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| **CISC 225, Spring 2023 Course Syllabus**  **Version 1.0 (Last modified 12/29/2023)** |

**Course title (credits):** Information System Design and Analysis (4)   
**Pre-requisites:** CISC 160 or permission of instructor

**Course Description:** This course is a foundation for database design and database security courses. Systems Analysis and Design is a fundamental, active field in which analysts continually learn new techniques and approaches to develop systems more effectively and efficiently. There is a core set of skills that all analysts need to know no matter what approach or methodology is used. All information systems projects move through the four phases of planning, analysis, design, and implementation; all projects require analysts to gather requirements, model the business needs, and create blueprints for how the systems should be built; and all projects require an understanding of organizational behavior concepts like change management and team building. This course captures the dynamic aspects of the field by keeping the student focused on doing Systems Analysis and Design while presenting the core set of skills that the analyst needs to know. Offered Fall and Spring Semester, annually.

**Meeting time and location:** This is a traditional face-to-face class. Class meets as the following:

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| **Section** | **Meeting Days** | **Meeting Time** | **Meeting Location** | **Start Date** | **End Date** |
| 01 | MW | **10:05 AM – 11:35 AM** | **1358** | **1/7/2023** | **4/27/2023** |

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| **Instructor(s) Information** |

**Instructor(s): Mina Gabriel**

**Office location: 1334**  
**E-mail:** [**mgabriel@harrisburgu.edu**](mailto:mgabriel@harrisburgu.edu) **Phone:**

**Office Hours: MW 2:00 PM – 3:00 PM**

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| **Course Materials: Textbook(s), Resources, Software, etc.** |

**Required textbook(s)** for this course:

* Book**:**
  + Rosenblatt, “Systems Analysis and Design”, 10th Edition ISBN: 978-1-285-17134-0
  + Beginning Database Design from novice to professional, 2nd edition ISBN-13: 978-1430242093 ISBN-10: 1430242094
* Supplemental readings will be as well: some from external resources and some from the following book:
  + PHP: Learn PHP Programming Quick & Easy ISBN-10: 1511594225 ISBN-13: 978-1511594226 (optional)

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| **Course Objectives** |

Expected knowledge gained at the end of this course:

1. System planning: first phase of the SDLC from this phase you will learn how systems projects get started and how to evaluate a project proposal to determine its feasibility and how to use project management tools and techniques.
2. System analysis: second in SDLC, you will use requirement modeling, data and process modeling, and Object modeling techniques to represent the new system.
3. System Design: third in SDLC, students will work on a physical design that will meet the specifications in the system requirement document, students’ task will include user interface design, data design and system architecture.
4. Students will be able to convert their Data Model to Relational database and will be introduce to learn SQL to access and manipulate data in MySQL, then link their database implementation to a user interface of any platform of their choice in order to learn the integration between the database, backend and front end of a fully working application.

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| **ABET Student Outcomes** |

This course covers the following ABET student outcomes:

SO1: Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

SO2: Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

SO3: Communicate effectively in a variety of professional contexts.

SO4: Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

SO5: Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

SO6: Apply computer science theory and software development fundamentals to produce computing-based solutions.

See “ABET Rubrics” for the details of the SOs.

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| **Program Goals** |

The student outcomes above are mapped to the following CISC program goals:

**Program goal 1:** Apply theoretical constructs of mathematical analysis, and sound reasoning to develop and deploy practical solutions for real world problems.

**Program goal 2:** Evaluate computing system requirements sufficient for developing efficient computational solutions for real world problems.

**Program goal 3:** Assimilate new methodologies and advances in computer technology in an ever-evolving discipline.

**Program goal 4:** Master the elements of effective written and oral communication of results to technical and non-technical audience.

**Program goal 5:** Work independently and in collaboration with colleagues.

**Program goal 6:** Live up to the ethical standards of the profession and professional knowledge and skills to contribute to society.

**Program goal 7:** Develop an understanding of the code of ethics of the software industry (social contract); and, therefore a sense of what it means to be a good citizen.

