database Systems: A practical approach to design, implementation, and management, 6th Edition, Pearson. ISBN-13: 9780137517053 (e-Textbook)

[2] Coronel, C. & Morris, S., (2022) Database Systems: Design, Implementation, and Management, 14th Edition. Cengage Learning. ISBN-13: 9780357673034

[3] Hoffer, J., Ramesh, V. and Topi, H. (2021) Modern Database Management, 13th Edition, Pearson. ISBN-13: 9780137305940 (e-Textbook)

[4] Elmasri, R. and Navathe, S.B., (2021) Fundamentals of Database Systems, 7th Edition, Pearson. ISBN-13: 9780137502523 (e-Textbook)

[5] Pratt, P. J., Ruffolo, L., Monk, E. F., Starks, J. & Last, M. Z. (2020) Concepts of Database Management 10th Edition, Cengage Learning. ISBN-13: 9780357422083

6.0 COURSE IMPLEMENTATION

i. Lecture
- 2 hours per week for 14 weeks (Total = 28 hours)

ii. Laboratory Activities
- 2 hours per week for 14 weeks (Total = 28 hours)

7.0 COURSE EVALUATION

Assessment Method	LO 1	LO 2	LO 3
Quiz = 5%	KZ2 (5%) (PLO2, P2, CTPS3)		
Lab Assignment = 20%		TG1 (10%) (PLO6, C3)	TG2 (10%) (PLO7, A3, CS3)
Group Project = 20%		PRJ1 (20%) (PO6, C3, TS2)	
Lab Test = 10%		LT (10%) (PO6, C3)	
Mid Term = 15%	MT1 (5%) (PLO2, P2, CTPS3)	MT2 (10%) (PO6, C3)	
Final Exam = 30%	FE1 (5%) (PLO2, P2)	FE2 (15%) (PO6, C3)	FE3 (10%) (PLO7, A3)
Total = 100%	**15%**	**65%**	**20%**

8.0 STUDENT LEARNING TIME (SLT)

Week	CLO	Guided Learning Time				Independent Learning								Assessment Time				SLT
		L	T	P	O	L	T	P	O	F	T	A	O	F	T	A	O	
W1	1	2		2		1	0	1		0	0	0	0					6
W2	1	2		2		1	0	1		0	0	0	0					6
W3	1	2		2		1	0	1		0	0	0	0					6
W4	2	2		2		1	0	1		0	0	0	2				0.5	8.5
W5	2	2		2		1	0	1		0	0	0	0					6
W6	2	2		2		1	0	1		0	0	3	0					9
W7	1	2		2		1	0	1		0	4	0	0		1			11
W8	2	2		2		1	0	1		0	8	0	0		2			16
W9	2	2		2		1	0	1		0	0	0	0					6
W10	2	2		2		1	0	1		0	0	0	0					6
W11	3	2		2		1	0	1		0	0	0	0					6
W12	3	2		2		1	0	1		0	0	3	0					9
W13	3	2		2		1	0	1		0	0	0	0					6
W14	3	2		2		1	0	1		0	0	0	2				0.5	8.5
>W14										8	0	0	0	2				10
Overall		28	0	28	0	14	0	14	0	8	14	6	2	2	3.5	0	0.5	120

SLT Credit Equivalent	**3.00**

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9.0 DETAILED SYLLABUS AND TEACHING PLAN

Week	Session	Contents	References	Delivery Method
1 (09/10/23 - 13/10/23)	**Lecture 1**	**Overview of Database System Development Lifecycle (DBSDLC)** • Software Crisis. • Stages of DBSDLC • Phases of database design • Evaluation of DBMS • Benefits of CASE tools	[1] Chapter 10	Lecture and Lab Activities
	Lab 1	• Establish a project team • Case Study: Database Planning and System Definition		
2 (16/10/23 - 20/10/23)	**Lecture 2**	**Database Analysis** • Fact-finding techniques • Types of facts collected • Types of documentations • Advantages and disadvantages of each type of fact-finding technique • Applying fact-finding techniques to the early stages of DBSDLC	[1] Chapter 11	Lecture and Lab Activities
	Lab 2	Case Study: Users' requirements specification and systems specification (Install drawing tool and draw ERD)		
3 (23/10/23 - 27/10/23)	**Lecture 3**	**Conceptual Database Design** • The purpose of design methodology • Phases of database design • Decomposition of the design scope into specific views of the enterprise • Using ER modeling to build a local conceptual model based on the information given in the view of the enterprise and validating the model • Documenting the conceptual database design process • The role of end-users throughout the process of conceptual database design	[1] Chapter 16	Lecture and Lab Activities
	Lab 3	Review of common mistakes in database design		
4 (30/10/23 - 03/11/23) **Assessment (Quiz)** • Mark: 5% • Type: Individual	**Lecture 4**	**Overview of Entity-Relationship (ER) Modeling** • Using ER modeling in database design • Basic concepts of ER model • ER model notations • Problems with ER model	[1] Chapter 12	Lecture and Lab Activities
	Lab 4	Construct ER models for selected cases using different notations: • UML notation		

