

Briefing Session on NSS ICT
Learning & Teaching Resource Package –
*Database Design Methodology and
Systems Development*

CDI02 00901 46 – NSS Enriching Knowledge for ICT
Curriculum Series: (7) Database Design
Methodology and Systems Development

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Agenda

- Overall introduction
- Part 1 - Introduction of the rationales and design of the resource package
- Break
- Part 2 - Briefing on the contents of the resource package and the use in learning and teaching
- Q & A

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Briefing Session on NSS ICT
Learning & Teaching Resource Package –
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Part 1 Introduction of the rationales and
the design of the resource package

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ICT – Some Fundamental Attributes

- Frontier for social development
 - The Information Society
 - The nth Wave
- Technology based
- Social-technical
- Crucial enabler for business
- Indispensable and visible (or sometimes invisible) in everyday life
- Skills based
- Logical/abstract/system thinking
- Atmosphere of ICT in Hong Kong

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The ICT Curriculum Aims (1)

- Provide students with a body of essential knowledge, concepts and applications of information, communication and computer systems
- Equip students with problem-solving and communication skills, and encourage them to think critically and creatively

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The ICT Curriculum Aims (2)

- Develop students into competent, effective, discriminating, ethical and confident users of ICT, so as to support their lifelong learning
- Provide students with opportunities to appreciate the impact of ICT on our knowledge-based society, so as to nurture in them positive values and attitudes towards this area

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Project Background

- ICT – One of the 5 elective subjects in the TE Key Learning Area in NSS curriculum
- To ensure smooth implementation, teachers must have
 - firm grasp of the curriculum intention
 - fully equipped to deliver the curriculum contents confidently
- To cope with the need, EDB commissioned projects to provide various learning and teaching resource packages for teachers with the intention to teach ICT

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The ICT Curriculum Revisited (1)

- Compulsory (165 hours)
 - Information Processing
 - Computer System Fundamentals
 - Internet and its Applications
 - Basic Programming Concepts
 - Social Implications

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The ICT Curriculum Revisited (2)

- Electives (Choose one, each of 75 hours)
 - Databases
 - Data Communications and Networking
 - Multimedia Production and Web Site Development
 - Software Development
- School-based Assessment (30 hours)

Total Curriculum Time = 270 hours

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Overall Objectives of the Package

- Provide quality bilingual learning and teaching reference materials in curriculum, pedagogy and assessment
- Support the learning and teaching of elective topics
- Enrichment to textbooks (if any)

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Design Principles (1)

- Builds on prior knowledge
 - Database Concepts → Database Design
- Balance between breadth and depth
 - Appreciation of various methodologies vs. walkthrough of a certain methodology (Waterfall model)
- Emphasis on both theoretical and applied learning
 - Normal forms and the actual use of them in solving database design issues

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Design Principles (2)

- Close alignment between curriculum, pedagogy and assessment
 - Matched pedagogy for different topics
 - Assessment tasks designed to reinforce learning outcomes and provoke explorations
- Takes into account the feasibility of implementation in the local education context
 - Feasibility in carrying out of activities (to ensure students' satisfaction)
 - Feasibility in obtaining relevant tools (software packages, etc)

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Design Principles (3)

- Caters for learner diversity
 - Templates and guidelines in different depths are available
 - Relevant strategies included in Teachers' Guide
- Friendly and appealing to learners
 - Lively interface of the PowerPoint slides
 - Authentic and interesting examples

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Design Principles (4)

- Promotes independent learning
 - Follow up activities in daily life context
- Well structured contents but with flexible learning and teaching paths
- As a resource bank – varieties of resources with organic relationship
 - Case studies, PowerPoint slides, worksheets, multimedia elements, etc

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Design Principles (5)

- Overall design strategy: Learning objectives \leftrightarrow learning outcomes \leftrightarrow learning and teaching strategies/approaches \leftrightarrow learning and teaching materials

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Use of the Package by ... (1)

- using various learning and teaching strategies (e.g. case study, problem-based learning)
- catering learner diversity (varied lesson contents, learning and teaching strategies and assessment)

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Use of the Package by ... (2)

- providing students with up-to-date knowledge and skills through authentic examples, cases, etc
- developing students' generic skills (e.g. problem solving) and nurturing students' career-related experiences

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Topics Covered in this Package/Briefing Session

