INFO20003 Database Systems

Assignment Project Exam Help

https://powcoder.com

Dr Renata Borovica-Gajic

Add WeChat powcoder

Lecture 02
Database Development Process

Semester 2 2018, Week 1

Student representatives

On LMS: Staff Information

Student representatives:

1. Chia Jun Eo: eoc@student.unimelb.edu.au
2. Mayank Tomar: mtomar@student.unimelb.edu.au
3. Omar Ma: omar.ma@student.unimelb.edu.au

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

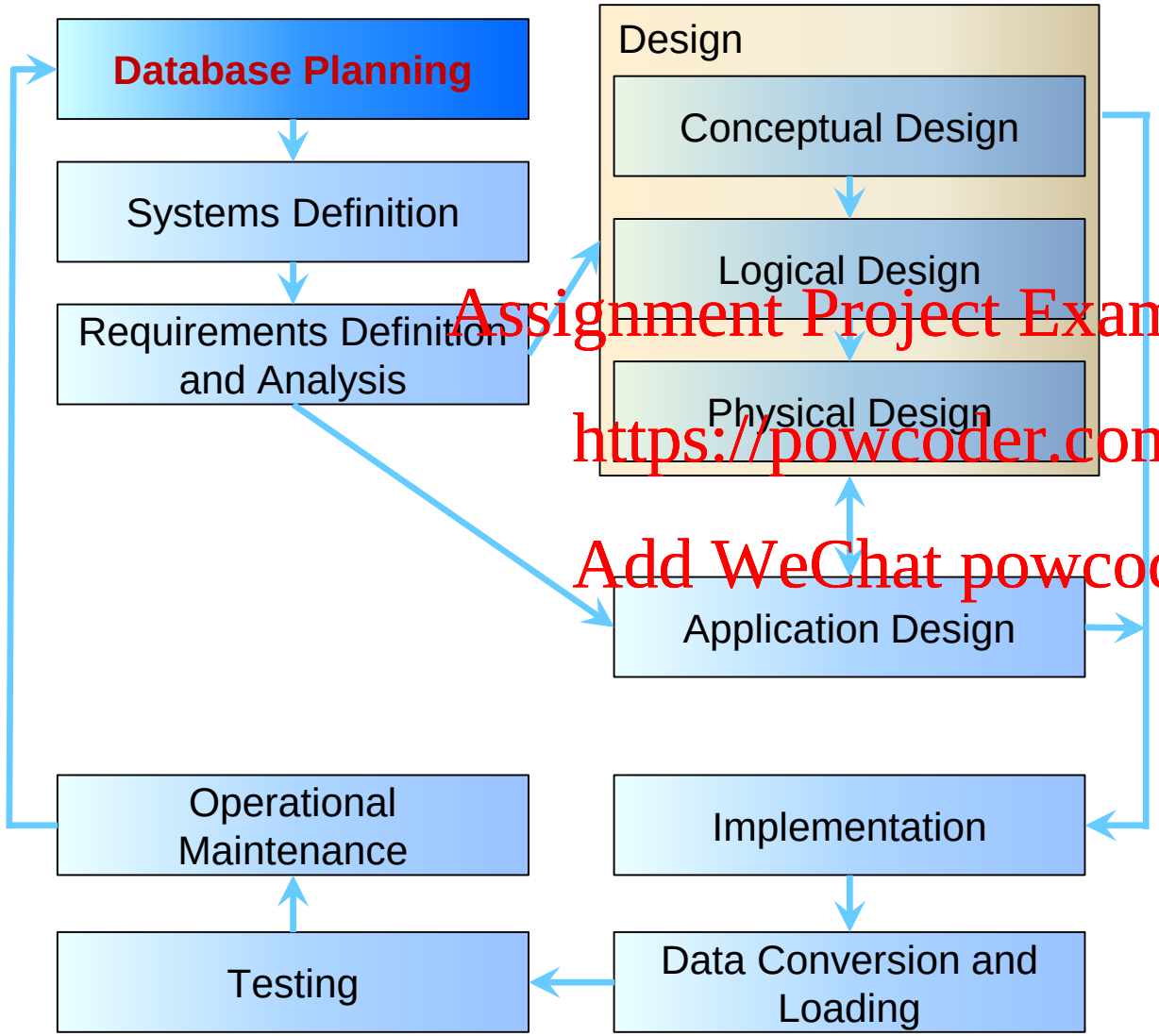
Coverage

- How database applications are developed
  - The development lifecycle
  - Focus on database *design*
    - Conceptual design
    - Logical design
    - Physical design

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Database Development Lifecycle

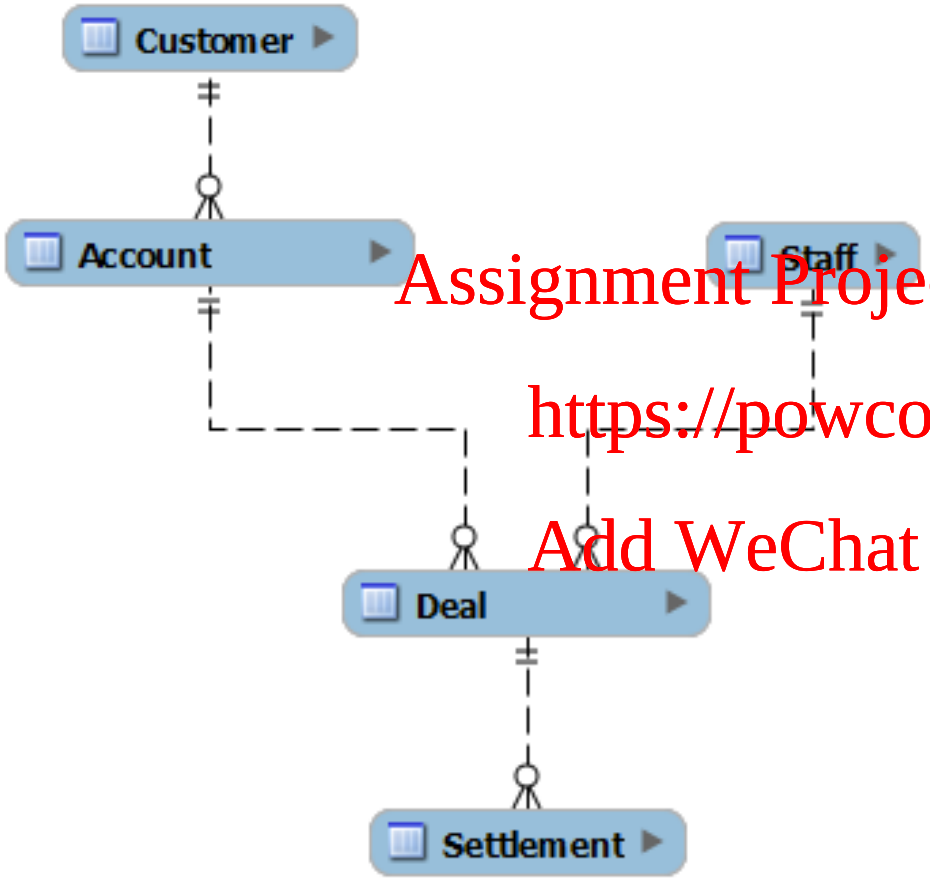


- Planning how to do the project.
  - How does the enterprise work
  - Enterprise data model
- Outside scope of the course

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Example Enterprise Data Model – Investment Banking



- A top level perspective on the data requirements
- Each box (subject area) would have a data model

