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### Department of Information Technology

**ENTD610: Object-Oriented Applications: Design and Development**

- **Credit Hours:** 3
- **Length of Course:** 8 Weeks
- **Prerequisite(s):** None

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- Instructor Information
- Evaluation Procedures
- Course Description
- Grading Scale
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- Course Objectives
- Policies
- Course Delivery Method
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- Selected Bibliography

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### Instructor Information

**Instructor:**

**Email:**

**Phone:**

**Office Hours:**

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### Course Description (Catalog)

This course appraises the object-oriented approach to application design and development of information systems. The course examines software development and design methodologies. It also assesses the principles, benefits, techniques, and practical applications to measure the quality of object-oriented design and development. It also applies object-oriented application design and development techniques such as Unified Modeling Language (UML), Unified Process, case analysis, problem domain analysis, activity diagramming, interaction diagramming, design heuristics, and design patterns to improve system adaptability and component reuse.

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### Course Scope

This course continues where ENTD600 course left off. It will focus on the middle phases of software engineering – detailed design and actual software implementation.

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### Course Objectives

1. Examine the principles and representations of Use Cases and Domain Models
2. Appraise the principles of design patterns; also categorize the various application models into standard design patterns
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3. Assess and apply the principles and processes of object-oriented analysis and design to design and develop object-oriented applications
4. Examine the role of iterative and incremental development in enabling agile development methodologies
5. Assess design processes using UML diagrams to perform object-oriented application design and development
6. Analyze the impact of sound object-oriented design on application module reusability

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Course Delivery Method

This **Object-Oriented Applications: Design and Development** course delivered via distance learning will enable students to complete academic work in a flexible manner, completely online. Course materials and access to an online learning management system will be made available to each student. **Online assignments are due by the last day of each week** and include Discussion Forum questions (accomplished in groups through a threaded discussion forum), examinations and quizzes (graded electronically), and individual assignments (submitted for review by the Faculty Member). Assigned faculty will support the students throughout this eight-week course.

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Course Materials

<table>
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<tr>
<th>Book Number</th>
<th>Authors</th>
<th>Book Title</th>
<th>Publication Info</th>
<th>ISBN</th>
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<tr>
<td>B</td>
<td>Matt Wiesfeld</td>
<td>The Object-Oriented Thought Process</td>
<td>Addison-Wesley</td>
<td>0-672-33016-4</td>
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Evaluation Procedures

- Detailed instructions for weekly assignments are found in Appendix B.
- Evaluation Criteria

<table>
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<tr>
<th>Graded Assignment</th>
<th>Percent of Final Grade</th>
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<td>Discussion Forum</td>
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<td>Assignment-1:</td>
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<td>Assignment-2:</td>
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<td>Final Project/Assignment</td>
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Grading Scale

Please see the student handbook to reference the University's grading scale.

Participation

Participation is very important in all online courses. Quality and quantity expectations are even higher in graduate courses. You are required to post minimum 4 valuable posts distributed over minimum 4 different days of the week. Your posts should reflect critical thinking and should add value to the classroom. Even good follow-up questions will count towards participation. You cannot simply copy statements from the book or other sources and expect to get points. While it is ok to include such lines in your post, I expect you to write a few statements on your own. Half-hearted opinions or “I agree” posts won’t count towards participation either. If you do post your own thoughts/opinions, try to back it up with facts. While quality is more important than the # of words in the post, avoid one liners. Posts that do not meet these minimum requirements will not be counted.

Several discussion questions will be posted in the discussion forum every week to help you participate well. I encourage you to login to the course every day, review the discussion posts and post your responses/questions/comments. Note that you cannot catch up on participation for previous weeks. In other words, only the posts made to current week’s forum will be counted, unless you get an authorization from me to make late posts to forums. Each week’s participation accounts for 4% of the final grade. So, all 8 weeks together, 32% of your final grade will be determined by participation.

