Object-Oriented Systems Design
MASY1-GC 3530 | 100 | Spring 2024 | 01/22/2024 -05/06/2024 | 3 Credits
Modality: In-person
Course Site URL: https://brightspace.nyu.edu

General Course Information
Name/Title: Mitch Haviv, Adjunct Instructor
NYU Email: mh28@nyu.edu
Class Meeting Schedule: 01/22/2024 -05/06/2024 / Mondays | 6:20 pm - 8:55 pm
Class Location: In-person
Office Hours: By Appointment. Phone: 212-508-7452 or NYU Zoom.

Description
This course addresses the concepts, skills, methodologies, techniques, tools, and perspectives essential for project managers, system analysts, business analysts and designers to successfully develop information systems in the object-oriented context. The course presents the concepts of the object-oriented approach and describes a systems development lifecycle framework that is applicable to the analysis and design of object-oriented application systems. Students learn to analyze IT system structures, model information processes, and design/redesign IT systems using object-oriented tools.

Prerequisites
3510 – Systems Development and Analysis

Learning Outcomes
At the conclusion of this course, students will be able to:
- Select systems development projects that can benefit from object-oriented design
- Design an enterprise system using object-oriented design methods
- Develop an object-oriented development project scope, feasibility study and project plan
- Analyze risk based on system requirements
- Model a business system using UML class diagrams, UML sequence and collaboration diagrams
- Create specifications for a user interface, database and any servers needed to support the object-oriented system

Communication Methods
Be sure to turn on your NYU Brightspace notifications and frequently check the "Announcements" section of the course site.
Also, I will send announcements via NYU Email.
To contact me, send me an email. I will respond within 24 hours.
Credit students must use their NYU email to communicate. Non-degree students do not have NYU email addresses. Brightspace course mail supports student privacy and FERPA

guidelines. The instructor will use the NYU email address to communicate with students. All email inquiries will be answered within 24 hours.

Structure | Method | Modality
There are 14 session topics in this course. The session topics are organized into three (3) areas of study: 1) Analysis Modeling, 2) Design Modeling and 3) Installation and Operations.

Active learning experiences and small projects are key components of the course. Assignments, papers, and exams will be based on course materials, lectures, and class discussions. Course sessions will be conducted synchronously on NYU Zoom, which you can access from the course site in [NYU Brightspace](#).

This course will meet weekly, with assignments, announcements and emails being sent through Brightspace. Zoom is the remote instruction platform used at NYU. Students are expected to check email and/or Brightspace at least twice a week for announcements concerning assignments, class changes or cancellations, and other important information. The course will involve lecture/discussions/forum discussions as well as case studies. There will be a Midterm, a Term Project, and a Final Exam. The Term Project must be done individually.

Expectations

Learning Environment
You play an important role in creating and sustaining an intellectually rigorous and inclusive classroom culture. Respectful engagement, diverse thinking, and our lived experiences are central to this course and enrich our learning community.

Participation
You are integral to the learning experience in this class. Be prepared to actively contribute to class activities, group discussions, and work outside of class.

Assignments and Deadlines
There will be weekly homework- due at the start of the next session.
Weekly Quizzes
Midterm
Term Project
Final Exam

Course Technology Use
We will utilize multiple technologies to achieve the course goals. I expect you to use technology in ways that enhance the learning environment for all students. All class sessions require use of technology (e.g., laptop, computer lab) for learning purposes.

Feedback and Viewing Grades
I will provide timely meaningful feedback on all your work via our course site in NYU Brightspace. You can access your grades on the course site Gradebook.

Attendance
Students are expected to attend all classes. Attendance will be taken into consideration when determining your final grade.

Refer to the SPS Policies and Procedures page for additional information about attendance.

Excused absences are granted in cases of documented serious illness, family emergency, religious observance, or civic obligation. In the case of religious observance or civic obligation, this should be reported in advance. Unexcused absences from sessions may have a negative impact on a student's final grade. Students are responsible for assignments given during any absence.

Each unexcused absence or being late may result in a student's grade being lowered by a fraction of a grade. A student who has three unexcused absences may earn a Fail grade.

Students who join the course during add/drop are responsible for ensuring that they identify what assignments and preparatory work they have missed and complete and submit those per the syllabus.

Textbooks and Course Materials
Students can purchase these items through the NYU Bookstore.