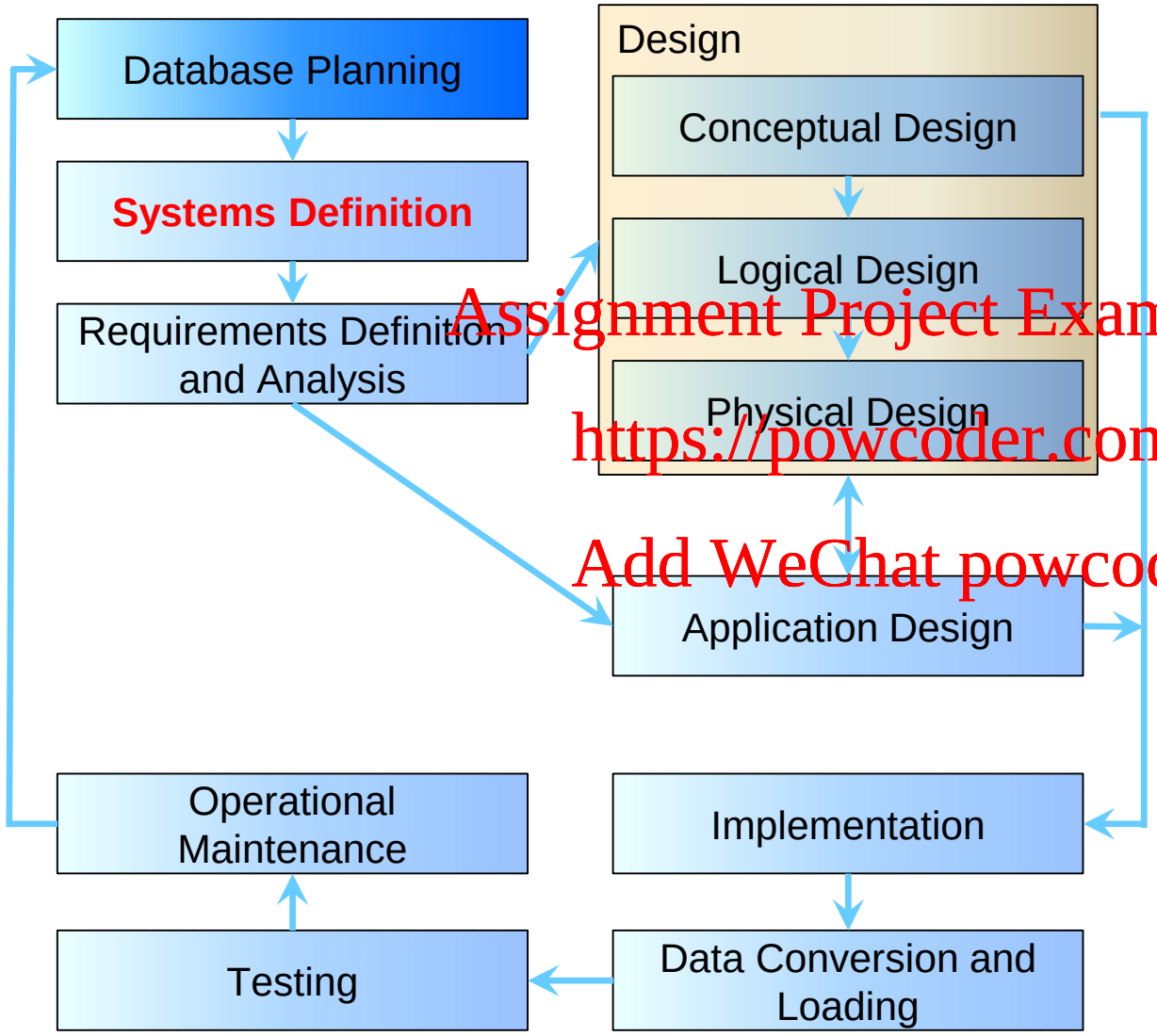
Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

© University of Melbourne 2018

Database Development Lifecycle

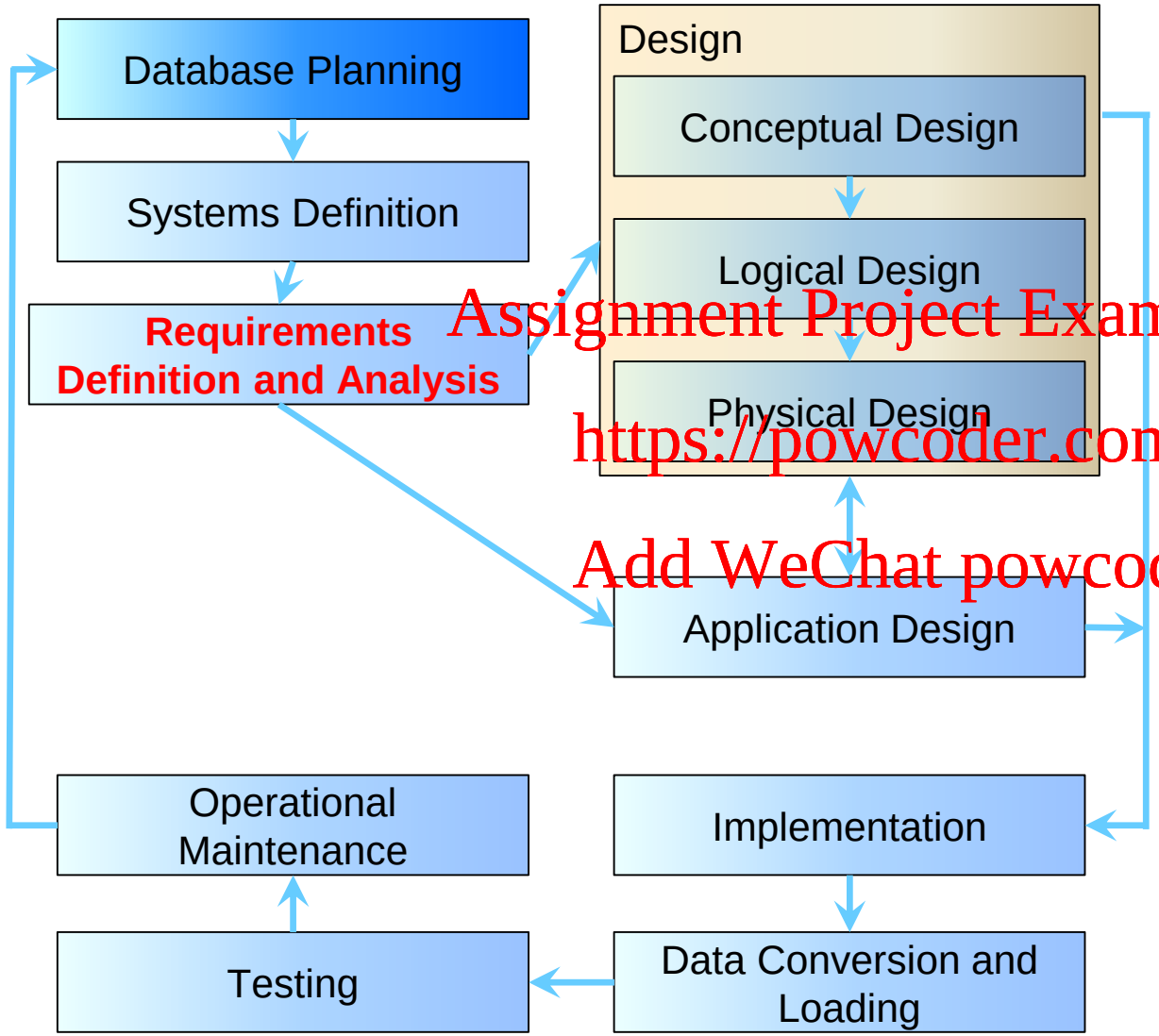


Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

- Specifying scope and boundaries
  - Users
  - Application areas
- How does the system interfere with other organisational systems
- Outside scope of the course (slightly)

© University of Melbourne 2018

Database Development Lifecycle

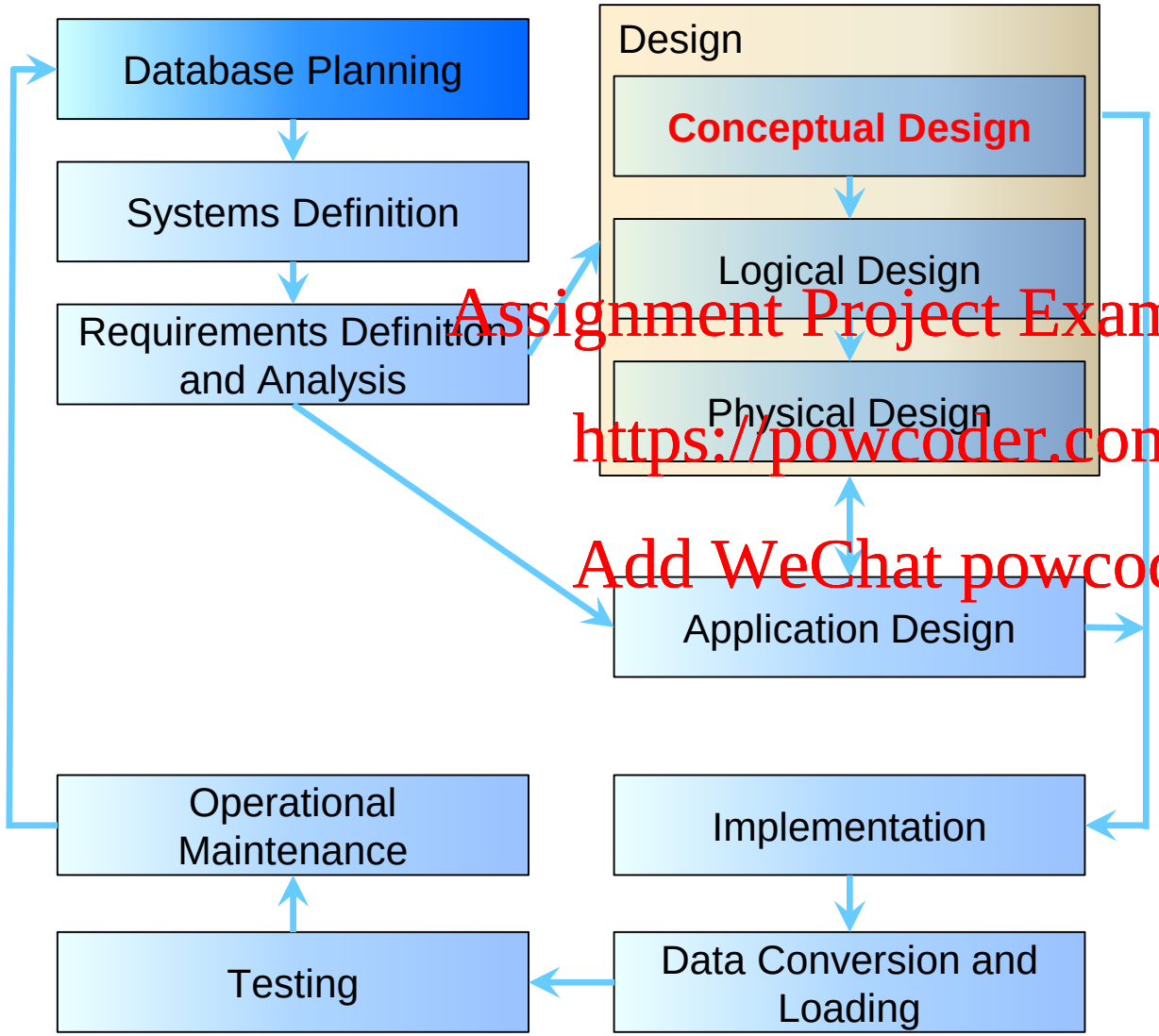


- Collection and analysis of requirements for the new system
- You will be given the requirements, but you will need to understand these!
- You may need to ask requirement questions about what you are given (for the assignment you state your assumptions)

