COMP1471 (2024/25)	Enterprise Software Engineering Development	Contribution: 100% of course
Course Leader: Dr Elena Irena Popa	Practical coursework	Deadline Date: Wednesday 20/03/2025

This coursework should take an average student who is up-to-date with tutorial work approximately 50 hours

Feedback and grades are normally made available within 15 working days of the coursework deadline

Learning Outcomes:

1. Understand and reflect on the problems which are addressed by modern software engineering methods.

2. Acquire a theoretical and practical knowledge of component-based software design and development and evaluate and select appropriate software design tools and techniques to assist the development of component based distributed computing systems.

3. Critically evaluate the quality of software design and architecture and apply modern modelling techniques and methods to the whole life cycle of real enterprise software systems.

COMP1471 Coursework Specification

This is a group coursework. A team must comprise four to six students, and it is essential to create groups exclusively from students belonging to your tutorial group

You are required to submit two outputs via the Moodle submission link before the specified deadline.:

1. **Every student is expected to upload a single PDF document with the report containing both their group and the individual sections. The content of the report should be uniform for all group members, except for the personal discussion and group work evaluation.**
2. **Additionally, each group is required to upload a zip file containing the code of the system developed collectively by the group. Ensure that any files you upload are free of viruses, not protected by a password, and not corrupted. Otherwise, they will be considered null submissions.**

Each member of the coursework (CW) team is expected to actively participate in and complete all tasks assigned for the coursework. The purpose of the CW team is to engage in discussions regarding each team member's solutions and collaboratively choose the best one or a combination of solutions. While students may take the lead on specific tasks and assume different roles, it is crucial that every member of the CW team actively contributes to all aspects of the work. Task division among team members is discouraged, as it often leads to subpar overall results.

Individual grades will be based on contributions to each task. Furthermore, students are required to present the proposed system design and demonstrate the prototype to the tutor as part of the assessment process.

Case Study: Digital Transformation at Greenwich Community Theatre (GCT)

The **Greenwich Community Theatre (GCT)**, nestled in southeast London, is a historic venue that blends the charm of its Victorian architecture with a commitment to delivering high-quality, accessible performances. With its cozy auditorium and versatile stage, GCT has become a cultural hub for musicals, dramas, comedies, and children's theatre since its inception in 2000.

Despite its reputation for excellence, the theatre faces increasing pressure to modernize its operations in the face of rising customer expectations and economic challenges. The theatre's management, the **Greenwich Cultural Centre Authority**, has decided to implement a digital ticketing system to improve customer experience and streamline operations.

Current Operations and challenges

GCT hosts evening performances six days a week, with additional Saturday matinees and occasional special children's performances. Discounts are offered to children and OAPs (Old Age Pensioners), who receive a 25% reduction on ticket prices.

Theatre tickets can be booked in one of the following ways:

1. Customers can phone up to book tickets with their credit cards, paying on booking. The operator then provides them with a confirmation number. On the day of the performance the customers can collect their tickets from the special collection booths, using their credit cards.

2. Customers can go to the ticket office during working hours and buy the tickets with cash, cheque or credit card. In the last hour before the start of a performance, this method incurs a 10% discount on the full price.

3. Social clubs can phone to book tickets. These are charged directly to accounts they hold with the theatre. There is a discount of at least 5% on the nominal price. This is increased by a further 5% for bookings of more than 20 tickets for a single performance.