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| **HU Core Competencies** |

Course objectives are mapped to the following Harrisburg University core competencies:

1. Critical Thinking
2. Written and Oral Communication
3. Teamwork/Collaboration
4. Entrepreneurship
5. Information Literacy
6. Ethical Decision Making
7. Global Awareness
8. Civic Engagement

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| **Deliverables (Homework, Assignments, Exams, Labs, etc.) & Grading Policy** |

The deliverables of this course are:

1. **Assignment:** The course consists of 7 assignments, and 4 final projects to deliver, due dates are clearly posted on the final syllabus or Canvas, dates are subject to change, I reserve the right to issue class-wide extensions if needed.
2. **Exams:** There is one Midterm exam and one Final project issued in this course. Dates are firm and posted on the final syllabus or Canvas page. Because these are timed, in-class exams or take home for online courses, no make-ups are allowed.

**Grading policy:** The final course grade is calculated as the following:

1. Assignments: 35%
2. Midterm Exam: 15%
3. Final Project: 30%
4. Final project Deliverables: 20%

**Program-wide Grading cutoffs:** The following is the gradecutoffs for the CISC program:

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| A | 94% - 100% |
| A- | 90% - 93% |
| B+ | 87% - 89% |
| B | 84% - 86% |
| B- | 80% - 83% |
| C+ | 77% - 79% |
| C | 74% - 76% |
| C- | 70% - 73% |
| D+ | 65% - 69% |
| D | 60% - 64% |
| F | 0% - 59% |

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| **Attendance & Expectations** |

Attendance is expected in class. While an occasional absence should not be an issue, efforts should be made to be in class ready to start on time. On time includes no headphones or other devices being on at the start of class. If you are wearing headphones or using a device when class starts, I will ask you to leave and you will be marked absent for that class.

If you miss a class, you should notify me beforehand (if possible) and reach out to other students regarding what you missed. Coming into class late or leaving early will count as an absence per CISC program policy (see below).

**Be aware that if you miss more than ⅓ of the classes, you will receive an F for this class per CISC program policy (see below).**

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| **Academic Dishonesty & Plagiarism** |

This class will follow the guidelines laid out in the CISC program-wide course conduct regarding plagiarism, as referenced above. **According to the University's Student Handbook**: “When an incident of academic dishonesty is suspected, the faculty member responsible for that course shall notify the accused student of the incident. If the faculty member determines that an incident of academic dishonesty has occurred, the faculty member may assign an appropriate consequence including (a) assignment of a grade of zero percent (0%) for the assignment in question; (b) referral of the student for remedial plagiarism education; (c) assignment of a grade of “F” for the course in question; or a combination of those consequences.”

Any incident of plagiarism will be met, at least, with a grade of 0 for the assignment/lab and a report to Student Services. Depending on the severity of the instance, an F for the class may be assigned.

**REGARDLESS OF THE SEVERITY, TWO INSTANCES OF PLAGAIRISM WILL RESULT IN AN F FOR THE COURSE.**

**ADDITIONALLY, ANY INSTANCE OF PLAGAIRISM ON THE MIDTERM EXAM OR FINAL PROJECT WILL RESULT IN AN F FOR THE COURSE.**

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| **Course Conduct & Class Policies** |

A CISC program-wide course conduct has been approved and adopted by all faculty. Policies set forth and explained therein are strictly enforced and observed by your instructor. It is your responsibility to carefully read the document and abide by the policies.

Please check the **course webpage** for course conducts and class policies not covered in this syllabus.

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| **Assessment Details** |

To assess the delivery of course objectives and the competency of students with respect to student outcomes, this course is assessed thru the following key assignment(s). Please note that the assessment is [completely] separate from your grade, and it has no effects on your earned grades.

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| **Lesson Plans & Tentative Course Schedule** |

The following is the tentative schedule of the class (course topics, lesson plans, objectives, assignments, and due dates). Please note that the schedule changes to adjust with the pace, accommodate unscheduled closures, and other unforeseen events.