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Database Development Lifecycle



- Construction of a model of the data used in the database – independent of all physical considerations
- Data Models
  - ER Diagrams

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Analysis of the problem

Business rule

- An investment bank has *a number* of branches. Within *each branch a number of departments* operate and are *structured in a hierarchical manner*. The bank employs around 3000 staff *who are assigned to work in the* various departments across the branches.

Assignment Project Exam Help

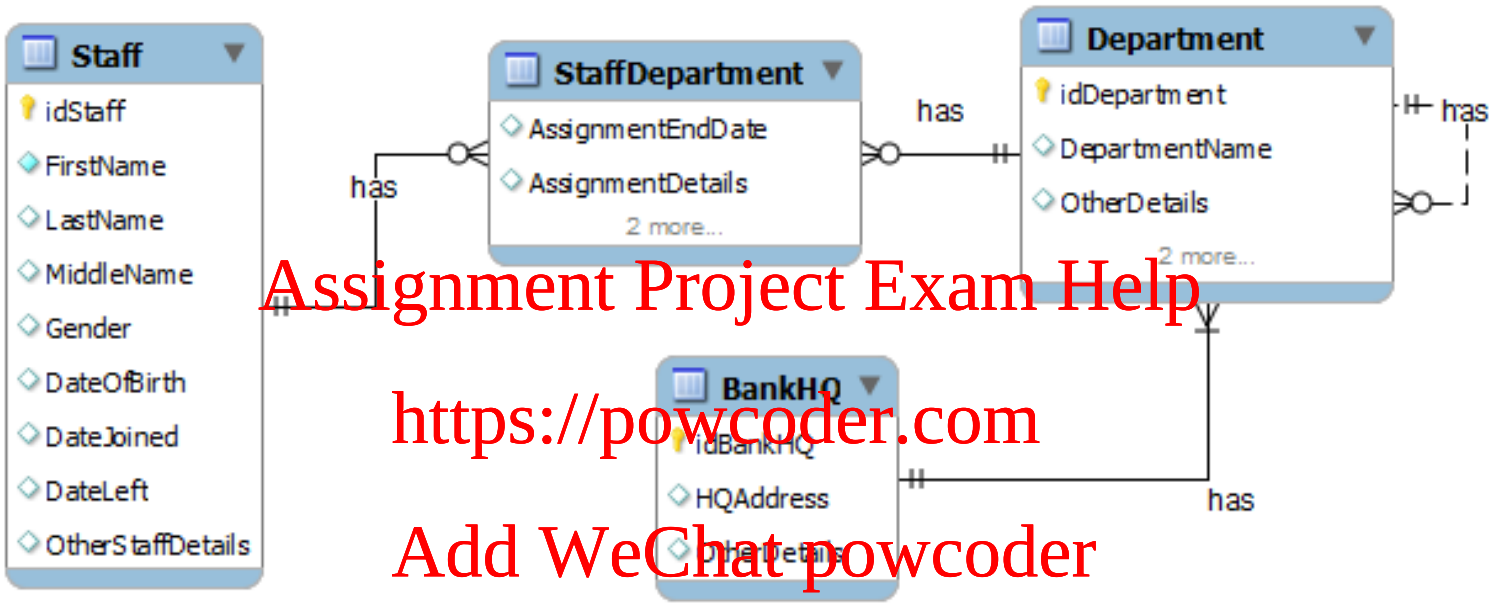
https://powcoder.com

- We need a database to record staff details including which department and branch they are assigned.

Add WeChat powcoder

© University of Melbourne 2018

Example Conceptual Data Model (ER) – Investment Banking



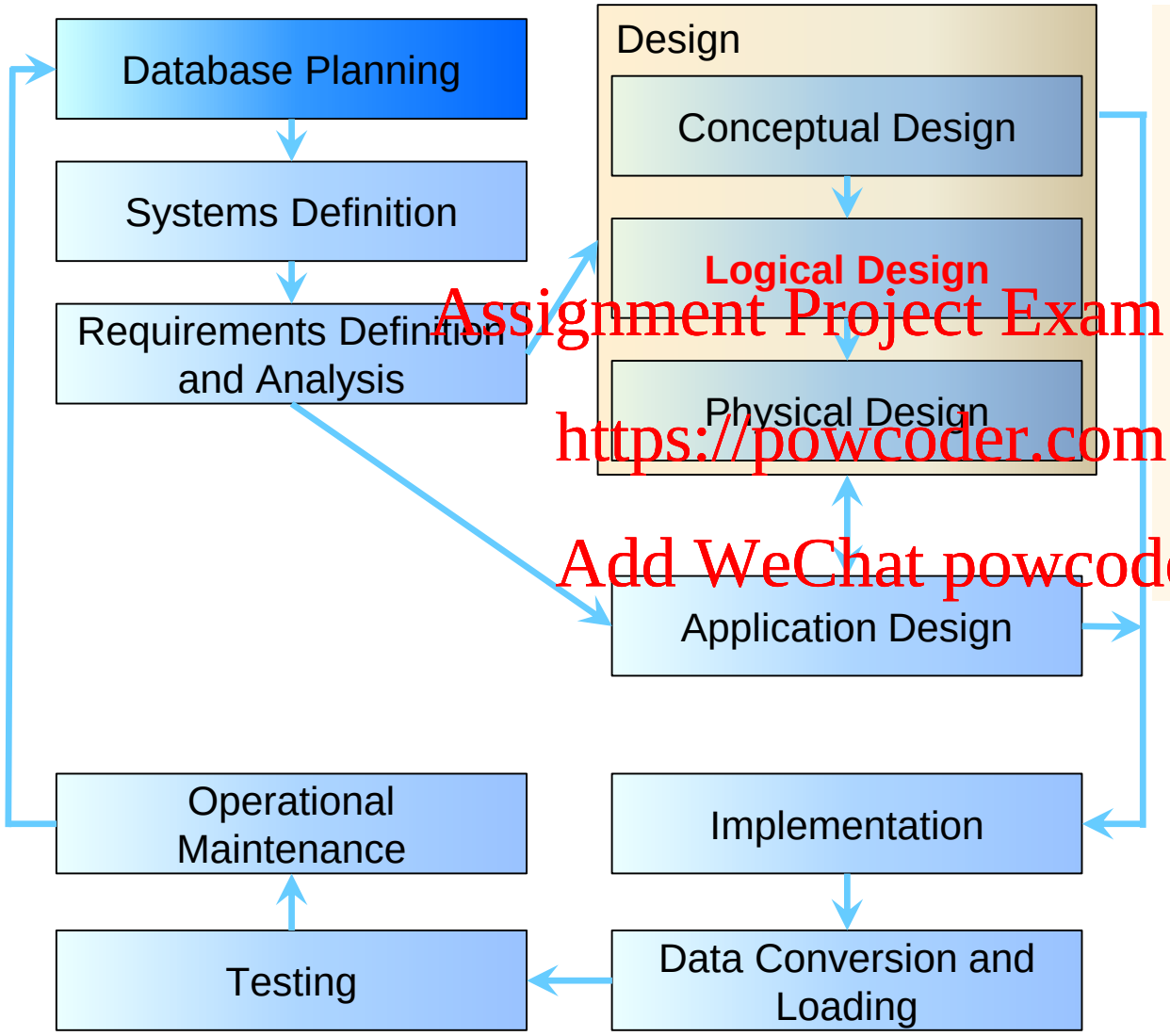
Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