Ticket prices vary depending on the performance and the location of the seats. The auditorium is divided into three pricing bands (A, B, and C), with prices varying by seat location and performance.
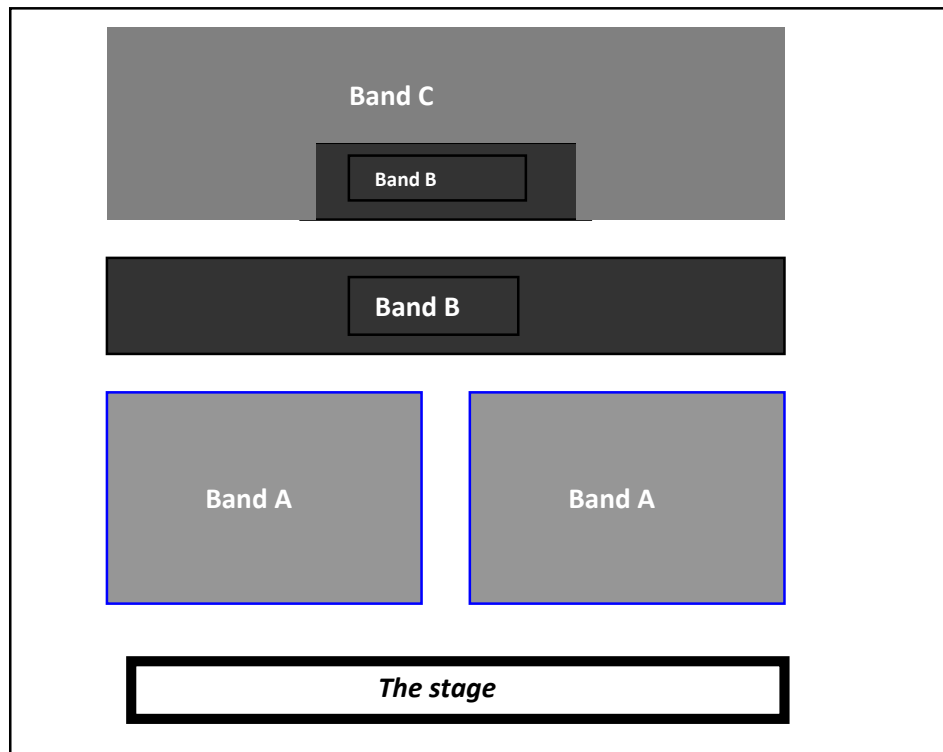
Staff manually record and organize all bookings using a spreadsheet system. While the system tracks key variables effectively, its lack of automation makes the process time-consuming and inefficient.

The Greenwich Community Theatre (GCT) is currently managed by the Greenwich Cultural Centre Authority. Recognizing the inefficiencies of their manual ticket booking process, the Board of Directors has decided to develop a software system to facilitate automated ticket bookings for performances. They believe that implementing such a system will save time and reduce costs, as sales staff will no longer need to filter and process booking information manually. This change is expected to enable staff to serve more customers efficiently.

However, the sales staff, many of whom have been with GCT for years, are resistant to the transition to a computerized system. They are reluctant to undergo training and prefer the familiar, manual processes they have used for years. They remain sceptical about the value of automation and express concerns about adapting to a new workflow.

Proposed Features of the New System

Despite this resistance, the Board of Directors is confident that automating the booking process will streamline operations and attract more customers. They envision several innovative features to boost ticket sales, including:

- **Theatre Packages**: Customers can book packages such as "Book 4 plays, get 1 ticket free."
- **Weekday Specials**: A 10% discount for plays scheduled Monday through Thursday.

The Board of directors believe that one of the keys to increase sales is to expand their services by housing plays that might appeal more the younger audience. The sales staff, however, feel that promoting such plays might risk their reputation of providing high quality performances.

The economic challenges facing the theatre industry have further motivated the Board to expand services and implement options that provide convenience and cost savings for customers. Their strategy includes:

- Allowing customers to browse the online play list and book tickets online at discounted rates.
- Enabling customers to write and share honest reviews about plays and their experiences at GCT, fostering greater engagement and improving the theatre's reputation.

All online payments for ticket bookings will be processed through credit cards, with the verification of credit card details handled by the theatre's bank via a system called VISACheck. VISACheck serves as an interface between the theatre and the bank's credit check services, ensuring secure transactions.

Customers will have a variety of shipping options, with rates determined by a formula based on the urgency of their orders. Alternatively, they can choose to collect their tickets on the day of the performance at special collection booths, where payment will be confirmed through the credit card used for the transaction.