Required:
Systems Analysis and Design: An Object-Oriented Approach with UML
Authors – Dennis, Wixom, Tegarden
Publisher – Wiley
2021, 6th Edition

Recommended:
Object-Oriented Systems Analysis and Design
Authors - George, Batra, Valacich and Hoffer
Publisher - Pearson/Prentice Hall
2017, 2nd Edition
ISBN-13: 978-0132279000
ISBN-10: 0132279002

- Any other System Design Book of your choice - or
- Learning an Object-Oriented Programming Language

Grading | Assessment
Your grade in this course is based on your performance on multiple activities and assignments. Since all graded assignments are related directly to course objectives and learning outcomes, failure to complete any assignment will result in an unsatisfactory course grade. Please carefully proof-read your written assignments before submitting them for a grade. I will update the grades on the course site.

Assessment Strategy:
Contributing factors for determining your course grade include:
- [Class Participation and Quizes](#) - **10%** (*Attendance is a prerequisite to participation*)
- [Homework](#) - **15%**
- [Midterm Exam](#) - **20%**
- [Project](#) – **20%**
- [Final Exam](#) - **35%**

Class Participation: To receive full credit for the course, you should attend all classes since much of the learning occurs during class lecture, presentation, and class discussions. Please contact the instructor if you anticipate missing any part of the class. Please arrive on time so as not to disturb the flow of the lecture. Excessive lateness's may result in lower overall grade. Participation grades will be based on:
- Involvement in class discussions and activities
- Participation which demonstrates integration of reading, class work, relevance, and application.
- Willingness to learn by accepting feedback, trying new skills and approaches, etc.
- Quality/quantity of providing effective and balanced feedback.

Homework: Homework assignments must be submitted on time within 1 week of date assigned (unless otherwise instructed). Late submission will impact your homework grade or may not be accepted altogether at instructor's discretion. Late submission will incur 10 points penalty for each session we meet and not submitted.

Project: There will be a project. It will include the culmination of topics, concepts and competencies learned in this class.

Midterm Exam: There will be a midterm exam. The exam will be an open book, open notes style exam. The exam will test the student's acquisition of topics, concepts and competencies learned in this class up to mid-term.

Final Exam: There will be a final exam. The exam will be an open book, open notes style exam. The exam will test the student's acquisition of topics, concepts and competencies learned in this class. The final exam will cover all material covered in the term.

See the ["Grades" section of Academic Policies"*](#) for the complete grading policy, including the letter grade conversion, and the criteria for a grade of incomplete, taking a course on a pass/fail basis, and withdrawing from a course.*

Course Outline

Start/End Dates: 01/22/2024 -05/06/2024 | Mondays
Time: 06:20 pm - 08:55 pm
No Class Date(s): Monday - 2/19/2024 and 03/18/2024
Special Notes: Spring Break 03/18/24 - 03/24/24

NOTE – There are two sessions scheduled for Sunday – April 21 and April 28, time TBA

Session 1 - 01/22/24

Topic Description: Introduction to Object Oriented Design

Session Objectives

A. Understand the objectives of the course
B. Understand the System Development Life Cycle
C. Understand the role of the Systems Analyst
D. Understand the basics of Object-Oriented Design (OOD)
E. Understand the Unified Process and the Unified Modeling Language (UML)

Session Outline

- Understanding the Goals of the Course
  What are the goals? How is the course graded? What do you want to learn?
- SDLC – the Software Development Life Cycle
  o Planning, Analysis, Design, Implementation
- Roles and Skills required in System Design
  o What is a Systems Analyst?
  o How does the SA work with the Business Analyst?
  o How does the SA work with the Project Manager? Others?
- Development Methodologies (intro)
  o Structured Design (Waterfall)
  o RAD (Prototyping, Phased, Throwaway)
  o Agile Design (XP, Scrum)
- Object Oriented Systems (intro)
  o Basic Introduction
  o Classes, Objects (Attributes and Methods)
  o The 3 Key Ideas: Encapsulation / Inheritance / Polymorphism
- Design Basics (OOSAD – Object Oriented Systems Analysis and Design)
  o Use-Case
  o Architecture Driven (Views: Functional, Behavioral, and Structural)
  o Iterative / Incremental
- UML – Unified Modeling Language
  o The Unified Process (Integration / Elaboration / Construction / Transition / Production)
  o UML

Assignments:

HOMEWORK #1 (due at the start of next session)

All 3 of these –   Chapter 1 (page 29 – Exercises G and H)
                                    (page 40 – Exercise D)
and
                          Chapter 1 – Minicase 1 (page 30)