© University of Melbourne 2018

Database Development Lifecycle

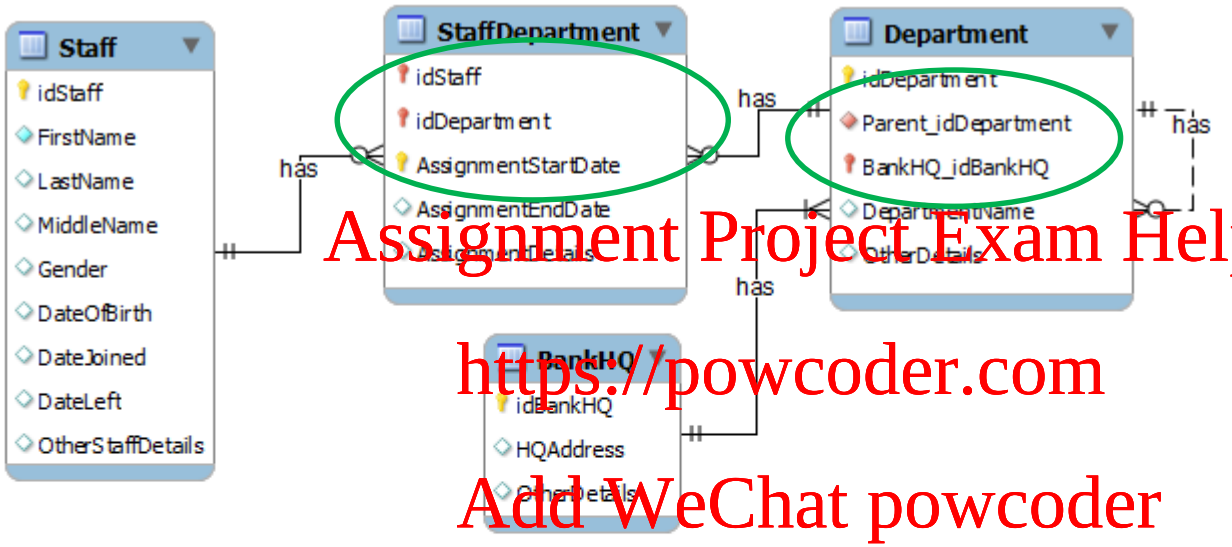


- Construction of a (relational) model of the data based on the conceptual design
- Independent of a specific database and other physical considerations

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Example Logical Data Model – Investment Banking

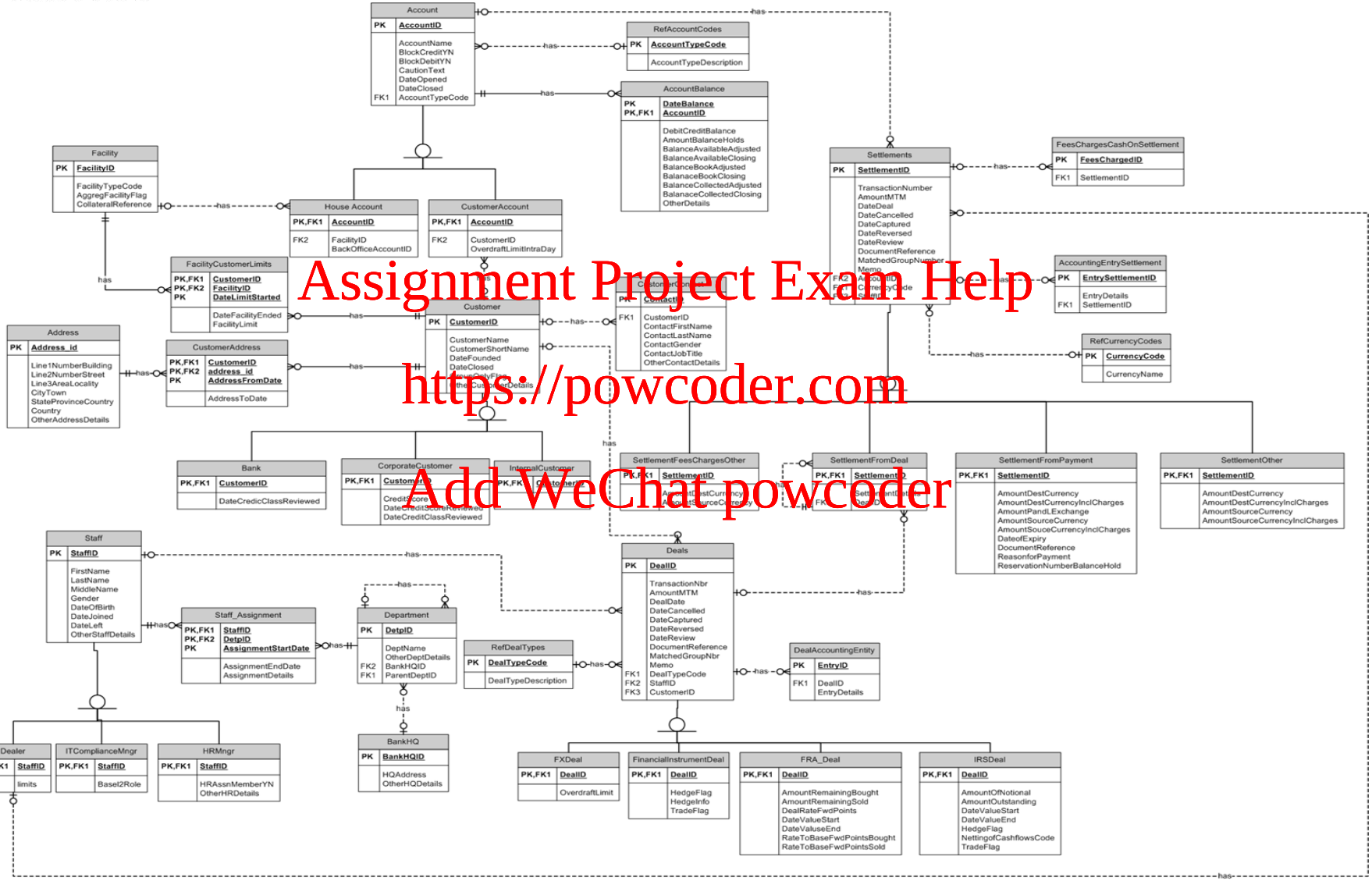


Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

Changes from Conceptual Model (ER)

© University of Melbourne 2018

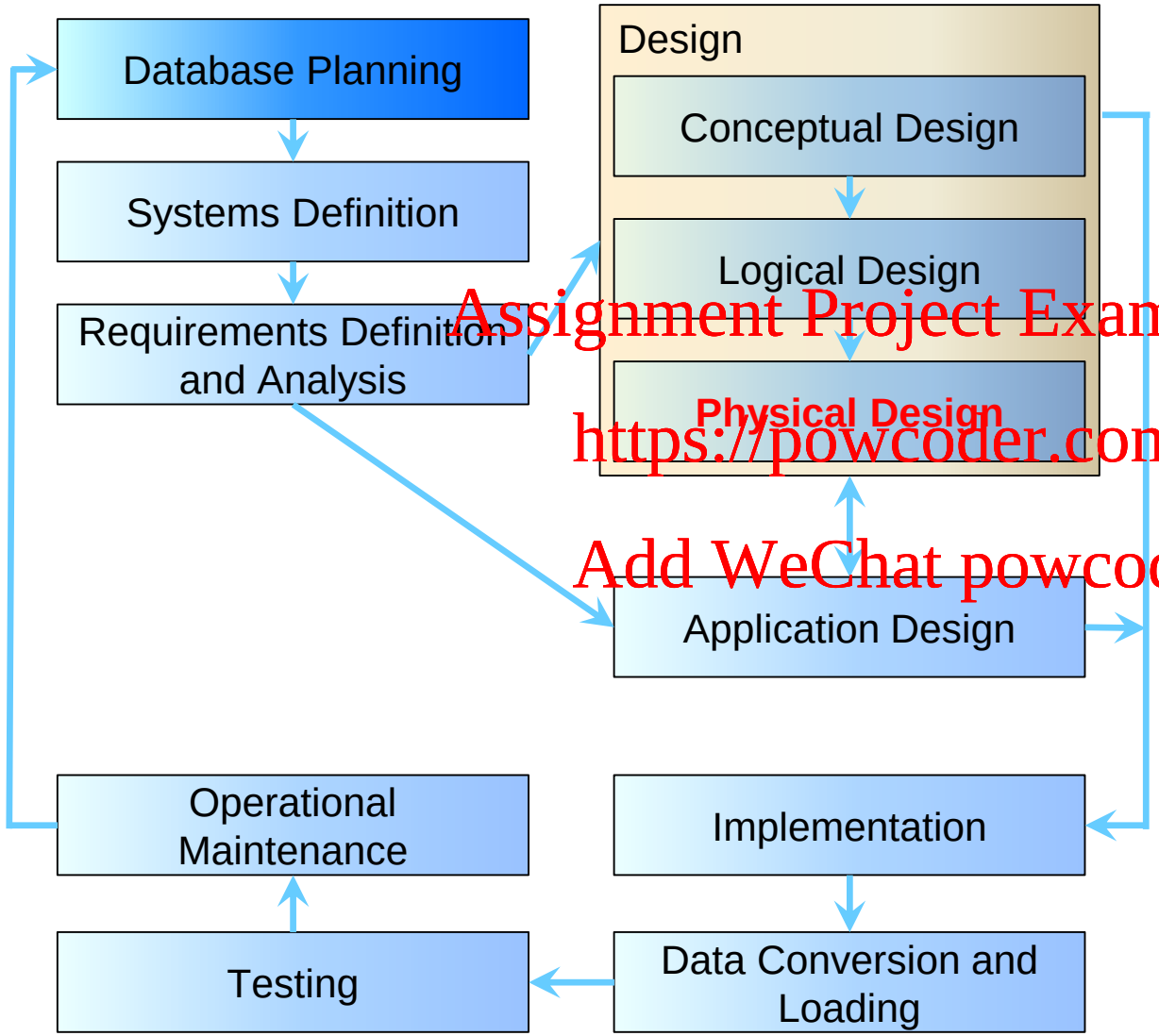
Example Logical Data Model – Investment Banking (Complete)



Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Database Development Lifecycle

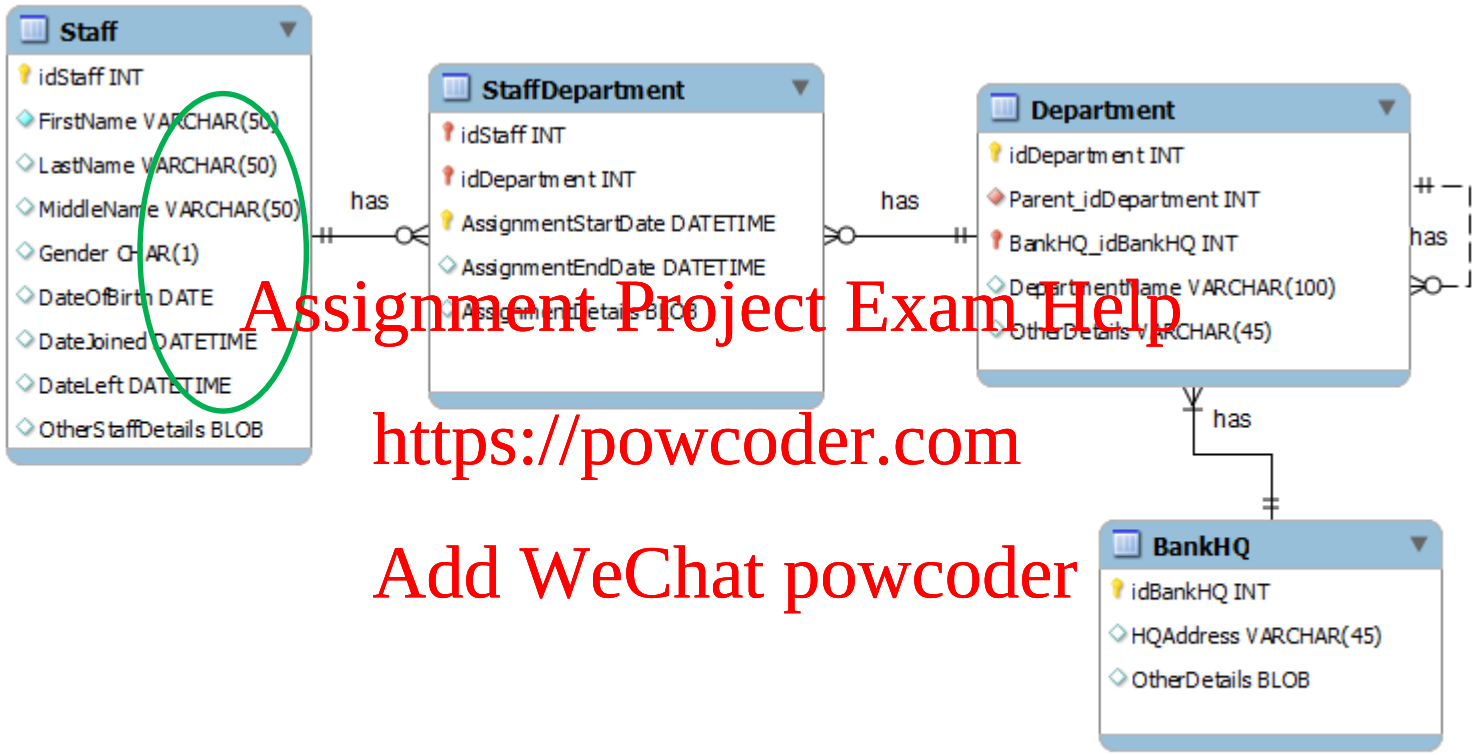


Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

- A description of the implementation of the logical design – for a *specific* DBMS.
- Describes:
  - Basic relations (data types)
  - File organisation
  - Indexes
- Although we don't do full physical design, we discuss some of the issues (e.g. data types)

© University of Melbourne 2018

Example Physical Model – Investment Banking (Staff)



Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

© University of Melbourne 2018

Choosing Data Types

- Types help the DBMS store and use information efficiently
  - Can make assumptions in computation
  - Consistency is guaranteed
- Minimise storage space
- Need to consider
  - Can you store all possible values
  - Can the type you choose support the data manipulation required
- Selection of types may improve data integrity

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Example of Data Dictionary

- We do the data dictionary as an ongoing process during analysis and design of the database
- Example of what is required

Key	Attribute	Data Type	Not Null	Unique	Description
Type of key Is it a primary key or a foreign key (leave blank if neither)	Name of Attribute	Data type of attribute	If the field is required or is optional	Must the value in the field be unique for that field	A description of the attribute giving any information that could be useful to the database designers or to the application developers. This would include things like attribute sizes, valid values for an attribute, information about coding for this attribute etc.

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Example of Partial Data Dictionary

Key	Attribute	Data Type	Not Null	Unique	Description
PK	StaffID	Integer	Y	Y	ID number of the staff member, should be 5 in length. This is the primary identifier (key) of the table.
	FirstName	VarChar			The first given name of the staff member, up to 100 characters.
	LastName	VarChar	Y		The family name of the staff member, up to 100 characters. This must exist for every staff member.
	Gender	ENUM	Y		The gender of the staff member, valid values are only “Male” or “Female” (???). An enumerated data type should be used if possible. This should be limited in applications using this field also.
	DateOfBirth	DateTime	Y		This is when the staff member was born. Needs dd/mm/yyyy format.
	...				

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

MYSQL Data Types (some)

- Character Types
  - CHAR(M): A fixed-length string, right-padded with spaces. The range of M is 0 to 255.
  - VARCHAR(M): A variable-length string. The range of M is 1 to 65535. (its 255 max. in MySQL 4).
  - BIT, BOOL, CHAR: CHAR(1).
  - BLOB, TEXT: up to 65536 bytes (for blob) or characters (for text).
  - ENUM ('value1','value',…) up to 65,535 members.
  - SET ('value1','value2',…) up to 64 members.
- Integer Types
  - TINYINT[(M)]: Signed (-128 to 127) Unsigned(0 to 255)
  - SMALLINT[(M)]: Signed (-32768 to 32767) Unsigned (0 to 65535)
  - MEDIUMINT[(M)]: Signed (-8388608 to 8388607) Unsigned (0 to 16777215)
  - INT[(M)] / INTEGER[(M)]: Signed (-2147483648 to 2147483647) Unsigned (0 to 4294967295)
  - BIGINT[(M)]:Signed(-9223372036854775808 to 9223372036854775807) Unsigned(0 to 18,446,744,073,709,551,615)

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

MYSQL Data Types (some)

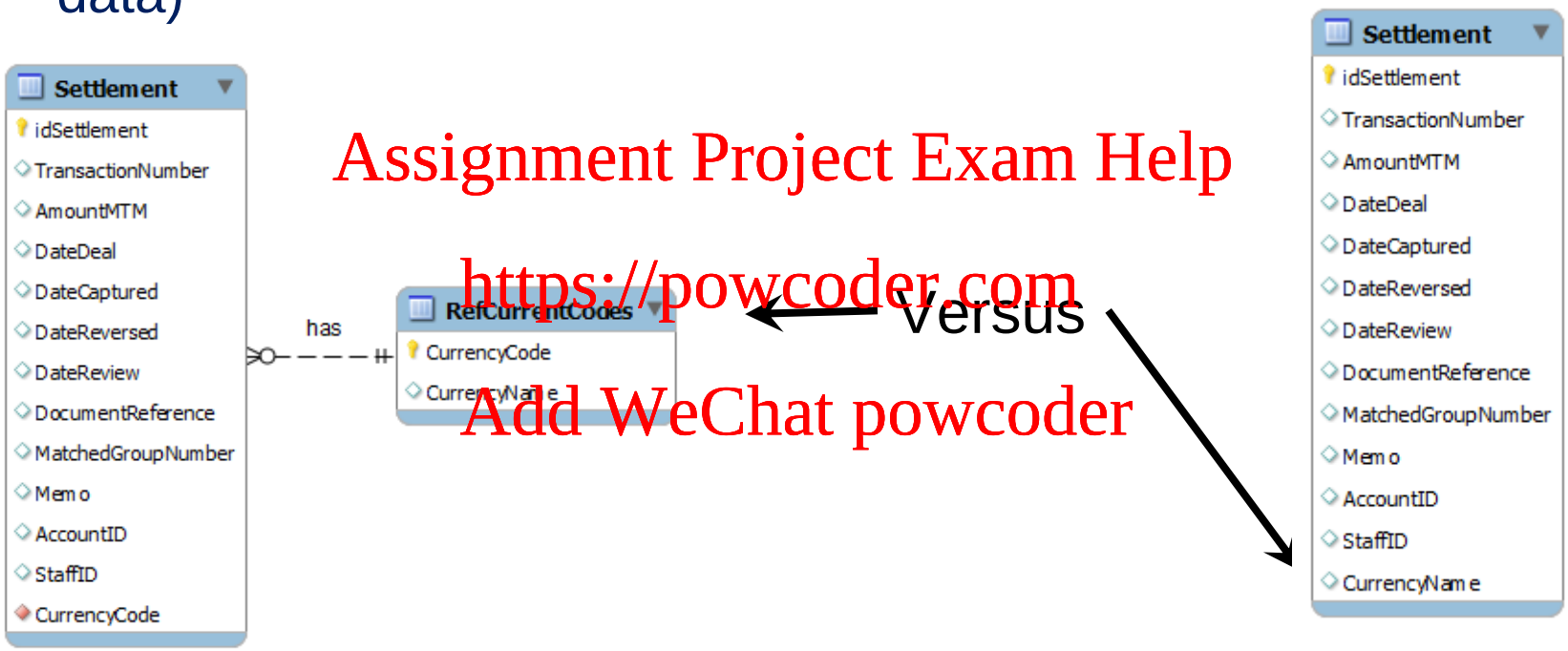
- Real Types
  - FLOAT[(M,D)]: single-precision, allowable values: -3.402823466E+38 to -1.175494351E-38, 0, and 1.175494351E-38 to 3.402823466E+38. M = display width, D = number of decimals.
  - DOUBLE[(M,D)] / REAL[(M,D)]: double-precision, allowable values: -1.7976931348623157E+308 to -2.2250738585072014E-308, 0, and 2.2250738585072014E-308 to 1.7976931348623157E+308.
  - DECIMAL[(M[,D])]: fixed-point type. An unpacked floating-point number. Stored as string. Good for MONEY!
- Time and Date Types
  - DATE 1000-01-01 to 9999-12-31
  - TIME -838:59:59 to 838:59:59
  - DATETIME 1000-01-01 00:00:00 to 9999-12-31 23:59:59
  - TIMESTAMP 1970-01-01 00:00:00 - ~ 2037 Stored in UTC, converted to local
  - YEAR[4] 1901 to 2155 - A useful function in MySQL: NOW();