Throughout the booking process, the system will allow both the operator and customers (in the case of online bookings) to select their seats from a graphical seating plan. The system will mark the selected seats as booked, calculate both individual and total ticket prices, and

issue a reservation slip. Once payment is processed, the system will generate the tickets and provide a receipt, detailing the breakdown of the total payment.

As consultants tasked with assisting the Greenwich Community Theatre, you are responsible for the analysis, design, and development of their new hybrid system. The project has a tight six-month deadline to go live, with staff training required within two weeks.

By introducing this automated system, the Board aims to modernize the theatre's operations, attract a broader audience, and improve customer satisfaction, ensuring the Greenwich Community Theatre remains competitive in a challenging market.

Your team has agreed with the client to produce a prototype system. As a group you need to decide what software system methodology you will follow and identify the roles necessary for that methodology. For example:

- For traditional methodologies: developer, business analyst, project manager, tester, etc
- for SCRUM methodology : Product Owner, Development Team(cross functional, small and self-organizing team), and Scrum Master.

Each member of the team should take lead on at least one role. However, **every member of the CW team should do all the work and attempt every single task of the CW.**   The work should not be split between members, as most likely this will result to poor work overall.

A CW team purpose is to discuss each of your solutions and then choose the best one (or a combination of them). The fact that other members in the group do not do their work will not justify you not doing the work. The grades are individual based on each team member contribution to each task.

Requirements

Produce a preliminary design using traditional, structured methodologies, covering the functionality of the proposed new system described in the case study**.** The design should include:

- **Entity Relationship Diagram** which represents the Conceptual Data Model of the scenario described in the coursework spec as modified by elicitation discussions with the client. You are required to distinctly show:
    - all entity types, attributes (including primary key attributes),
    - all relationships,
    - as well as determine the structural constrains (cardinality and participation constrains) of each relationship.
- **Data Flow Diagram** which represents the Process Model of the same specific functional area that you modelled for the Entity Relationship Diagram. You are required to include the DFD **level 0** (context diagram).

Implement a database based on the design produced as per above requirement**.** The prototype database is to be built using any competent technology/tools you are familiar with. MS Access is fine for a prototype.

Your group is required to present and discuss deliverables for Phase 1 with your client (your tutor) during your lab hours on the 5th of February.

Requirements - PHASE 2: The OO system

Following the successful completion of the prototype database outlined in Phase 1, your task is **to create an expanded system utilizing object-oriented (OO) methodologies**. This approach aims to facilitate more adaptable design and construction iterations, as well as the reusability of both design and code. Consequently, you are now tasked with generating a design for the new system, employing object-oriented analysis and design principles along with UML.

The system is to be built using any OO technology/tools you are familiar with. It is imperative that the system incorporates substantial business and user interface (UI) functionality, sufficient to assess the effectiveness of the design, particularly concerning the main functionalities of the system, encapsulated within the main/ top-level use cases.

Your group is expected to provide regular updates and engage in discussions about the progress of your work during your lab hours, beginning on February 12th and continuing until the week before the submission deadline.

Deliverables(by the submission date)

1) A final report (~ 3500 words) which should include:

a) A discussion regarding the 5 Ps relevant to the given case study
   i) Problem:
   - a short description
   - a brief evaluation of the commercial risk presented by the implementation of the new system
   - a rich picture
   ii) Process:
   - A discussion of the software system methodology you followed. Please choose at least one traditional and one agile methodology and argue your choice based on research, stating the merits and constraints of these approaches **for the given case study**. Include a section on how you fulfilled all the roles necessary for the chosen methodology within the group.
   iii) Project:
   - state the goal of the system, a list of resources, and a breakdown of the budget (providing the framework within which management can be exercised).
   - include a brief discussion regarding the suitability of any tools used (such as CASE tools, environments, systems and programming languages proposed)
   iv) Product:
   - State the artefacts that are created during the life of the project, such as models, source code, executables, and documentation.
   - **A list of functional and non-functional** requirements
   v) People: describe the prime movers in the software project

b) Structured design:
   i) Entity Relationship Diagram
   ii) Data Flow Diagram.