• Format: MCQ/ True False • Lectures: 1 to 3 • Date: Week 4, 5, 6, or 7 • Venue/Platform: Physical or Ulearn		• Chen notation • Crow Foot notation		
5 (06/11/23 - 10/11/23)	**Lecture 5**	**Enhanced ER (EER) Modeling** • Limitation of the basic concepts of ER model • Additional data modeling concepts • EER modeling using UML notation	[1] Chapter 13	Lecture and Lab Activities
	Lab 5	• Construct data model for selected cases using the EER modeling technique • Data Modeler		
6 (13/11/23 - 17/11/23) <mark>**Public Holiday (Deepavali)** 13/11/23 Monday</mark> **Assessment (Assignment 1)** • Mark: 10% • Type: Individual or Grouping (max 5 students) • Lectures: 4 to 6 • One Case Study (Construct an EERD) • Notation: Crow's Foot, UML, or Chen • Tool: Draw .io • Due Date: 15/12/2023 (Week 10) • Submission: Ulearn	**Lecture 6**	**Enhanced ER (EER) Modeling** • Case Study of EER modeling	[1] Chapter 13	Lecture and Lab Activities
	Lab 6	• Construct data model for selected cases using the EER modeling technique • Data Modeler		
7 (20/11/23 - 24/11/23)	**Lecture 7**	**Object-Relational Data Model** • Introduction to Object-oriented and Object-relational • Implication of object orientation on database design	[1] Chapter 9	Lecture and Lab Activities

Assessment (Lab Test) • Mark: 10% • Type: Individual • Lectures: 4 to 6 • One Case Study (Construct an EERD) • Notation: Crow's Foot, UML, or Chen • Tool: Draw .io • Date: Week 7 • Submission: Ulearn		• ORDBMS: Advantages and disadvantages • OODBMS and ORDBMS in comparison		
	Lab 7	• Construct data models for selected cases using object-relational data modeling techniques.		
8 (25/11/23 - 03/12/23)	**MID-SEMESTER BREAK**			
9 (04/12/23 - 08/12/23) **Assessment (Mid-Term Exam)** • Mark: 15% • Type: Individual • Format: MCQ (50 questions) • Lectures: 1 to 7 • Date: Week 9 or 10 • Venue: Physical (TBA)	**Lecture 8**	**Logical Database Design for the Relational Model** • Deriving a set of relations from a conceptual data model • Validation of relations using normalization • Validation of a logical data model to ensure it supports the required transactions • Merging logical data models based on one or more user views into a global logical data model that represents all user views • Ensuring that the final logical data model is a true and accurate representation of the data requirements of the enterprise	[1] Chapter 17	Lecture and Lab Activities
	Lab 8	• Create and validate the logical data model based on the created conceptual data model • Merge the local data models to create a global logical data model		
10 (11/12/23 - 15/12/23)	**Lecture 9**	**Physical Database Design for the Relational Databases** • Purpose of physical database design • Mapping of logical to physical database design • Designing base relations for the target DBMS • Designing general constraints for the target DBMS • Designing user views	[1] Chapter 18	Lecture and Lab Activities

	Lab 9	• Create a physical database design from the created logical data model • Using the physical design, implement the database on Oracle as the target DBMS		
11 (18/12/23 - 22/12/23)	**Lecture 10**	**Physical Database Design for the Relational Databases – Implementation** • Mapping of logical to physical database design • Mapping subtype/supertype relationships • Supertype implementation	[1] Chapter 18	Lecture and Lab Activities
	Lab 10	• Introduction to data modeler for mapping physical design		
12 (25/12/23 - 29/12/23) ==**Public Holiday (Christmas)**== ==25/12/23== ==Monday==	**Lecture 11**	**Distributed Database Design** • The need for distributed databases • Advantages and disadvantages of distributed databases • Heterogeneity in the distributed database system • The main issues associated with distributed database design	[1] Chapter 24	Lecture and Lab Activities
	Lab 11	• Design a distributed database that includes a fragmentation scheme, all types of fragmentation (horizontal and vertical)		
13 (01/01/24 - 05/01/24) ==**Public Holiday (New Year)**== ==01/01/24== ==Monday== **Assessment (Assignment 2)** • Mark: 10% • Type: Individual or Grouping (max 5 students) • Lectures: 11 & 12 (DDBMS) • Due Date: 19/1/2024 (Week 15) • Submission: Ulearn	**Lecture 12**	**Distributed Database Design** • Transparencies in a distributed DBMS • Date's twelve rules for a distributed DBMS	[1] Chapter 24	Lecture and Lab Activities
	Lab 12	• Continuing with the distributed database – the reconstruction of global relations from fragments		

