

CCT College Dublin Continuous Assessment

Programme Title:	BSc (Hons) in Computing in Information Technology		
Cohort:	September 2020 – Year 2 – Full Time		
Module Title(s):	Object Oriented Constructs (OOC) Linear Algebra (LA) Databases (DB)		
Assignment Type:	Pair or Individual/ Integrated	Weighting(s):	OOC (50%) LA (30%) DB (20%)
Assignment Title:	System of Linear Equations Calculator		
Lecturer(s):	Amilcar Aponte (amilcar@cct.ie) Aldana Louzan (alouzan@cct.ie)		
Issue Date:	2 nd November 2021		
Submission Deadline Date:	Saturday, 18th December 2021 @ 23:59		
Late Submission Penalty:	Late submissions will be accepted up to 5 calendar days after the deadline (Friday, 24 th December 2021 @ 23:59). All late submissions are subject to a penalty of 10% of the mark awarded . Submissions received more than 5 calendar days after the deadline above <u>will not</u> be accepted and a mark of 0% will be awarded.		
Method of Submission:	Moodle		
Instructions for Submission:	Single ZIP file that contains: <ul style="list-style-type: none"> • Source code (Full NetBeans Project). • Documentation in PDF format. 		
Feedback Method:	Results posted in Moodle gradebook		
Feedback Date:	21st January 2021		

Learning Outcomes:

Please note this is not the assessment task. The task to be completed is detailed on the next page.
This CA will assess student attainment of the following minimum intended learning outcomes:

Linear Algebra

- MLO2: Recognise the equations of lines and planes in two and three dimensions, utilise this information in the formation of connected lines and planes (Linked to PLO 4 (Stage 1/2 SLO 4))
- MLO3: Perform basic matrix computations (Linked to PLO 1 (Stage 1/2 SLO 1))
- MLO4: Solve a linear system using various methods (Linked to PLO 1 (Stage 1/2 SLO 1))
- MLO5: Compute the determinant and inverse of an invertible matrix (Linked to PLO 1 (Stage 1/2 SLO 1))

Object Oriented Constructs

- MLO 3. Plan, design and document a proposed solution to a given problem, present and justify decisions taken for implementation of said solution to peers and stakeholders.
- MLO 4. Understand and apply best practices in Object Oriented Programming in the production of software and in the production of requirements definition documentation.
- MLO 5. Operate both as an individual and as part of a multidisciplinary team to produce software solutions to well defined requirements

Databases

- MLO1: Understand the fundamental concepts of relational databases, database management systems (DBMS), Integrity constraints and applications of relational database models. (Linked to PLO 1 (Stage 1/2 SLO 1))
- MLO2: Demonstrate and implement data definition and manipulation language at the basic and advanced levels using SQL. (Linked to PLO 2, PLO 3 (Stage 1/2 SLO 2 / SLO 3))

Attainment of the learning outcomes is the minimum requirement to achieve a Pass mark (40%). Higher marks are awarded where there is evidence of achievement beyond this, in accordance with QQI *Assessment and Standards, Revised 2013*, and summarised in the following table:

Percentage Range	CCT Performance Description	QQI Description of Attainment	
		Level 6, 7 & 8 awards	Level 9 awards
90% +	Exceptional	Achievement includes that required for a Pass and in most respects is significantly and consistently beyond this	Achievement includes that required for a Pass and in most respects is significantly and consistently beyond this
80 – 89%	Outstanding		
70 – 79%	Excellent		
60 – 69%	Very Good	Achievement includes that required for a Pass and in many respects is significantly beyond this	Achievement includes that required for a Pass and in many respects is significantly beyond this
50 – 59%	Good	Achievement includes that required for a Pass and in some respects is significantly beyond this	Attains all the minimum intended programme learning outcomes
40 – 49%	Acceptable	Attains all the minimum intended programme learning outcomes	
35 – 39%	Fail	Nearly (but not quite) attains the relevant minimum intended learning outcomes	Nearly (but not quite) attains the relevant minimum intended learning outcomes
0 – 34%	Fail	Does not attain some or all of the minimum intended learning outcomes	Does not attain some or all of the minimum intended learning outcomes

Please review the CCT Grade Descriptor available on the module Moodle page for a detailed description of the standard of work required for each grade band.

The grading system in CCT is the QQI percentage grading system and is in common use in higher education institutions in Ireland. The pass mark and thresholds for different grade bands may be different from what you have experience of in the higher education system in other countries. CCT grades must be considered in the context of the grading system in Irish higher education and not assumed to represent the same standard the percentage grade reflects when awarded in an international context.

Assessment Task

Students are advised to review and adhere to the submission requirements documented after the assessment task. This assignment is an integrated assessment that spans over 3 modules: Databases, Object Oriented Constructs and Linear Algebra.

You are required to develop a program that will solve systems of linear equations of two and three variables using matrices. Your program will also include a component of data persistency, that will keep track of different users and the operations they perform.

System requirements

Two different user account types must be created. Depending on the account type, different options in the system will be available to them. The two types of users will be:

Admin

- There should be one system administrator pre-registered through the backend database with the following credentials:
 - Username: CCT
 - Password: Dublin
- The admin should be able to log into the system.
- Once logged in, the administrator will be able to:
 - Modify their own profile (name, surname, and any other attribute you define for them).
 - Access a list of all other users in the system.
 - Remove other users from the system.
 - Review the operations performed by other users.