Session 2 – 01/29/24

Topic description – **Project Management**

Session Objectives
A. Understand how business needs affects the information system
B. Understand how to do a feasibility analysis
C. Understand how use-cases can help in the analysis
D. Understand how to create a work plan
E. Understand how to staff a project
F. Understand how project management workflows interact with other workflows

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- Project Identification
    o What is a System Request?
- Feasibility Analysis
    o Technical Feasibility
    o Economic Feasibility – NPV / ROI / Accounting!!
    o Organizational Feasibility
- Project Management Tools
    o GANTT chart
    o Network Diagrams
    o Other tools
- Work plan
    o Scope
    o Refining
    o Managing Risk
- Staffing
    o Staffing Plan
    o Managing and Motivating Staff
- CASE tools

Assignments:
HOMEWORK #2 (due at the start of next session)
All 3 of these – Chapter 2 Exercises B, H, M
and
Chapter 2 – Minicase 3

Session 3 – 02/05/24

Topic description – Requirements

Session Objectives
A. Understand how to define requirements
B. Understand how to analyze requirements
C. Understand how to gather requirements
D. Understand the importance of management and user acceptance

Session Outline
- Quiz

- LAB – clarifying what we know - using cases
- Requirements
  - Why are they needed?
- Requirement Determination
  - Defining
  - Gathering
  - Creating a Requirements Definition
- Requirement Analysis
  - Different types of analysis
    - Problem / Root Cause / Costs / Outcome / Technology
  - Benchmarking
- Requirements Gathering
  - Interviews
  - Joint Application Development (JAD)
  - Questionnaires
- System Proposal
  - Staffing Plan
  - Managing Staff

Assignments:
All 3 of these – Chapter 3 Exercises A, B, H
and
Chapter 3 – Minicase 1

Session 4 – 02/12/24

Topic description – Business Process and Modeling

Session Objectives
A. Understand how to identify Business Processes
B. Understand how to create Use Cases
C. Understand how to create functional models using Use Case and Activity Diagrams
D. Understanding how to verify the models

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- Use Case Diagrams
  - Elements of Use Case Diagrams
  - Creating a Use Case Diagram
- More About Use Cases
  - Types
  - Elements of Use Case
  - Describing a Use Case
  - Examples – and more examples
- Business Process Modelling via Activity Diagrams
  - Elements of an Activity Diagram
  - Creating an Activity Diagram

- Verifying and Validating
  - Walkthroughs
  - Functional Model Validation

Assignments:

HOMEWORK #4 (due at the start of next session)
Chapter 4 Exercises U, V, W
and
Chapter 4 – Minicase 1

Session 5 – 02/26/24

Topic description – Object Oriented Design

Session Objectives
A. Understand Classes and Objects
B. Understand how to create class diagrams
C. Understand how to use CRC cards
D. Understand a Structural Model
E. Understand how to apply the model

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- Structural Models
  - Classes and Attributes and Methods
  - Encapsulation / Inheritance / Polymorphism
    - Information Hiding
  - Relationships
- Object Identification
  - Patterns
  - Common Object Lists
- Class Diagrams
  - Elements of a diagram
  - Object Diagrams
- Creating Structural Models
  - CRC Cards (Class - Responsibility - Collaboration)
  - Elements of a CRC card
- Verifying and Validating the Structural Model

Assignments:

Chapter 5 - Exercise E (choose 3 of the 4)
and
Chapter 5 – Exercises V and W
and
Chapter 5 – Minicase 2

Session 6 – 03/04/24

<u>**Topic description – Behavioral Models**</u>

Session Objectives
  A. Understand how to create sequence diagrams
  B. Understand how to create communication diagrams
  C. Understand state machines
  D. Understand the relationship between different types of models

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- Behavioral Models
  o Why are they needed?
- Interaction Diagrams
  o Object and Operations
  o Messages
  o Sequence Diagrams
  o Communication Diagrams
- State Machines
  o States
  o Events
  o Actions
  o Elements of a State Machine
  o Creating a State Machine
- CRUDE Analysis
  o Create / Reference / Update / Delete / Execute
- Verifying and Validating the Behavioral Model

<u>**Assignments:**</u>

HOMEWORK #6 (<u>due at the start of next session</u>)
Chapter 6 - Exercise A
and
Chapter 6 –Exercise H
and
Chapter 6 – Minicase 2

Session 7 – 03/11/24

<u>**Topic description – Design!**</u>

Session Objectives
  A. MIDTERM
  B. Understand how to verify and compare different types of models
  C. Understand how to start the design
  D. Understand factoring, layers, and partitions
  E. Understand package diagrams
  F. Understand custom, packaged, and outsourced design