PHASE 1 System Analysis and Design

Topic 1

**Systems planning** is the first of five phases in the systems development life cycle. After an introduction to systems analysis and design, you will learn how systems projects get started, how to evaluate a project proposal to determine its feasibility, and how to use project management tools and techniques. The deliverable for this phase is the preliminary investigation report.

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| Graded Item | Learning Outcomes | Weight | Due Date |
| Assignment 01: Introduction to  Systems Analysis  and Design | Describe the impact of information technology on business strategy and success, Define an information system and describe its components, Explain how profiles and models can represent business functions and operations Explain how the Internet has affected business strategies and relationships Identify various types of information systems and explain who uses them Distinguish between structured analysis, object-oriented analysis, and agile methods Compare the traditional waterfall model with agile methods and models Apply five basic guidelines for systems development Discuss the role of the information technology department and the systems  analysts who work there | % 2.5 | 01/16  No classes University Closed |
| Assignment 02: Analyzing the Business Case | Explain the concept of a business case and how a business case affects an IT project Describe the strategic planning process and why it is important to the IT team  Conduct a SWOT analysis and describe the four factors involved Explain the purpose of a mission statement  Explain how the SDLC serves as a framework for systems development List reasons for systems projects and factors  that affect such projects Describe systems requests and the role of the systems review committee Define operational, technical, economic, and schedule feasibility Describe the steps and the end product of a preliminary investigation | % 2.5 | 01/23 |
| Assignment 03:  Managing System Projects | Explain project planning, scheduling, monitoring,  and reporting Describe work breakdown structures, task  patterns, and critical path analysis Explain techniques for estimating task completion times and costs Describe various scheduling tools, including Gantt charts and PERT/CPM charts  Analyze task dependencies, durations, start dates, and end dates Describe project management software and how it can assist you in project planning, estimating, scheduling, monitoring, and Reporting Discuss the importance of project risk management Understand why projects sometimes fail | % 2.5 | 01/30 |

Topic 2

Systems analysis is the second of five phases in the systems development life cycle. In the previous

phase, systems planning, you conducted a preliminary investigation to determine the project’s

feasibility. Now you will use requirements modeling, data and process modeling, and object

modeling techniques to represent the new system. You also will consider various development

strategies for the new system, and plan for the transition to systems design tasks. The deliverable

for this phase is the system requirements document.

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| Graded Item | Learning Outcomes | Weight | Due Date |
| Assignment 04: Requirements Modeling | Describe systems analysis phase activities Explain joint application development (JAD), rapid application development (RAD), and agile methods Use a functional decomposition diagram (FDD) to model business functions and processes  Describe the Unified Modeling Language (UML) and examples of UML diagrams List and describe system requirements,  including outputs, inputs, processes, performance, and controls Explain the concept of scalability Use fact-finding techniques, including interviews, documentation review, observation, questionnaires, sampling, and research  Define total cost of ownership (TCO) Conduct a successful interview Develop effective documentation methods to use during systems development | % 2.5 | 02/06 |
| Assignment 05: Data and Processing Modeling | Describe data and process modeling concepts and tools, including data flow diagrams, a data dictionary, and process descriptions Describe the symbols used in data flow diagrams and explain the rules for their use Draw data flow diagrams in a sequence, from general to specific Explain how to level and balance a set of data flow diagrams Describe how a data dictionary is used and what it contains Use process description tools, including structured English, decision tables, and  decision trees Describe the relationship between logical  and physical models | % 2.5 | 02/13 |
| Assignment 06:  Object Modeling | Explain how object-oriented analysis can be used to describe an information system Define object modeling terms and concepts, including objects, attributes, methods, messages,  classes, and instances Explain relationships among objects and the concept of inheritance Draw an object relationship diagram Describe Unified Modeling Language (UML) tools and techniques, including use cases, use case diagrams, class diagrams, sequence diagrams, state transition diagrams, and activity diagrams Explain the advantages of using CASE tools  in developing the object model Explain how to organize an object model | % 2.5 | 02/20 |
| Assignment 07:  Development Strategies | Describe the concept of Software as a Service Define Web 2.0 and cloud computing Explain software acquisition alternatives,  including traditional and Web-based software development strategies Describe software outsourcing options, including offshore outsourcing and the role of service providers  Explain advantages and disadvantages of in-house software development Discuss cost-benefit analysis and financial  analysis tools Describe a request for proposal (RFP) and a  request for quotation (RFQ) Describe the system requirements document Explain the transition from systems analysis to systems design Discuss systems design guidelines Describe software development trends | % 2.5 | 02/27  Spring Recess |