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Other Physical Design Decisions

- How to store “Look Up”
  - Trade off between speed and space (and possibly integrity of data)



Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

- Data field integrity (ensure fields only contain correct data)
- Handling missing data (concept of NULL data)

© University of Melbourne 2018

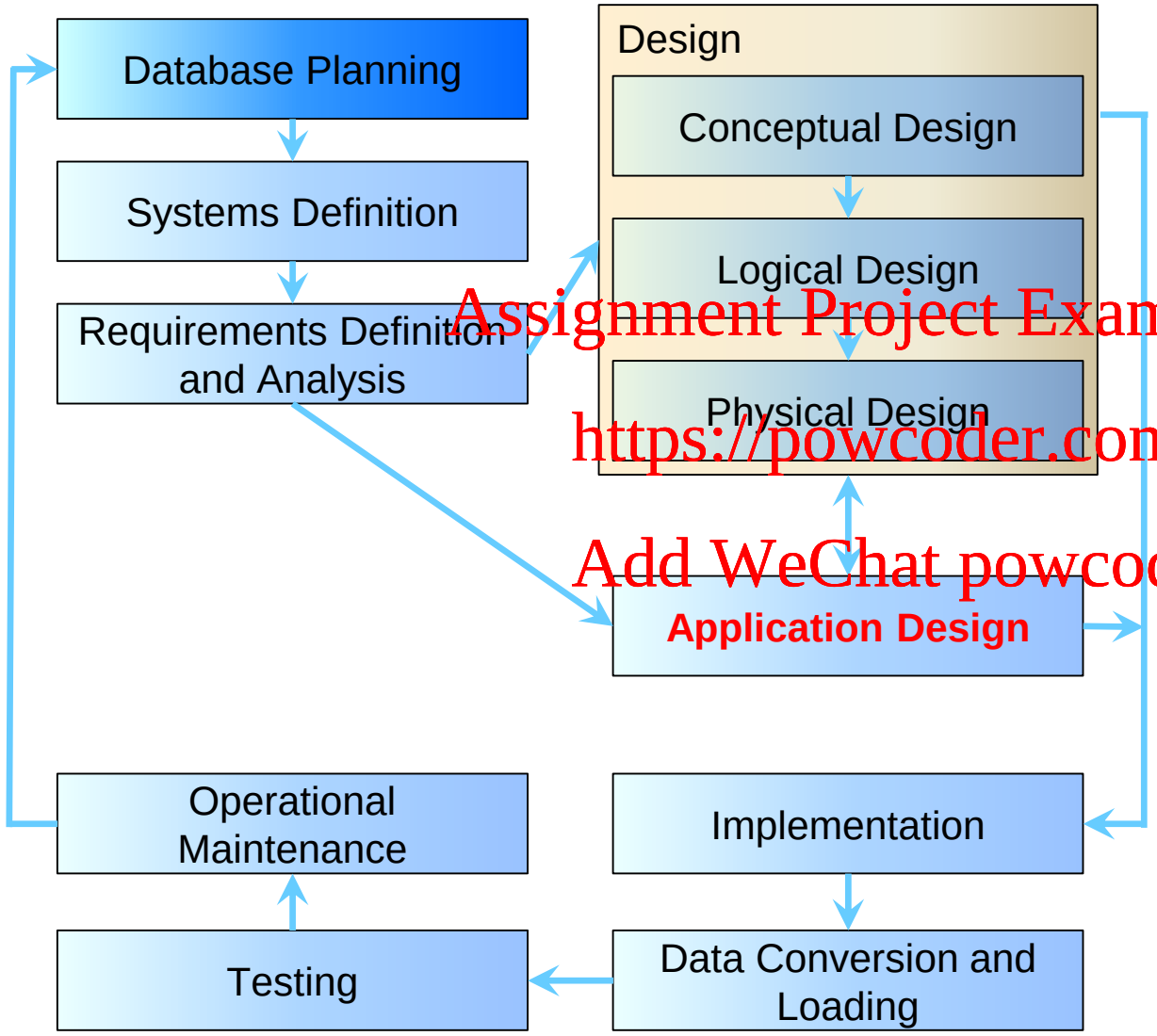
Other Physical Design Decisions (2)

- To De-Normalise or Not (That is the Question)
  - Normalisation
    - A formal method used to validate and improve upon the logical design thus far (which attributes should be grouped together), before proceeding with the physical design
    - Taught later in the semester
  - De-Normalisation
    - At physical design time need to decide how to implement the design – including removing some of the normalisation steps...
    - Benefits
      - Improved database performance
    - Costs
      - Wasted storage space
      - Data integrity / consistency threats

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Database Development Lifecycle