Session Outline

- MIDTERM
- Verifying the different types of models
  - Functional Model (the job requirement)
  - Structural Model (the data)
  - Behavioral Model (the interaction)
- Starting the Design
  - Factoring
  - Partitions
  - Layers
- Packages
  - Creating a Package Diagram
  - Verifying
- Design
  - Custom Development
  - Package
  - Outsourcing
  - Which is best for the project?
- Selecting a Design

Assignments:

HOMEWORK #7 (due at the start of next session)
Chapter 7 – Exercise H
and
Chapter 7 – Minicase 4

Session 8 – 03/25/24

Topic description – Classes and Methods

Session Objectives
    A. Understand Objects
    B. Understand Design of Objects
    C. Understand Reuse of Objects
    D. Understand Constraints and Contracts
    E. Understand Methods

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- TERM PROJECT – START CONSIDERING
- Objects
  - Classes / Object / Methods
  - Encapsulation
  - Inheritance
  - Polymorphism
- Design Criteria
  - Coupling

- o Cohesion
- Object Activities
  - o Changing Specifications
  - o Reusing Objects
  - o Optimizing the design
- Constraints
  - o Types of constraints and contracts
- Methods
  - o Events
  - o Messages
- Verifying

Assignments:

Chapter 8 – Exercise E
and
Chapter 8 – Minicase 3

Session 9 – 04/01/24

Topic description – Data Management Layer

Session Objectives
   A. Understand Data Storage and Object Persistence
   B. Understand Mapping of data to formats
   C. Understand how to Optimize a Relational Database (RDB)
   D. Understand how to access the data within the RDB

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- Data Storage Formats (Object Persistence)
  - o Sequential Access
  - o Random Access
  - o Object Relational DB (ORDBMS)
  - o Object Oriented DB (OODBMS)
  - o NoSQL data / HADOOP

- Mapping Objects
  - o Regarding ORDBMS, OODBMS, RDBMS
- Optimizing Storage
  - o Access Speed
  - o Storage Size
  - o Efficient
- Data Access Classes and Manipulation Classes
- Verifying

Assignments:

Chapter 9 – Exercise L

and
Chapter 9 Appendix (page 362) – Exercise G (1 and 2)
and
Chapter 9 – Minicase 2
and
Chapter 9 Appendix (page 363) – Minicase 2a

Session 10 – 04/08/24

Topic description – User Interface Layer

Session Objectives
A. Understand User Interface Design Principles
B. Understand how to Design to Standards
C. Understand Navigation
D. Understand Input and Output
E. Understand how to Design a User Interface

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- TERM PROJECT – Your Requirements Finalized
- User Interface Design
  o Layout
  o Content
  o Aesthetics
  o Consistency
  o Minimizing Effort
  o Use Scenario Development
  o Navigation Design
  o Prototype
  o Evaluation
- Input
  o Types of Input
  o Validation of Input and Security
- Output
  o Types of Output
  o Media
- Other things critical to design
  o Mobile Computing
  o Social Media
  o Specialized Interface Design
  o International and Cultural Interface Design

Assignments:

Chapter 10 – Exercises Q and R
and
Chapter 10 – Minicase 4

Session 11 – 04/15/24

Topic description – Physical Architecture Layer

Session Objectives
  A. Understand Physical Architecture Considerations
  B. Understand Client-Server architectures
  C. Understand Cloud Computing
  D. Understand Networks
  E. Understand Specifications

Session Outline
  - Quiz
  - LAB – clarifying what we know - using cases
  - Physical Architecture Layer
    o Components
    o Server Side
    o Client Side
    o Client-Server architecture
  - Cloud Computing
            IoT
  - Infrastructure Design
            Network
            Deployment Diagram
  - Hardware and System Specifications
  - Other Considerations (non-functional)
    o Operational
    o Performance
    o Security
    - Verifying

Assignments:

Chapter 11 – Exercise E
and
Chapter 11 – Exercise S (some book versions have this a Exercise R.a)
and
Chapter 11 – Minicase 4

Session 12 – 04/21/24

SUNDAY

Topic description – Construction

Session Objectives
  A. Understand how to Manage the Programming
  B. Understand Documentation
  C. Understand Testing
  D. Understand why User Acceptance Testing is critical