Topic 3

Systems design is the third of five phases in the systems development life cycle. In the previous phase, systems analysis, you developed a logical model of the new system. Now you will work on a physical design that will meet the specifications described in the system requirements document. Your tasks will include user interface design, data design, and system architecture. The deliverable for this phase is the system design specification.

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| Graded Item | Learning Outcomes | Weight | Due Date |
| Assignment 08: User Interface Design | Explain the concept of user interface design and human-computer interaction, including basic principles of user-centered design List user interface design guidelines Describe user interface components, including screen elements and controls Discuss output design and technology issues Design effective source documents Explain input design and technology issues Discuss guidelines for data entry  screen design Use input masks and validation rules to  reduce input errors Describe output and input controls and  security | % 2.5 | 03/6 |
| Assignment 09: Data Design | Explain file-oriented systems and how they differ from database management systems Explain data design terminology, including entities, fields, common fields, records, files, tables, and key fields Describe data relationships, draw an entity relationship diagram, define cardinality, and  use cardinality notation Explain the concept of normalization  Explain the importance of codes and describe various coding schemes Explain data warehousing and data mining  Differentiate between logical and physical storage and records  Explain data control measures | % 2.5 | 03/13 |
| Assignment 10: System Architecture | Provide a checklist of issues to consider when selecting a system architecture Describe servers, server-based processing,  clients, and client-based processing Explain client/server architecture, including tiers, cost-benefit issues, and performance Compare in-house e-commerce development  with packaged solutions Discuss the potential impact of cloud  computing and Web 2.0 Explain the difference between online and batch processing Define network topology, including  hierarchical, bus, ring, and star models Explain network protocols and licensing issues Describe wireless networking, including wireless standards, topologies, and trends  Describe the system design specification | % 2.5 | 03/20 |

Topic 4

Midterm Exam **03/08/2023** and 3 quizzes total of %20 of the course load

PHASE 2 Database Design & implementation

Topic 5

* Developing a Data Model
* Generalization and Specialization

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| Graded Item | Learning Outcomes | Weight | Due Date |
| Assignment 11: Database Design & implementation book exercise 1-1 | The first thoughts about how to design a database may be influenced by a particular report or by a particular method of input. Sometimes the driver for a database is simply that some valuable information has come to hand and needs to be “put somewhere.” The hurried creation of a database or spreadsheet can lead to a design that cannot cope with even simple changes to the information you would like to retrieve. It is important to think carefully about the underlying data, and design the database to reflect the information being stored rather than what you might want to do with the data in the short term | % 2.5 | 03/27 |
| Assignment 12: Database Design & implementation book exercise 2-1 | Express the problem in terms of what a user might want to achieve. Think about other possible uses of the information and how the data might be usefully ordered or grouped.  Choose the type of product to manage the data and create an appropriate design. Build the application. For a relational database, this will include setting up the tables and developing forms and reports to satisfy the use cases. | % 2.5 | 04/03 |
| Assignment 13: Database Design & implementation book exercise 3-1 | • Determine the main objective of the system.  • Determine the jobs different users do in an average day.  Brainstorm the  •data that could be associated with each job.  • Agree on the scope of the project and decide on the relevant data.  • Sketch data input use cases, consider exceptions, and check existing forms.  • Sketch a first data model.  • Brainstorm the possible outputs given the data being collected.  • Sketch information output use cases.  • Check that the data model can readily provide the output information | % 2.5 | 04/10 |
| Assignment 13: Database Design & implementation book exercise 4-1 | Even at the very early stages of analysis, a simple data model can provide us with a number of questions. The answers to these questions will help us to understand a problem better. The resulting clarifications to the problem should eventually be reflected in the use cases and may affect the final model and the eventual implementation. | % 2.5 | 04/10 |