c) The UML design, including:
   i) **Use Case Analysis** - A UML Use Case diagram identifying all actors and their Use Cases. The use-case should also indicate any included or extended cases
   ii) **Interaction Diagrams**. Using UML sequence (interaction) diagrams perform an analysis of the main Use Case scenarios (at least 3)
   iii) **Design UML Class Diagram** – Show all attributes, all methods and associations for all main classes (this should not be a Conceptual UML Class Diagram)

d) A discussion about the use of Design patterns in your design, with examples. You are expected to introduce patterns in your design, discuss about how these are used and consequently show how these were implemented in your code

e) An appendix with
   i) **screenshots of the prototype**
   ii) **listings of any code written by your group (**no generated code, please)

f) A personal discussion regarding your role and contribution within the group.

g) **Completed copies of the Group Self-Assessment** form found included in the coursework specification. You need to pear-assess each other's work and critically discus the quality of each completed task.

h) **A completed copy of the work breakdown form** on the last page of this document. As a group you will fill in and attach to the report pro-forma (from the end of this document) that will enumerate all the tasks that your group tackled and completed as part of this coursework, and the involvement of each member of the group in each task. This will be used in part to establish the individual contribution of each member of the group. The pro-forma must be agreed and signed by all members of the group.

2) A prototype of the system.

This should reflect your design. You will need to upload the System/code through the coursework web site (as a ZIP file).

3) System prototype acceptance testing

As part of the software development cycle an acceptance testing will need to be carried out. Your group needs to demonstrate to the client (your tutor) the design and prototype system you have built. You will be asked to demonstrate the required business functionality and to show the adherence of the implemented system to the submitted design. The acceptance testing will take place during the week of the submission of your cw and/or the following weeks. The time and place will be made available by your tutor.

Failure to attend this may result in an overall mark of zero for this assessment.

Group Self-Assessment Sheet

Student Team:

Student Name :_____ **ID:**_____

Student Name :_____ **ID:**_____

Student Name :_____ **ID:**_____

Student Name :_____ **ID:**_____

Student Name _____ **ID** _____

Student Name _____ **ID** _____

Place **a tick in the box that you deem to be most indicative of the quality of the work**.

Please include comments for each section of the self-assessments

Note: You must submit this self-assessment together with the report. The boxes in bold are for the tutor.

Marks mapping:

80-100 Exceptional	70-79 Excellent Very good	60-69 Good	50-59 Satisfactory	40-49 Fail	0-39 Fail
A	B	C	D	E	F

	A	B	C	D	E	F	Comments
The 5 Ps **Problem: 5 marks** • a short description • a brief evaluation of the commercial risk • a rich picture							
Process: 8 marks • discussion of the software system methodology							
Project: 4 marks • goal of the system, a list of resources, and a breakdown of the budget • suitability of any tools used							
Product : 5 marks • artefacts • A list of functional and non-functional requirements							
People: 2 marks prime movers in the software project							

Deliverables for PHASE 1 • **ERD - 5 marks** • **Context diagram -2 marks**							
UML Design **Use Case Diagram -9 marks** **Design Class diagrams -9 marks** **Sequence diagrams - 9 marks**							

Use of patterns – 8 marks								
System prototype • **How much the design produced is reflected into the code -8 marks** • Quality of product -8 marks								
Acceptance Testing - 10 marks (includes how well the app is presented and the ability to answer technical questions)								
Accurate Self- Assessment + Accurate Peer- Assessment - 5 marks								
Possible AO?								

Group members work contribution forms

In percentage, please indicate the work contribution of each member. This should be agreed by all group members**. The total of all members work must add to 100%**

You must **submit these forms in the final report**.