14 (08/01/24 - 12/01/24) **Assessment (Project)** • Mark: 20% • Type: Grouping (5 students) • Lectures: 1 to 6 & 8 to 10 • Due Date (Proposal): 24/11/23 (Week 7) • Due Date (Final Report, Slides & Peer Evaluation Form: 12/1/2024 (Week 14) • Submission: Ulearn	**Lecture 13**	**Data Warehousing Concept** ● Main concepts ● Problems and issues ● Architecture and main components ● Data flows and process	[1] Chapter 31	Lecture and Lab Activities
	Lab 13	Design of DW architecture		
15 (15/01/24 - 19/01/24) **Assessment (Project)** • Date (Presentation): Week 15 • Venue/Platform: Physical (F2F), online, or provide a pre-recorded video	**Lecture 14**	**Data warehousing Design** ● Dimensional modeling (DM) ● Difference between the ER Model and DM ● Step-by-step methodology of DW design	[1] Chapter 32	Lecture and Lab Activities
	Lab 14	Draw dimensional model		
16 (20/01/24 - 28/01/24)	**REVISION WEEK**			
17-18 (29/01/24 - 08/02/24)	**FINAL EXAMINATION WEEK** **Assessment (Final Exam)** • Mark: 30% • Type: Individual • Format: Structured Questions (Part A, B, & C) • Lectures: 4 to 6 & 8 to 14			

10.0 MATRIX OF LEARNING OUTCOMES

COURSE vs PROGRAM LEARNING OUTCOME (PLO)

Subject	PROGRAM LEARNING OUTCOME (PLO)								
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
BITP 2313		X				X	X		

COURSE LEARNING OUTCOME (CLO) vs PROGRAM LEARNING OUTCOME (PLO)

CLO	PROGRAM LEARNING OUTCOME (PLO)								
CLO1		X							
CLO2						X			
CLO3							X		

COURSE LEARNING OUTCOME (CLO)

CLO1	Explain the database design process in the database system development life cycle. (PLO2, P2, CTPS3)
CLO2	Construct a data model using relational and non-relational data modeling techniques. (PLO6, C3, TS2)
CLO3	Explain database design issues in applications such as DSS and E-Commerce. (PLO7, A3, CS3)

COURSE vs SOFT SKILLS

Subject	SOFT SKILLS																						
	communication skill					critical thinking & problem solving					team work			lifelong learning			entrepreneurs hip skills			Ethics & moral professionalism			leadership skills		
	CS1	CS2	CS3	CS4	CS5	CTPS 1	CTPS 2	CTPS 3	CTPS 4	CTPS 5	TS1	TS2	TS3	LL1	LL2	LL3	ES1	ES2	ES3	EM1	EM2	EM3	LS1	LS2	LS3
BITP 2313	X	X	X			X	X	X			X	X													

COURSE LEARNING OUTCOME (CLO) vs SOFTSKILLS

LO	SOFT SKILLS																						
	communication skill					critical thinking & problem solving					team work			lifelong learning			entrepreneurs hip skills			ethics & moral professionalism			leadership skills		
	CS1	CS2	CS3	CS4	CS5	CTPS 1	CTPS 2	CTPS 3	CTPS 4	CTPS 5	TS1	TS2	TS3	LL1	LL2	LL3	ES1	ES2	ES3	EM1	EM2	EM3	LS1	LS2	LS3
LO1						X	X	X																	
LO2											X	X													
LO3	X	X	X																						

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COURSE vs TAXONOMY

Subject	Taxonomy																	
	Affective					Cognitive						Psychomotor						
	A1	A2	A3	A4	A5	C1	C2	C3	C4	C5	C6	P1	P2	P3	P4	P5	P6	P7
BITP 1123	X	X	X			X	X	X				X	X					

COURSE LEARNING OUTCOME (CLO) vs TAXONOMY

LO	Taxonomy																	
	Affective					Cognitive						Psychomotor						
	A1	A2	A3	A4	A5	C1	C2	C3	C4	C5	C6	P1	P2	P3	P4	P5	P6	P7
LO1												X	X					
LO2	X	X	X															
LO3						X	X	X										

TEACHING PLAN APPROVAL

Prepared by;   Approved by;

Name: Dean/Deputy Dean (Academic)/HOD

Stamp: Stamp:

Date: Date: _____

TEACHING PLAN IMPLEMENTATION
(MID SEMESTER BREAK)

Comment :

Checked by;

……………………………..
Dean/Deputy Dean (Academic)/HOD

Stamp: Date: _____

TEACHING PLAN IMPLEMENTATION
(WEEK 16)

Comment :

Checked by;

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Dean/Deputy Dean (Academic)/HOD

Stamp: Date: _____