Topic 6

* From Data Model to Relational Database Design

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| Graded Item | Learning Outcomes | Weight | Due Date |
| Assignment 14: Database Design & implementation book exercises  5-1,2,3,4 | This chapter has described a miscellany of common modeling situations. Investigating these leads to a more  precise understanding and representation of the real–life problem. These situations are summarized as follows:   * Attribute, class, or relationship? * More than one relationship between two classes * Consider self-relationships * Different routes between classes * Different routes between classes | % 2.5 | 04/17 |
| Assignment 15: Database Design & implementation book exercise 6-1 | As the data model begins to develop, situations will sometimes arise where we find that a class may not describe our possible objects as neatly as we might like. We might find that we have some objects for which some of the attributes do not really apply.  How do we handle these “same only different” cases in a pragmatic way? | % 2.5 | 04/17 |
| Assignment 16: Database Design & implementation book exercise 7-1 | 1. For each class, create a table.  2. For each attribute, create a field and choose an appropriate data type. Consider  whether some attributes (e.g., address) should be split into several fields.  3. Think about which fields should be required to have a value.  4. Consider what constraints need to be placed on the values of fields. Possibly create a  new domain if your database product supports this.  5. Choose a field or combination of fields as the primary key. Ask careful questions to  ensure that the key fields will always have unique values.  6. For each Many–Many relationship, insert a new intermediary class and two 1–Many  relationships.  7. For each 1–Many relationship, take the primary key field(s) from the table  representing the class at the 1 end and add this field(s) as a foreign key in the table  representing the class at the Many end.  8. For a 1–1 relationship, put the foreign key in the table where it is most likely to have a  value or where the attribute is most important.  9. For compulsory relationships, add a constraint to the foreign key fields that they must  not be null.  10. For inheritance (as an approximation), alter the model to have a 1–1 is a relationship  between the parent and each child class. Create tables and foreign keys as in point  seven. | % 2.5 | 04/19 |

Topic 7

* Normalization

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| Graded Item | Learning Outcomes | Weight | Due Date |
| Assignment 17: Database Design & implementation book exercise 8-1 | If we have poorly structured tables in a database, we run the risk of having problems with updating data. These  include:   * Modification problems: If information is repeated, it will become inconsistent if not updated everywhere. * Insertion problems: If we don’t have information for each of the primary key fields, we will not be able to enter a record * Deletion problems: If we delete a record to remove a piece of information, we might as a consequence lose some additional information. | % 2.5 | 04/19 |

Topic 8

* More on Keys and Constraint

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| Graded Item | Learning Outcomes | Weight | Due Date |
| Assignment 18: Database Design & implementation book exercise 8-1 | * We often need to introduce a generated ID number to ensure we have a field, with stable and unique values, that we can use as a primary key. This is particularly true for people, where identifying information such as names and addresses are likely to change. * Be aware that mistakes in data entry means it is possible to have a person in your database twice with two different ID numbers. Try to avoid this! * Where a primary key is made up of several concatenated fields, it is worth considering a generated ID number to reduce the size of the foreign keys referencing the table. * Where a generated ID has been introduced, constraints should be used to retain the uniqueness of the combinations of fields that have been replaced as a primary key. * Unique constraints can be used to enforce a 1–1 relationship. * A constraint on the value of a field may be more appropriate than a relationship to another (very simple) table. * You have three options when you wish to delete a row that it is being referenced by a foreign key:   + Disallow the deletion.   + Make the field referencing the deleted row NULL (“nullify delete”).   + Remove all rows that reference the deleted row (“cascade delete”). | % 2.5 | 04/24 |