Team member name	Student ID	individual overall work contribution (%)	Signature
Student:			
Student:			
Student:			
Student:			
Student:			
		Total 100%	

Describe each task you performed (for example: creation of Use case diagram)	Student 1: work contribution in %	Student 2: work contribution in %	Student 3: work contribution in %	Student 4: work contribution in %	Student 5: work contribution in %	Student 5: work contribution in %	total
Task:							100%
Task:							100%
Task:							100%
Task:							100%
Task:							100%

Task:							100%

Assessment Criteria - Marks breakdown:

The analysis and design:

- A discussion regarding **the 5 Ps relevant to the given case study** -24 marks
  - Problem: 5 marks
  - Process: 8 marks
  - Project: 4 marks
  - Product : 5 marks
  - People: 2 marks
- Deliverables for Part 1 – 7 marks
  - ERD + context diagram
- The UML design 27 marks
  - Use case - 9 marks
    - Marks given for using correct symbols, correct use cases and actors, correct use of include and extend types of relations
  - Design Class diagrams - 9 marks
    - Marks given for using correct symbols, correct classes (including attributes and methods), correct use of relations, completeness
  - Sequence diagrams - 9 marks
    - Marks given for using correct symbols, correct objects), correct use communication (and naming), completeness
- Use of patterns – 8 marks
  - Correct explanation of using GRASP and at least other 2 patterns studied within the course

System prototype -6 marks:
- How much the design produced is reflected into the code – 8 marks
- Quality of product - 8 marks
  a. Does the product have the required functionality?
  b. Does the system run?
  c. Is the code clear to read, well laid out and easy to understand?
  d. Is the code self -documenting? Have you commented appropriately?

Acceptance testing : -10 marks

Accurate Group Self–assessment: - 5 marks

Report structure, English proficiency, References (3 marks)

The marks for each reaction will be awarded taking in consideration the grading criterial from the assessment marking rubric (see next page)

Assessment Marking Rubric:

	0-29% Fail	30-39% Fail	40-49% Satisfactory	50-59% Good	60-69% Very Good	70-79% Excellent	80-100% Exceptional
D1 Knowledge **Knowledge of underlying concepts and principles associated with Software Engineering.**	No evidence or lacking understanding of underlying concepts and principles associated with Software engineering. Solutions showing no (or insufficient) knowledge and/ or understanding of techniques applicable to software engineering. Most deliverables are missing in the submission, or they don't include most of the required elements.	Little evidence of Knowledge of underlying concepts and principles associated with Software Engineering. Solutions showing insufficient knowledge and/ or understanding of techniques applicable to software engineering. Many deliverables are missing in the submission, or they don't include most of the required elements. The solution presented could obtain a passing grade with further work.	Basic knowledge and understanding of the underlying concepts and principles associated with Software Engineering Solutions showing limited knowledge and /or understanding of techniques applicable to software engineering. The required technical principles, techniques and methods are remembered and applied to a limited degree. Some deliverables are missing in the submission, or they miss some of the required elements.	A sound understanding of the subject and underlying concepts and principle with Software Engineering. Good solutions showing the ability of the student to apply the theory to the concrete problem posed. The required technical principles, techniques and methods are remembered and applied to a good degree. All deliverables are present in the submission and contain most required elements.	A clear understanding of the subject and underlying concepts and principles with Software Engineering. Very good solutions showing the ability of the student to apply the theory to the concrete problem posed. The required technical principles, techniques and methods are remembered and applied mostly accurately. All deliverables are present in the submission. Mostly accurate knowledge and understanding of main concepts and theories	Excellent and thorough understanding of the subject of Software Engineering. Excellent solutions demonstrating understanding of the system analysis & design. Complete solution which is consistent throughout. All deliverables are present in the submission and contain all required elements and these are of high quality in terms of both content and presentation.	Demonstrates exceptional knowledge and critical understanding of the underlying concepts and principles associated with the area of Software Engineering. Complete, optimised, and effective solution which is consistent throughout. All deliverables are present in the submission and these are of high quality in terms of both content and presentation. Accurate consistent knowledge and understanding of main concepts and theories
D2 Research **Can collect and interpret appropriate data and successfully undertake research with a degree of autonomy**	No evidence of collecting and interpreting appropriate data	Poor evidence of collecting and interpreting appropriate data No evidence of undertaking research with a degree of autonomy	Adequate evidence of collecting and interpreting appropriate data Undertaking research with a degree of autonomy	Good evidence of research. Successfully undertake research with a degree of autonomy	Very good evidence of research. Successfully identifying alternatives and determining appropriate resources	Excellent evidence of research. Successfully identifying suitable alternatives and determining excellent resources	Outstanding evidence of research. Successfully identifying best alternatives and determining excellent, current resources.