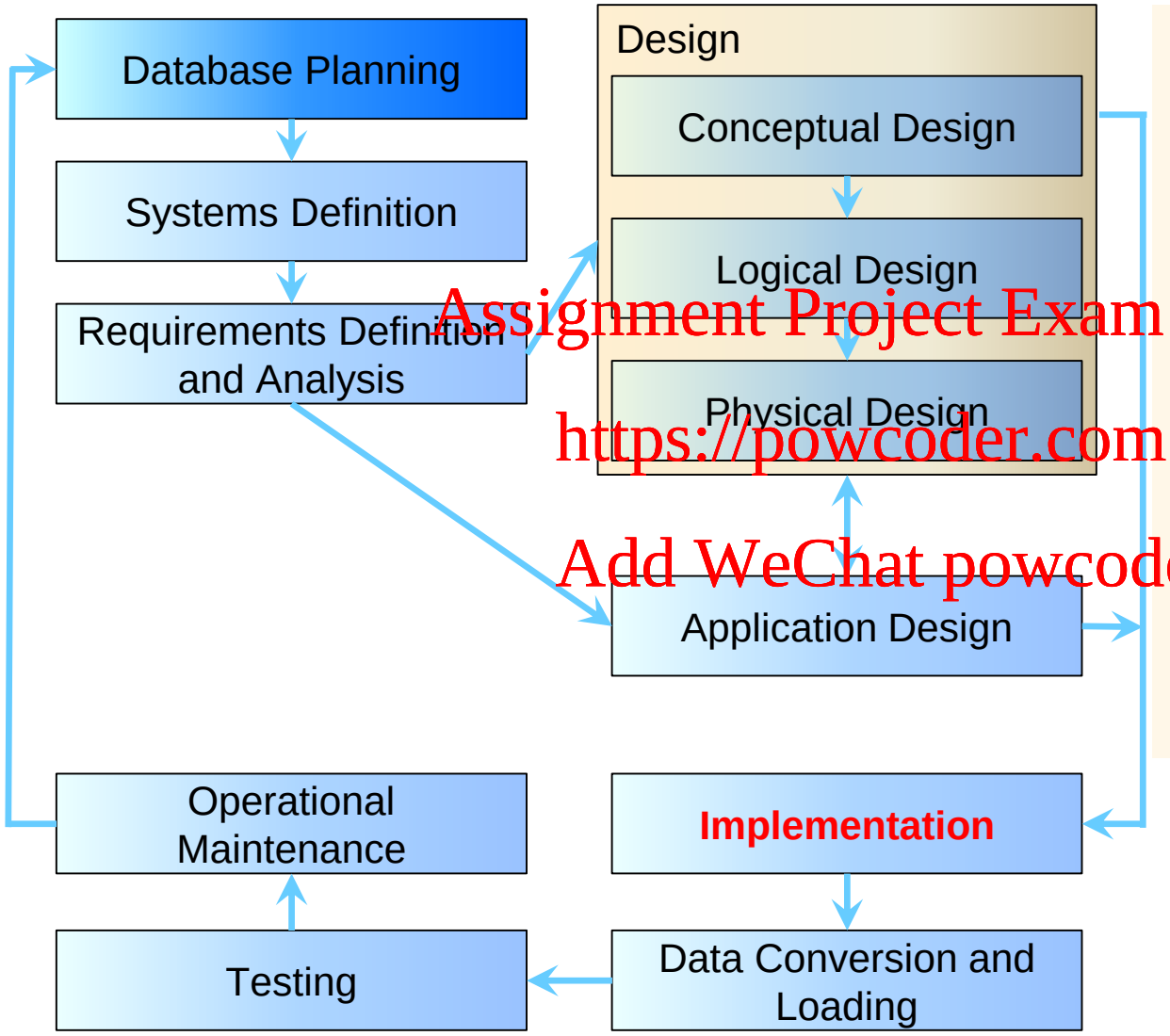


- Done in conjunction with design
- Design of the interface and application programs that use and process the database

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Database Development Lifecycle

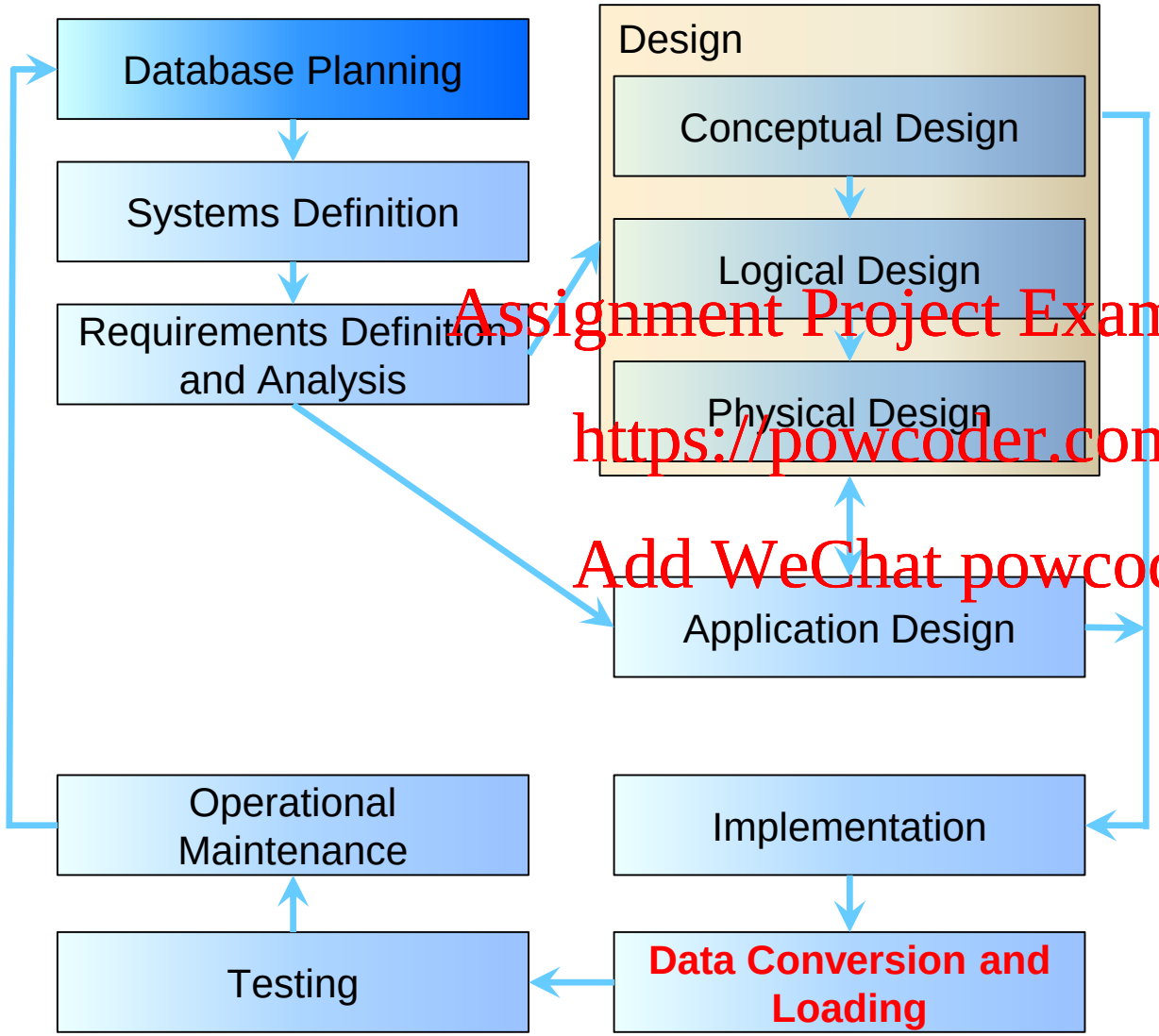


- The physical realisation of the database
- Implementation of the design
- Some of the things in implementation are covered as you will be implementing database tables

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

Database Development Lifecycle



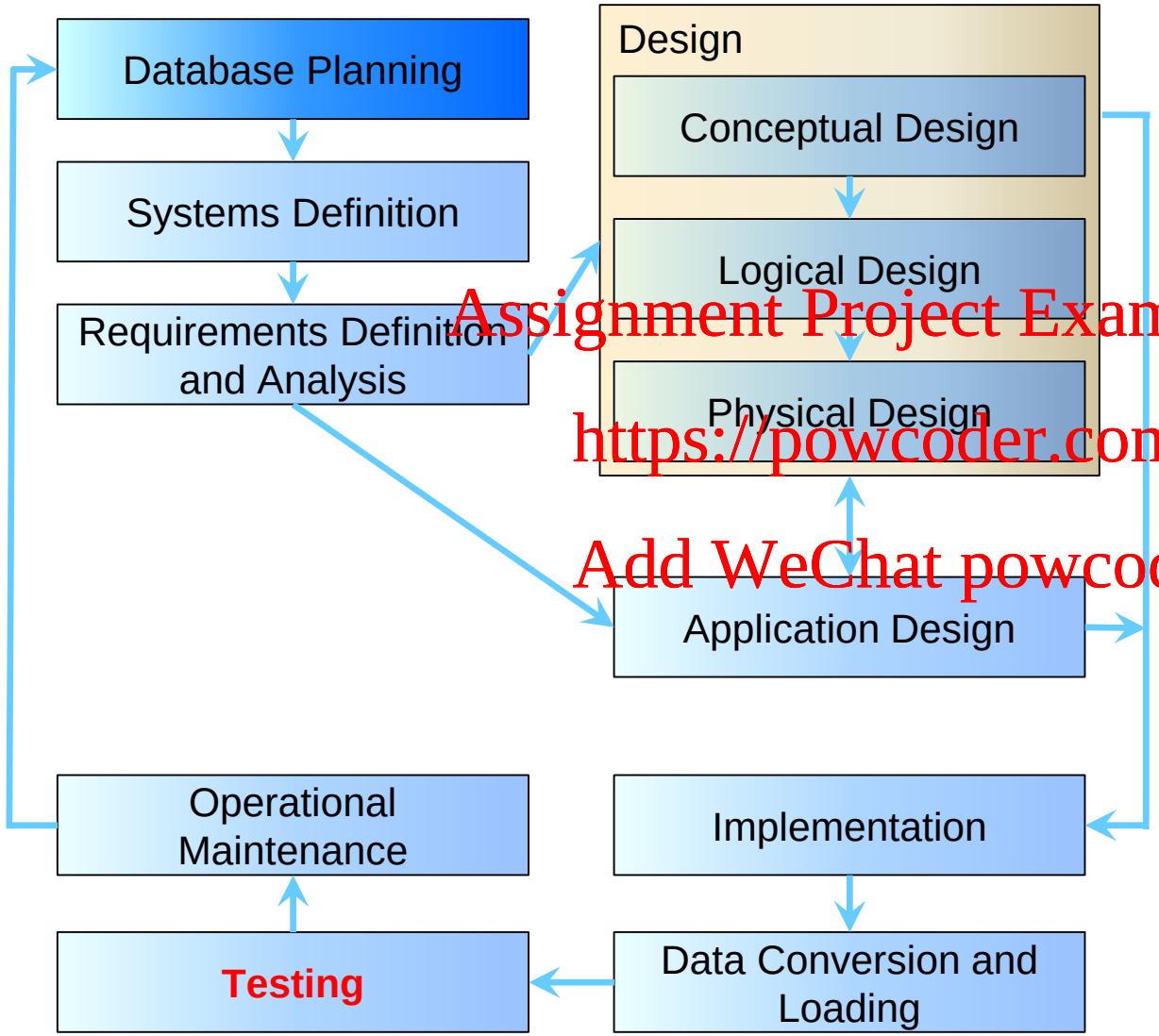
Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