- Databases
 - Introduction to Databases
 - Relational Databases
 - **Introduction to Database Design Methodology (22 hours)** ←
 - Database Applications, Development and Society

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Learning Objectives for “Introduction to Database Design Methodology”

- How to identify and perform an analysis of the data requirements of simple scenarios in different applications
- The construction of simple data models using the ER diagrams methodology
- The importance of good database design as a blueprint for the development of a database management system

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Introduction to Database Design Methodology – Main Contents

- Good database design
- 3 levels of data abstraction
- Types of relationship among entities
- Simple scenarios in business, education, etc
- Data redundancy
- ER diagrams

Abstract? Logical thinking? Real-life related?
Interesting? Lab exercises? Multimedia?
Analogies readily available? ... etc

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Some Reflections on the Topics

- Related to Data Modelling
- Fundamentally, data modelling is to capture reality, as much as possible, into the application system (before any processing can be done)
- Usually carried out by the Database Administrator (DBA)/Data Analyst in the industry
- Requires higher order of abstract and logical thinking

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Topics Covered in this Package/Briefing Session

- Software Development
 - Programming
 - Programming Languages
 - **Systems Development (16 hours)** ←

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Learning Objectives for “Systems Development”

- The importance of a systematic approach to software development
- How to apply concepts underlying software development in a systematic way

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Systems Development – Main Contents

- Basic concepts
- Systems analysis
- Systems design
- Systems implementation
- Systems conversion and maintenance
- Systems documentation
- Alternative approaches (Waterfall Model and others)
- The personnel

Abstract? Logical thinking? Real-life related? Interesting?
Lab exercises? Multimedia? Analogies readily available? ...
etc

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Some Reflections on the Topics

- Need a good grasp on “system”
- Need some understanding of the business world (e.g. The personnel)
- Usually carried out by Systems Analysts in the industry
- A more social-technical topic when compared with Introduction to Database Design Methodology

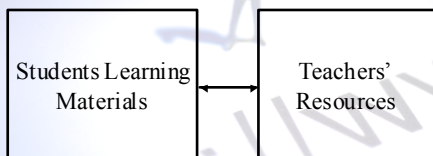
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Project Deliverables

- The package - learning and teaching materials in both English and Traditional Chinese
 - to be made available at e-platform
- 2 sets of DVD-ROMs containing the package to be distributed to each school
- 4 regional-based briefing sessions

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The Package



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Students' Materials

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PowerPoint slides

- Major learning points
- Navigation centre/Learning control centre



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Multimedia Elements

- links to video clips on Web, images, cartoons,



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Work Sheets /Activity Sheets (1)

Worksheets/Activity sheets

Chapter 1 - The Importance of Good Database Design

Worksheet 1

Activity 1 - Selecting Suitable Fields in Database Design. [30-35 min]

The activity will be one exploring the importance of choosing suitable fields in constructing tables in a database. Tables with fields chosen to design can database applications written to access database users' needs.

Background

Support that your school uses a database to provide information to students. The database is available to all staff and students with the following changes:

Field Name	Field Type	Field Name	Field Type	Field Name	Field Type
NAME	Text	AGE	Number	ADDRESS	Text
SEX	Text	DOB	Date	PHONE	Text
RELIGION	Text	ETHNICITY	Text	HOBBIES	Text
SPORTS	Text	EXTRACURRICULAR	Text	EXTRA	Text
TECHNICAL	Text	ARTS	Text	EXTRA	Text
EXTRA	Text	EXTRA	Text	EXTRA	Text

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Work Sheets /Activity Sheets (2)

Task 1

Support that your school uses a database to provide information to students. The database is available to all staff and students with the following changes:

1. To understand what database design is.
2. To be aware of the importance of good database design to different database applications.
3. To understand what fields to be considered in database design.

Task 2

Support that your school uses a database to provide information to students. The database is available to all staff and students with the following changes:

1. To understand what database design is.
2. To be aware of the importance of good database design to different database applications.
3. To understand what fields to be considered in database design.

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Assessment Tasks

Chapter 1 - The Importance of Good Database Design - Exemplar

Name: _____ Class: _____ No: _____

1. In this chapter, we have learned more about the importance of good database design. Give 3 examples of how you can improve your database design.
2. Give 3 examples of how you can improve your database design.