D3 Evaluation **Evaluate the appropriateness of different software process models and explain the merits and constraints of these approaches for a given case study.**	No evidence of evaluation of different software process models .	Poor evidence of evaluation of different software process models .	Sound evidence of evaluation of different software process models . .	Good evidence of evaluation of different software process models.	Very good evidence of evaluation of suitable software process models chosen for the given case study..	Excellent evaluation of suitable software process models chosen for the given case study .	Outstanding evaluation of most suitable software process models chosen for the given case study.
D4 Communication **Produce a well-structured assessment written in coherent standard English, well presented in an appropriate academic style. Express ideas in an effective and convincing manner. Facilitate group discussion**	Unacceptable quality of presentation, structure and standard of English. Not able to express ideas. Not participating in group discussion	Poor quality of presentation, structure and standard of English. Express ideas in a poor manner. Poor participating in group discussion	Acceptable quality of presentation, structure and standard of English. Express ideas in an acceptable manner. Some participating in group discussion	Good quality of presentation, structure and standard of English. Express ideas well Good participating in group discussion	Very good quality of presentation, structure and standard of English. Express ideas in a very good manner. Very good participating in group discussion	Excellent quality of presentation, structure and standard of English. Express ideas in an excellent manner. Excellent participating in group discussion being able to follow and take lead	Professional quality of presentation, structure and standard of English. Express ideas in an outstanding manner. Outstanding participating in group discussion being able to follow and take lead and inspire.
D5 Referencing **Determining appropriate resources. Sources used are acknowledged in the text and reference list using correct academic citation**	No evidence of determining appropriate resources. Sources used are not acknowledged	Poor evidence of determining appropriate resources.. Most sources used are not acknowledged	Some evidence of determining appropriate resources. Most sources used are acknowledged	Good evidence of determining appropriate resources.. All sources used are acknowledged .	Evidence of determining very good resources.. All sources used are acknowledged .	Evidence of determining excellent resources.. All sources used are acknowledged .	Evidence of determining an extensive list of outstanding resources.. All sources used are acknowledged ..

D6 Employability	Non participation or very poor participation within group work. No evidence of effort to communicate and collaborate with members from the cw group. Very poor time management. No evidence of ability to reflect on group work.	Poor participation within group work. Little effort to communicate and collaborate with members from the cw group. Poor evidence of ability to reflect on group work. Poor group dynamics with a range of issues. Poor time management.	Some participation within group work. Limited effort to communicate and collaborate with members from the cw group. Some evidence of ability to reflect on group work. Group dynamics having areas of concern . Ok time management with some issues in committing to meeting goals.	Good participation within group work. Good effort to communicate and collaborate with members from the cw group. Good evidence of ability to reflect on group work.. Good group dynamics with minor issues. Good time management with minor issues in committing to meeting goals.	Very good participation within group work. Very good effort to communicate and collaborate with members from the cw group. Very good evidence of ability to reflect on group work. Very good group dynamics . Very good time management with no issues in committing to meeting goals.	Excellent participation within group work. Excellent effort to communicate, motivate and collaborate with members from the cw group. Excellent evidence of ability to reflect on group work. Excellent good group dynamics. Excellent time management .	Outstanding and effective group dynamics. OutstandinA2:H7g effort to communicate, motivate and inspire members from the cw group. Outstanding evidence of ability to reflect on group work. Outstanding time management and meeting goals ahead of the planned time.
Developing transferable skills such interpersonal skills and human relations within team work, organisation and communication. Also time management and commitment to meeting goals, both short-term and long-term. Ability to reflect on these skills.							