- Transfer existing data into the database
- Conversion from old systems
- Non trivial task

- We give you the data. In a real world situation you would have to do this step – very carefully, very time consuming... Lots of issues around this

© University of Melbourne 2018

Database Development Lifecycle

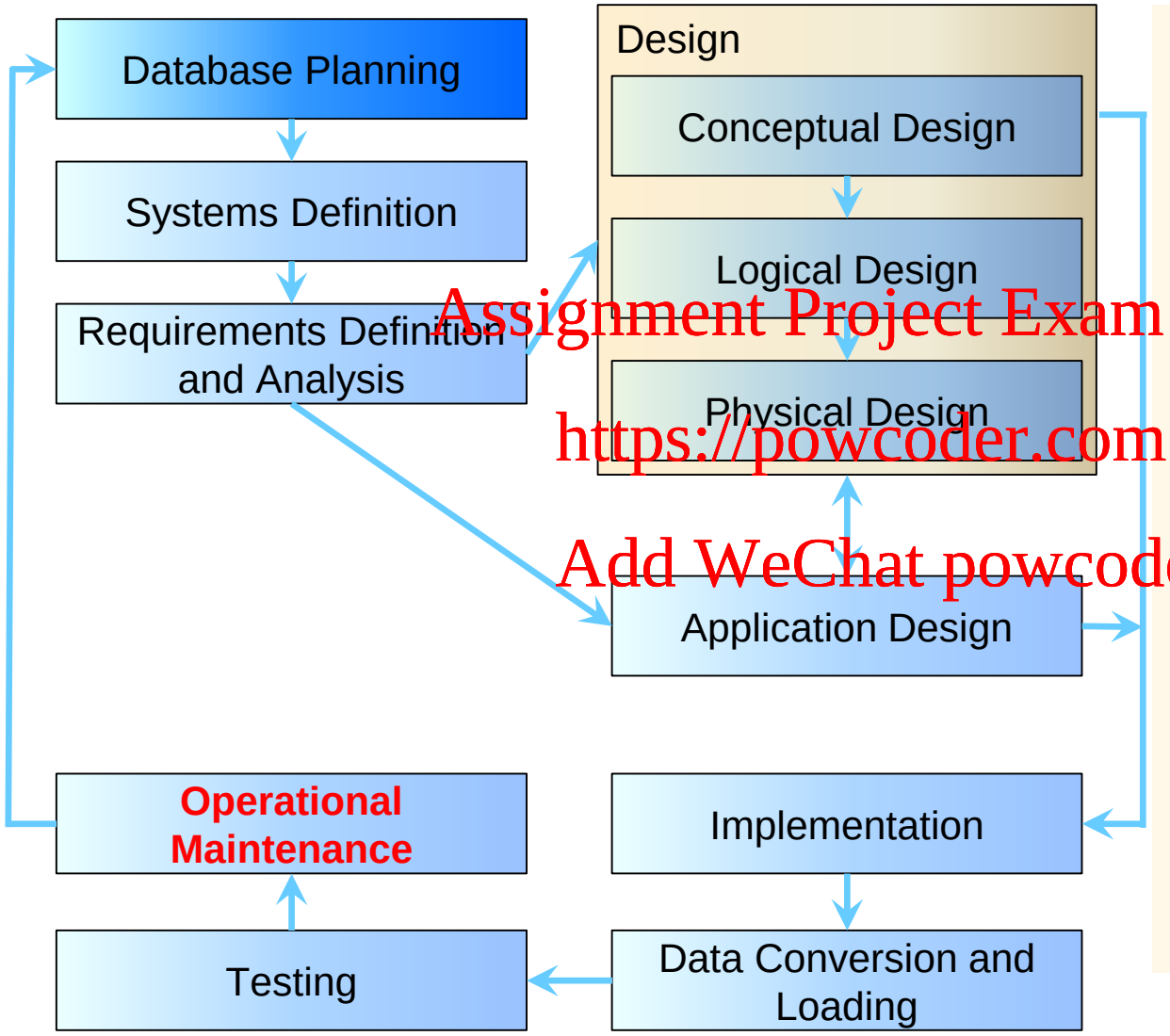


Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

- Running the database to find errors in the design / setup (both at a physical level and at a logical level)
- Other issues also
  - Performance
  - Robustness
  - Recoverability
  - Adaptability
- Outside scope of the course (slightly) – but you need to test your solutions

© University of Melbourne 2018

Database Development Lifecycle



Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

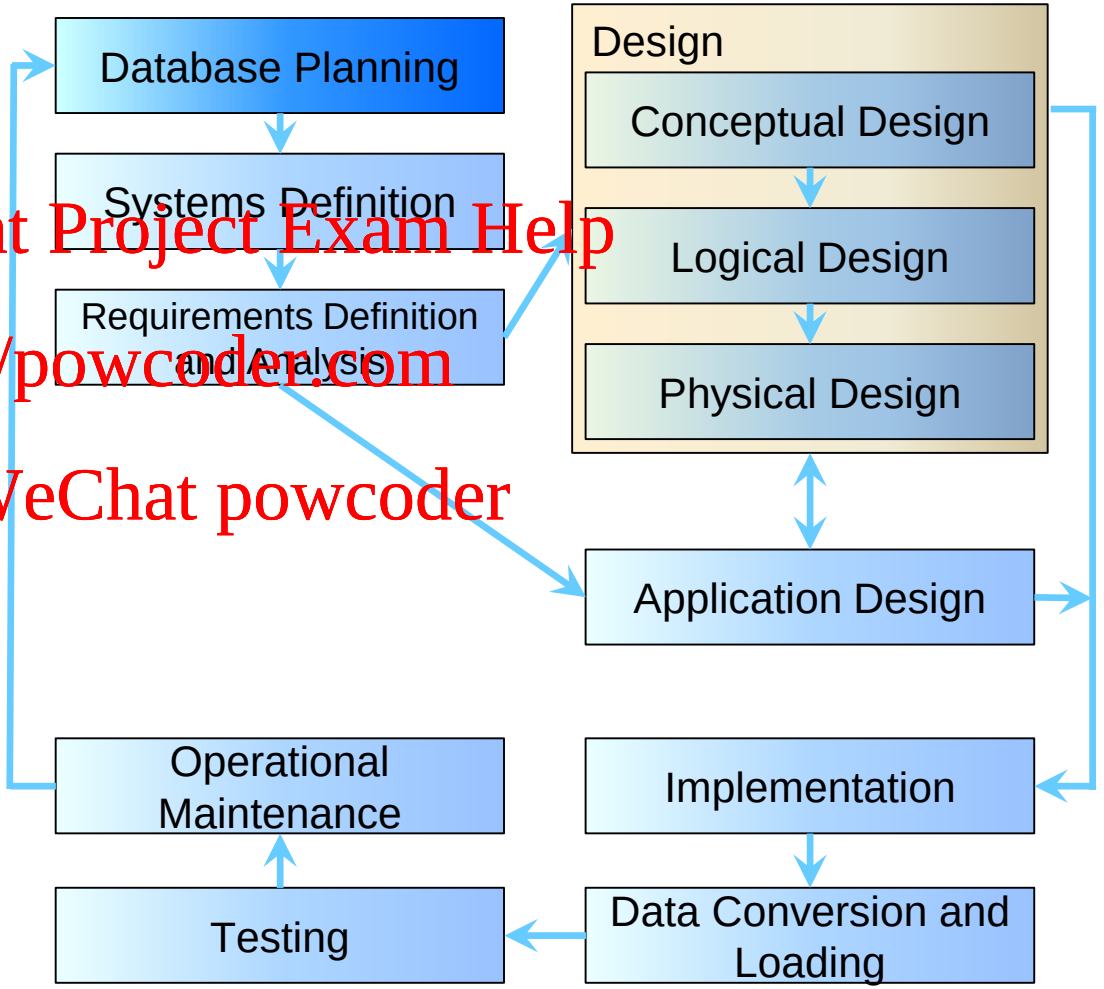
- The process of monitoring and maintaining the database system following its commissioning
- Handling new requirements
- Handling changes to requirements

- Outside scope of the course

© University of Melbourne 2018

Summary

- Discussed the lifecycle of Database Development
- Showed detail of the Modelling stages



Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

© University of Melbourne 2018

What's Examinable?

- Can you discuss the Database Development Lifecycle?
- What is done at each stage of Design?

Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

© University of Melbourne 2018

Next Lecture

- Introduction to Database Design
  - Conceptual design (ER diagrams)

Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

© University of Melbourne 2018

BIOMEDICAL RESEARCH VICTORIA

INNOVATING FOR HEALTH

Now Recruiting *Computer Science Students

Undergraduate Research Opportunities Program (UROP)

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

- UROP provides **casual paid employment** for undergraduate students (2nd year +) in biomedical research teams in Melbourne
- Do you have **PROGRAMMING SKILLS** & an **interest in biomedical science**?
- Applications open: **30 July – 14 August 2018** for projects starting in winter semester break

www.biomedvic.org.au/urop

Principal Sponsor

CSL