Field Name	Field Type	Field Name	Field Type	Field Name	Field Type
NAME	Text	AGE	Number	ADDRESS	Text
SEX	Text	DOB	Date	PHONE	Text
RELIGION	Text	ETHNICITY	Text	HOBBIES	Text
SPORTS	Text	EXTRACURRICULAR	Text	EXTRA	Text
TECHNICAL	Text	ARTS	Text	EXTRA	Text
EXTRA	Text	EXTRA	Text	EXTRA	Text

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Students' Materials - Others

- Case study
- Practical tasks
- Supplementary notes
- Articles for reading
- Extended reading lists
- Summary / Reflection
- Glossary

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Teachers' Resources

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Teaching plans/guides

Chapter 1 - The Importance of Good Database Design

Teaching Plan

Topic: The Importance of Good Database Design

Duration: 100 min

Learning Goals:

1. To understand what database design is.
2. To be aware of the importance of good database design to different database applications.
3. To understand what fields to be considered in database design.

Learning Objectives:

By the end of the lesson, you should be able to:

- Explain the importance of good database design to different database applications.
- Explain what fields to be considered in database design.

Classroom Activities:

The students in this chapter can be divided into groups to do a practical task, problem solving, and communication (to be in the workshop).

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Sample answers for worksheets / activity sheets (1)

Chapter 1 The importance of Good Database Design - Exercises

Name: _____ Class: _____ No. _____ Score: _____

1. In this chapter we have studied seven desirable characteristics of a well-designed database. Use the given choice to match the characteristics with a poorly designed database.

Characteristics	Mark
It is easy to design, develop, install, and use.	1
It meets all user requirements.	1
It is easy to maintain and update.	1
It is easy to learn and use.	1
It is easy to integrate with other systems.	1
It is easy to use the existing data.	1
It is easy to use the existing data.	1

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Sample answers for worksheets / activity sheets (2)

2. An online retail store has a relational database to store product information. The IT consultant suggests to use a database management system with the following structure:

Field Name	Field Type	Field Width	Field Format	Description
ID	Integer	10		Product ID
NAME	Character	50		Product Name
PRICE	Integer	10		Product Price
QUANTITY	Integer	10		Product Quantity
STATUS	Integer	10		Product Status
DESCRIPTION	Text			Product Description
REVISION	Text			Product Revision
DATE	Text			Product Date
USER	Text			Product User

3. Suggest reasons for the use of a database management system in a retail store.

The use of a database management system is given as the main reason for updating data. The use of a database management system is given as the main reason for updating data.

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Teachers' Resources - Others

- Additional teaching materials
- Hints in catering for learners' diversity
- Reference materials

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End of Part 1

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Part 2 Systems Development

1

The Software Development in ICT

- The Software Development option comprises three topics:

Time allocation: 75 hrs

This L&T Resources Package focuses on this topic



2

Systems Development

- General Information:
 - Total time allocation: **16 hours**
 - Altogether **8 chapters**
 - Each chapter focuses on different topics in different aspects of Systems Development

3

Overall Time Allocation

- Chapter 1 (60 min)**
 - Basic Concept
- Chapter 2 (120 min)**
 - System Analysis
- Chapter 3 (240 min)**
 - System Design
- Chapter 4 (240 min)**
 - System Implementation

4

Overall Time Allocation (Con't)

- Chapter 5 (120 min)**
 - System Conversion & Maintenance
- Chapter 6 (60 min)**
 - System Documentation
- Chapter 7 (60 min)**
 - Alternative Approach
- Chapter 8 (60 min)**
 - IT Personnel



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Resources in the Package

Teachers' Notes / Teaching Plan 	L&T Power Point 	Chapter End Reflection 	Chapter End Summary
Students' Notes 	Extended Reading List 	Glossary 	Sample Answers to Activities

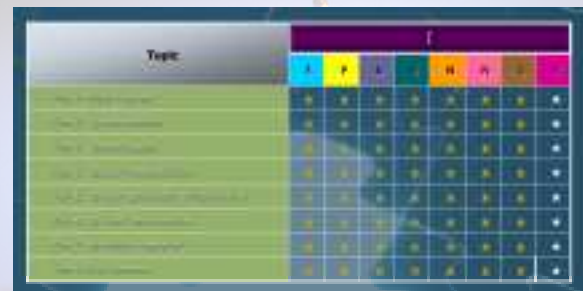
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Pedagogy / L&T Strategy