Regular User

- The regular user should be able to sign up to the system using a self-registration option.
- Once registered, the regular user should be able to log into the system.
- Once logged in, the regular user will be able to:
 - Modify their own profile (name, surname, and any other attribute you define for them).
 - Solve systems of linear equations of two and three variables. How to handle the input of the equations is for you to decide. Every time a system of equations has been solved by the system; a record of this operation should be stored in the database.

You will also produce a document where you will include:

- Challenges you faced in the development process and your strategies to overcome them.
- The rationale for your design decisions.
- Database conceptual design. Include in your report the conceptual design using CHEN notation. You can use tools such as draw.io to achieve this. In the diagram, you need to identify entities, attributes and relationships.
- Logical design. Transform the conceptual representation from above to the logical structure in the Relational Model.
- Validate the Relational Model and determine if Normalisation is necessary Include a short paragraph to explain that design is in 1NF, 2NF, 3NF.
- Physical design: Produce the SQL create statements for each relation including INSERT statements (dummy data).
- Appendix with your database file.

Programming Requirements

You are expected to build your program using an object-oriented approach. Thus, all the Object Orientation and SOLID principles should be implemented using abstract classes, interfaces, access modifiers and any other tool that Java provides for this.

The use of other Java constructs such as ENUMS, collections, packages, and wrapper classes, among others, is also recommended.

The program should have a user interface. The minimum requirement is a command line program, but if you want to aim for a distinction, explore other options such as the GUI builder that NetBeans has incorporated. All user input should be correctly validated, and relevant error messages are required to improve the user experience. All business logic and user interactions should be separated.

Linear Algebra Requirements

You are expected to build a program which uses the properties of matrices to solve a system of simultaneous equations.

You must test your program with the following simultaneous equations:

1. $2x - 3y - 2 = 0$
 $3x + 8y - 3 = 0$
2. $x + y + z = 2$
 $2x + 3y + 5z = 11$
 $x - 5y + 6z = 29$

Database Requirements

You must design and implement a database in 3NF that meets the requirements of your assignment.

You must provide the logical and conceptual design of your database using appropriate diagrams.

You must manipulate your data using appropriate CRUD operations in SQL.

Submission Requirements

All assessment submissions must meet the minimum requirements listed below. Failure to do so may have implications for the mark awarded.

All assessment submissions must:

- Be uploaded to the Moodle uploader links that are posted on the three modules LA, OOC and DB classes (upload it to all Moodle links) in a ZIP folder that contains:
 - Source code (Full NetBeans Project).
 - Documentation in PDF format.
- Include comments in the code.
- **Run smoothly. No debugging will be done.**
- Be submitted by the deadline date specified or be subject to late submission penalties
- Be submitted via Moodle upload.
- Use [Harvard Referencing](#) when citing third party material
- Be the student's own work.
- Include the CCT assessment cover page.

Additional Information

- Try to keep it simple. Plan your program before you start coding.
- In any situation, the lecturers are entitled to call you in for further explanation of your code/report.
- Lecturers are not required to review draft assessment submissions. This may be offered at the lecturer's discretion.
- In accordance with CCT policy, feedback to learners may be provided in written, audio or video format and can be provided as individual learner feedback, small group feedback or whole class feedback.
- Results and feedback will only be issued when assessments have been marked and moderated / reviewed by a second examiner.
- Additional feedback may be provided as individual, small group or whole class feedback. Lecturers are not obliged to respond to email requests for additional feedback where this is not the specified process or to respond to further requests for feedback following the additional feedback.
- Following receipt of feedback, where a student believes there has been an error in the marks or feedback received, they should avail of the recheck and review process and should not attempt to get a revised mark / feedback by directly approaching the lecturer. Lecturers are not authorised to amend published marks outside of the recheck and review process or the Board of Examiners process.
- Students are advised that disagreement with an academic judgement is not grounds for review.
- For additional support with academic writing and referencing students are advised to contact the CCT Library Service or access the [CCT Learning Space](#).
- For additional support with subject matter content students are advised to contact the [CCT Student Mentoring Academy](#)
- For additional support with IT subject content, students are advised to access the [CCT Support Hub](#).

Marking Scheme Summary (OOC)

Description	Weighting
Sign up / Register of a new regular user. <ul style="list-style-type: none">The programme interacts with the database correctly.User friendliness and error messages if needed.Code comments and structure.	10
Login section. <ul style="list-style-type: none">The programme interacts with the database correctly.Users are re-directed to their corresponding menu.User friendliness and error messages if needed.Code comments and structure.	10
All functions for regular users are present on their menu and work correctly. <ul style="list-style-type: none">Modify their own profile.Solve systems of linear equations.Save operations to the database.The programme interacts with the database correctly.User friendliness and error messages if needed.Code comments and structure.	60
All functions for admin are present on their menu and work correctly. <ul style="list-style-type: none">Modify their own profile.List of all other users in the system.Remove other users from the system.Review the operations performed by other usersThe programme interacts with the database correctly.User friendliness and error messages if needed.Code comments and structure.	20
Total	100

Marking Scheme Summary (LA)

Description	Weighting
Program able to solve a 2x2 system of linear equations With matrices	30 20
Program able to solve a 3x3 system of linear equations With matrices	30 20
Total	100

Marking Scheme Summary DB)

Description	Weighting
Logical design	20

Conceptual design	30
Appropriate connection with DB	10
Database in 3NF	10
CRUD methods to query the DB	30
Total	100