E. Understand how to put the system into Production
F. Understand Change Management

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- Programming
  - Assigning Programmers
  - Coordination
  - Scheduling
- Documentation
  - Types of Documentation
  - Designing Documentation
- Testing
  - Testing and OO
  - Who is involved? Planning?
  - Unit Test
  - Integration Tests
  - System Tests
  - User Acceptance Tests

Assignments:
- Due Next time:
    Chapter 12 – Exercise D
    and
    Chapter 12 –Exercises N and O
    and
    Chapter 12 – Minicase 2

Session 13 – 04/28/24

SUNDAY

Topic description – Installation and Operation / REVIEW

Session Objectives
A. Understand how to put the system into Production
B. Understand Change Management
C. Term Project Review
D. Course Review

Session Outline
- Quiz
- LAB – clarifying what we know - using cases
- Conversion and Implementation
  - Style
  - Strategy
- Change Management

- - - o Accepting the Change
    - o Managing the Change
    - o Costs and Benefits
    - o Driving Adoption
    - o Training
  - Post Implementation Details
    - o System Support
    - o System Maintenance
    - o Assessment
    - o When is it time for 2.0?

Assignments:

- Term Project
- Study for next week's final exam

Session 14 – 05/06/24

Topic description – Review and FINAL

- Wrap Up and Review Course
- FINAL Exam (good luck!)

NOTES:

The syllabus may be modified to better meet the needs of students and to achieve the learning outcomes.

The School of Professional Studies (SPS) and its faculty celebrate and are committed to inclusion, diversity, belonging, equity, and accessibility (IDBEA), and seek to embody the IDBEA values. The School of Professional Studies (SPS), its faculty, staff, and students are committed to creating a mutually respectful and safe environment (*from the* SPS IDBEA Committee).

New York University School of Professional Studies Policies

1. <u>Policies</u> - You are responsible for reading, understanding, and complying [with University Policies and Guidelines](#), [NYU SPS Policies and Procedures](#), and [Student Affairs and Reporting](#).

2. <u>Learning/Academic Accommodations</u> - New York University is committed to providing equal educational opportunity and participation for students who disclose their dis/ability to the [Moses Center for Student Accessibility](#). If you are interested in applying for academic accommodations, contact the [Moses Center](#) as early as possible in the semester. If you already receive accommodations through the Moses Center, request your accommodation letters through the Moses Center Portal as soon as possible ([mosescsa@nyu.edu](#) | 212-998-4980).

3. <u>Health and Wellness</u> - To access the University's extensive health and mental health resources, contact the [NYU Wellness Exchange](#). You can call its private hotline (212-443-9999), available 24 hours a day, seven days a week, to reach out to a professional who can help to address day-to-day challenges as well as other health-related concerns.

4. <u>Student Support Resources</u> - There are a range of resources at SPS and NYU to support your learning and professional growth. For a complete list of resources and services available to SPS students, visit the [NYU SPS Office of Student Affairs site](#).

5. <u>Religious Observance</u> - As a nonsectarian, inclusive institution, NYU policy permits members of any religious group to absent themselves from classes without penalty when required for compliance with their religious obligations. Refer to the [University Calendar Policy on Religious Holidays](#) for the complete policy.

6. <u>Academic Integrity and Plagiarism</u> - You are expected to be honest and ethical in all academic work. Moreover, you are expected to demonstrate how what you have learned incorporates an understanding of the research and expertise of scholars and other appropriate experts; and thus, recognizing others' published work or teachings—whether that of authors, lecturers, or one's peers—is a required practice in all academic projects.

Plagiarism involves borrowing or using information from other sources without proper and full credit. You are subject to disciplinary actions for the following offenses which include but are not limited to cheating, plagiarism, forgery or unauthorized use of documents, and false form of identification

[Turnitin](#), an originality detection service in NYU Brightspace, may be used in this course to check your work for plagiarism.

Read more about academic integrity policies at the NYU School of Professional Studies on the [Academic Policies for NYU SPS Students](#) page.

7. <u>Use of Third-Party Tools</u> - During this class, you may be required to use non-NYU apps/platforms/software as a part of course studies, and thus, will be required to agree to the "Terms of Use" (TOU) associated with such apps/platforms/software.

These services may require you to create an account, but you can use a pseudonym (which may not identify you to the public community, but which may still identify you by IP address to the company and companies with whom it shares data).

You should carefully read those terms of use regarding the impact on your privacy rights and intellectual property rights. If you have any questions regarding those terms of use or the impact on the class, you are encouraged to ask the instructor prior to the add/drop deadline.