7

Single Index Page linking all resources



Trial

8

Demonstration

9

Chapter 1 Basic Concept

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Chapter 1 Basic Concept

- Brief Teaching Plan and Teachers' Notes
 - Learning Goals
 - Time Allocation
 - Teaching Strategies/Approaches
 - Notes for teachers
- L&T PowerPoint files
 - For both teachers and students
 - Self-documented
 - Teaching Organization Chart in the first page
 - Icon Explanation at the last page
 - Multimedia-rich materials to arouse students' interest

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Chapter 1 Basic Concept

- L&T PowerPoint files (Con't)
 - Different approaches to cater for different learning styles
 - Direct Instruction (more teacher-centered)
 - Enquiry Approach (more interactive)
 - Problem Based (more Student Center)
 - Including activities at different learning stages
 - Listening to explanations from teachers
 - Debate
 - Writing solution to problem
 - Oral presentation



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Chapter 1 Basic Concept

- Chapter End Reflection & Summary
 - Reflection Worksheet **R**
 - formative assessment with marking scheme
 - helping students to organize concepts and ideas learnt
 - Chapter End Summary **S**
 - Suggested solution to reflection worksheet for marking purpose
 - helping students to refresh their memory

13

Chapter 1 Basic Concept

- Student Notes **N**
 - textual materials for students to revise
 - Text-based to illustrate proper expression of ideas with language.
- Reading List **W**
 - extended reading list with brief explanatory notes
- Glossary **G**
 - glossary list with definition of terms

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Chapter 5 System Conversion and Maintenance

15

Chapter 5 System Conversion and Maintenance

- With similar features as in resources for Chapter 1
 - Teaching Plan **T**
 - L&T Powerpoint & worksheets **P**
 - Reflection & Summary **R S**
 - Notes for students **N**
 - Extended reading list & Glossary **W G**

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Chapter 5 System Conversion and Maintenance

- L&T PowerPoint files **P**
 - Extensive use of multimedia rich presentation to facilitate learning
 - Animation is used to illustrate ideas
 - Authentic cases is used to show the application of ideas in daily lives
 - Interactive quiz for self-checking of understanding

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Case Study A Library System

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Case Study: A Library System

- An authentic example showing how to analyze the problem and hence design suitable solution,
- Spreading across chapters according to the learning stages

19

Case Study: A Library System

1. System Analysis :
 - Alternative Proposal (Activity provided)
 - Requirement Specification (Activity provided)
2. System Design :
 - Describe Library System with various charts (Activity provided)

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Coursework

- SBA Report Template helping student to write a well-structured report.
- Students should apply the techniques they learned in Chapter 1 to 8 to solve the SBA problem
- Adopting *scaffolding learning strategy*:
 - Different chapters of the SBA report forms a framework requiring students to construct their own knowledge

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Coursework

- Examples Report Templates
 - Chapter 3: Charts in SBA Project
 - Chapter 5: System Testing & Evaluation
 - Chapter 6: Requirement Statement & User Manual of System developed in SBA Project

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Assessment Tasks

- Formative assessment tasks with instructions **Q** **A**
- Suggested rubrics / marking scheme **M**

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Q & A

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Part 2 Introduction to Database Design
Methodology

1

Introduction to Database Design Methodology

- General Information:
 - Total time allocation: 22 hours
 - Altogether 7 chapters
 - Each chapter focuses on different topics in database design methodology

2

Overall Time Allocation

- **Chapter 1** (120 min.)

- The Importance of Good Database Design

Learning Outcomes

Be aware of and appreciate the importance of a good database design in effective database management.

- **Chapter 2** (120 min.)

- Three Levels of Data Abstraction in Database

Describe the needs of the three levels of data abstraction, namely conceptual level, physical level and view level.

3

Overall Time Allocation

- **Chapter 3** (160 min.)

- Basic Concepts of Entity-Relationship Model

Learning Outcomes

Be aware of the different types of relationships among entities in a relational database.

- **Chapter 4** (280 min.)

- Entity-Relationship Diagram

Analyse simple scenarios in business, education or other fields and create simple ER diagrams involving binary relationship only in designing databases.

4

Overall Time Allocation (Con't)

- **Chapter 5** (280 min.)

- Logical Database Design

Learning Outcomes

Transform the ER diagrams to tables in relational databases.

- **Chapter 6** (80 min.)

- Data Redundancy & Anomalies

Explain the concepts of data redundancy and discuss the methods or measures used to reduce data redundancy.

- **Chapter 7** (280 min.)

- Normalisation

5

Overall Time Allocation (Con't)

- **Case Study** (90 min.)

- An e-Learning platform
- included in Chapters 3, 4, 5, 7



6

Resources in the Package

- Teaching Plan
- PowerPoint files
- Worksheets
- Assessment
- Glossary
- Reading List
- etc.

Teacher version and student version available for "Power Point files", "Worksheets", "Assessments"

7

Demonstration





8

Chapter 1

The Importance of Good Database Design








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Chapter 1 The Importance of Good Database Design

- Teaching Plan 
 - Learning Goals
 - Time Allocation
 - Teaching Strategies/Approaches
- PowerPoint files 
 - For teacher & student  
 - Texts, pictures & animations to cater for different learning styles
 - Including activities at different learning stages
 - Easy for teacher to customize (by Copy & Paste)



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Chapter 1 The Importance of Good Database Design

- Worksheets   
 - Teacher's note with suggested teaching strategies provided
 - Emphasize on developing students' generic skills in addition to subject knowledge
 - Cater for learner diversity:
 - Worksheets can be completed with or without using IT tools (data files provided in different formats). 
 - Animations are provided for assisting students to understand. 
- Assessment Exercises 
 - Formative assessment with marking scheme 

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Chapter 1 The Importance of Good Database Design






- Glossary 
 - Glossary list with definition of terms
 - Summarising key concepts / terms
- Reading List 
 - Extended reading list with brief explanatory notes
 - The concept of "Reading to Learn"

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Chapter 4 Entity-Relationship Diagram

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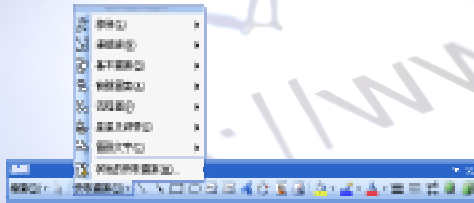
Chapter 4 Entity-Relationship Diagram

- Teaching Plan 
- PowerPoint files  – Different authentic examples
- Worksheet 1:  – Task-based approach: each task focuses on different concepts of ER diagrams.
- Worksheet 2:  – Some authentic cases: *an online supermarket, a discussion forum*
- Assessment Exercises 

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Some Tools for drawing ER Diagram

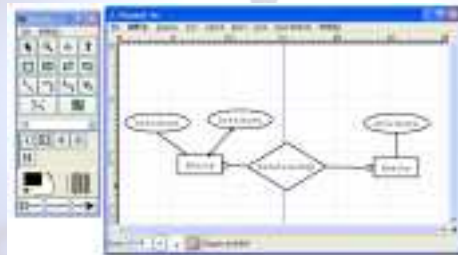
- Drawing Tool in MS Word



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Some Tools for drawing ER Diagram

- Dia (http://dia-installer.de/index_en.html)








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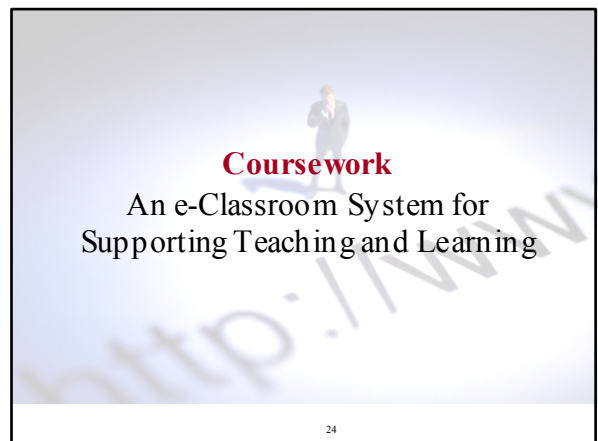
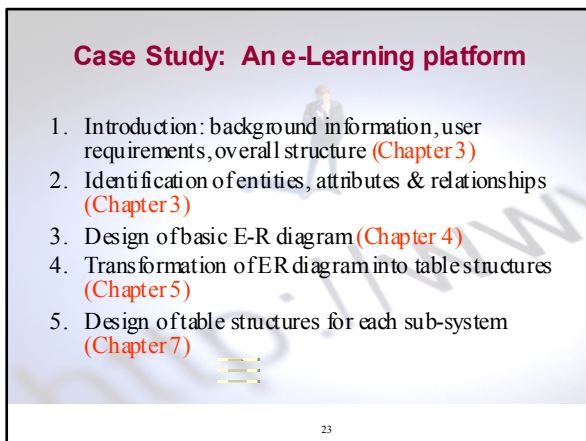
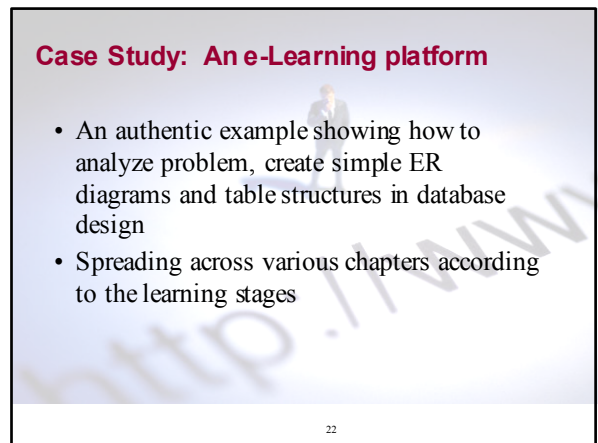
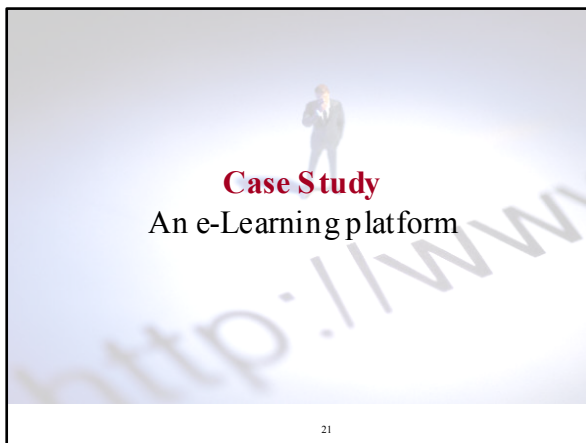
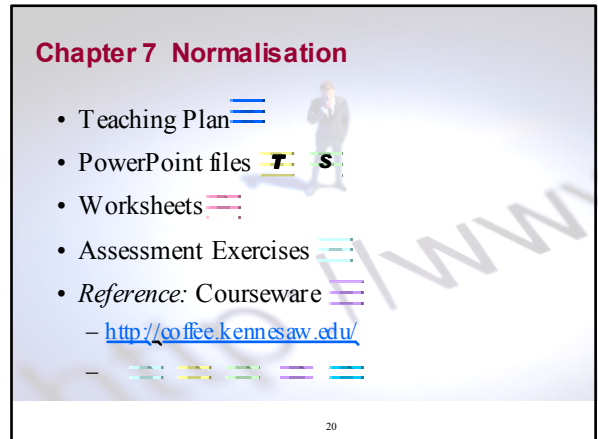
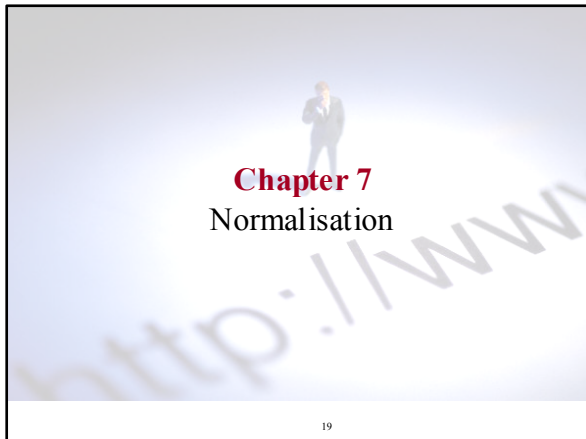
Chapter 5 Logical Database Design

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Chapter 5 Logical Database Design

- Teaching Plan 
- PowerPoint files 
- Worksheets 
- Assessment Exercises 
- Reference: Online Exercises  – <http://coffee.kennesaw.edu/>

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



Coursework

- A continuous assessment given to students
- Students should apply the techniques they learn in Chapter 1 to 7 to solve the problem
- Adopting *scaffolding learning strategy*:
 - *The given case study acts as a framework to support students to construct their own knowledge and solutions*

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Coursework

- Formative assessment tasks with instructions 
- Suggested rubrics / marking scheme 

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Thank You!

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