Course Outline

8 Week Course

(Click on the Week Number to Hyperlink to Detailed Information)

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic(s)</th>
<th>Learning Objective(s)</th>
<th>Reading(s)</th>
<th>Assignment(s)</th>
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<td>Introduction</td>
<td>See Appendix B Week 1</td>
<td>A1: Complexity</td>
<td>Discussion Introduction</td>
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<td></td>
<td></td>
<td></td>
<td>A2: The Object Model</td>
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<td></td>
<td></td>
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<td>B1 Introduction to Object-Oriented Concepts</td>
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<td></td>
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<td>B2 How to Think in Terms of Objects</td>
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<td></td>
<td></td>
<td></td>
<td>B3 Advanced Object-Oriented Concepts</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(A1 means 1st chapter in Book A, and</td>
<td></td>
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</table>
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<table>
<thead>
<tr>
<th>Classes</th>
<th>See Appendix B</th>
<th>B1 means 1\textsuperscript{st} chapter in Book B, so on</th>
<th>Discussion Assignment-1</th>
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| OO concepts | See Appendix B  | B3: Classes and Objects  
B4: The Anatomy of a Class  
B5: Class Design Guidelines  
B6: Designing with Objects | Week 2 |
| B7 Mastering Inheritance and Composition  
B8 Frameworks and Reuse: Designing with Interfaces and Abstract Classes  
B9 Building Objects  
B10 Creating Object Models with UML | Discussion Assignment-2 |
| UML | See Appendix B  | A5: Notation | Week 4 |
| Software Lifecycle | See Appendix B  | A6: Process  
A7: Pragmatics  
A8: System Architecture: Satellite-Based Navigation | Week 5 |
| Applications | See Appendix B  | A9: Control System: Traffic Management  
A10: Artificial Intelligence: Cryptanalysis  
B11 Objects and Portable Data: XML  
B12 Persistent Objects: Serialization and Relational Databases | Week 6 |
| More Applications | See Appendix B  | A11: Data Acquisition: Weather Monitoring Station  
A12: Web Application: Vacation Tracking System  
Appendix A: Object-Oriented Programming Languages | Week 7 |
| Implementation | See Appendix B  | B13 Objects and the Internet  
B14 Objects and Client/Server Applications  
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Appendix A: Instructor Biography  
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**Policies**
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Please see the student handbook to reference all University policies. Quick links to frequently asked about policies are listed below.
Drop/Withdrawal Policy
Plagiarism Policy
Extension Process and Policy

Academic Services

ONLINE LIBRARY RESEARCH CENTER & LEARNING RESOURCES
The Online Library Resource Center is available to enrolled students and faculty from inside the electronic campus. This is your starting point for access to online books, subscription periodicals, and Web resources that are designed to support your classes and generally not available through search engines on the open Web. In addition, the Center provides access to special learning resources, which the University has contracted to assist with your studies. Questions can be directed to orc@apus.edu.

- Charles Town Library and Inter Library Loan: The University maintains a special library with a limited number of supporting volumes, collection of our professors’ publication, and services to search and borrow research books and articles from other libraries.
- Electronic Books: You can use the online library to uncover and download over 50,000 titles, which have been scanned and made available in electronic format.
- Electronic Journals: The University provides access to over 12,000 journals, which are available in electronic form and only through limited subscription services.
- Turnitin.com: Turnitin.com is a tool to improve student research skills that also detect plagiarism. Turnitin.com provides resources on developing topics and assignments that encourage and guide students in producing papers that are intellectually honest, original in thought, and clear in expression. This tool helps ensure a culture of adherence to the University’s standards for intellectual honesty. Turnitin.com also reviews students’ papers for matches with Internet materials and with thousands of student papers in its database, and returns an Originality Report to instructors and/or students.
- Smarthinking: Students have access to 10 free hours of tutoring service per year through Smarthinking. Tutoring is available in the following subjects: math (basic math through advanced calculus), science (biology, chemistry, and physics), accounting, statistics, economics, Spanish, writing, grammar, and more. Additional information is located in the Online Research Center. From the ORC home page, click on either the “Writing Center” or “Tutoring Center” and then click “Smarthinking.” All login information is available.

Selected Bibliography None

Appendix A – Instructor Biography

Appendix B – Weekly Student Course Guide
Week 1 – Introduction

Scope: This week you will learn about the Object Oriented Concepts

Objectives: Successful students will be able to:

1. Understand why Software is inherently complex
2. Describe the evolution of Object model
3. Discuss the generations of programming languages including OO languages
4. Explain the meaning of Encapsulation
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5. Think in terms of Objects
6. Explain how constructors work in OO languages

Required Readings:

1. A1: Complexity
2. A2: The Object Model
3. B1 Introduction to Object-Oriented Concepts
4. B2 How to Think in Terms of Objects
5. B3 Advanced Object-Oriented Concepts

Supplemental Reading: None

Turn-Ins:

1. News Group Introduction - Introduce yourself in Discussion Forums and respond to at least 2 of your classmates (Back to e-Classroom Instructions)
2. Click on the “Discussion Forums” and “Introduce Yourself” links
   a. Click "REPLY TO THIS MESSAGE" and enter a short introductory paragraph about yourself, what you are majoring in and what you expect learn from this course.
   b. Click Reply
   c. Respond to 2 other student’s answers by clicking the Subthread link located beneath their answer
   d. Click the Submit button
3. Review DQs in the weekly discussion forum and participate in discussion activity. You should post minimum 4 valuable posts on 4 different days.
4. I encourage you to upload a picture of yourself (optional) in your "My Profile" to personalize the online interaction with your classmates. This is not a course requirement.
   a. To upload your photo, look in the left menu, and click Course Materials.
   b. In the center of the page, click My Folder, Upload To My Folder, Browse, click on the file name of your photo, Open and Upload File.
   c. When your picture uploads, place a check mark in the box to make it visible in your profile to other students.
5. Privacy Profile – If you want to share your photo with other students, you must adjust your privacy setting in your profile by following these steps:
   a. In the left menu click My Profile
   b. Click the sub-link Modify Profile
   c. In the table, scroll down to the Profile Privacy section and click the small arrow in the drop down menu.
   d. Select “Show to Everyone” or “Show to instructor” as you prefer
6. Scroll down and click the Re-Create Profile button

Notes: Please refer to the Announcements posted in your e-classroom.
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Week 2 – Classes

Scope: This week we will study about Advanced Object and Class Concepts.

Objectives: Successful students will be able to:

1. Describe the content of an Object
2. List the 3 kinds of relationships among objects.
3. Define abstraction and encapsulation
4. Talk about the difficulty of classification
5. Understand why iterative development naturally fits well with most software applications

Required Readings:

1. A3: Classes and Objects
2. A4: Classification
3. B4 The Anatomy of a Class
4. B5 Class Design Guidelines
5. B6 Designing with Objects

Supplemental Reading: None

Review DQs in the weekly discussion forum and participate in discussion activity. You should post minimum 4 valuable posts on 4 different days.

Turn-Ins: Assignment-1: Consider various components involved in Information System for a typical university. Identify at least 2 classes and data members and methods associated with each class.

Professor Notes: Write your response in MS Word document and upload the file into your folder. Refer to Announcements in your online classroom.

Week 3 – OO Concepts

Scope: This week we will study about OO design concepts: inheritance, composition, abstract classes and interfaces.

Objectives: Successful students will be able to:

1. Know the difference between inheritance and composition
2. Know when to use inheritance vs. composition
3. Explain how inheritance weakens encapsulation
4. Define development framework
5. Understand the equivalence of UML diagram for a class and corresponding code in most OO languages.

Required Readings:

1. B7 Mastering Inheritance and Composition
2. B8 Frameworks and Reuse: Designing with Interfaces and Abstract Classes
3. B9 Building Objects
4. B10 Creating Object Models with UML
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Supplemental Reading: None

Review DQs in the weekly discussion forum and participate in discussion activity. You should post minimum 4 valuable posts on 4 different days.

Turn-Ins: Assignment-2: There are a lot of examples out there in the web. Browse and choose your favorite one and consider equivalent implementation that does not use inheritance. In your own words, explain the value of inheritance based on that example. What are the advantages and disadvantages?

Professor Notes: Write your response in MS Word document and upload the file into your folder. Refer to Announcements in your online classroom.

Week 4 – UML

Scope: This week we will review all the UML notations and diagrams.

Objectives: Successful students will be able to:

1. List various UML diagrams that are used in OO software design
2. Understand the purpose of Deployment Diagram
3. Know how to use <<include>> and <<extend>> relationships in UML use case diagrams
4. Describe the purpose of Template classes in OO implementation
5. Know the scenarios in which timing diagram is useful

Required Readings:

1. A5: Notation

Supplemental Reading: None

Review DQs in the weekly discussion forum and participate in discussion activity. You should post minimum 4 valuable posts on 4 different days.

Turn-Ins:
1. Take the Midterm Project/Assignment and complete and submit by this weekend. Please provide brief answers for essay questions.

Professor Notes: Refer to Announcements in your online classroom.

Week 5 – Software Lifecycle

Scope: This week we will study and understand the Software LifeCycle and a sample OO application

Objectives: Successful students will be able to:

1. Understand the rationality behind agile processes
2. Understand the purpose of release planning
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3. Explain why there is no "big-bang" integration event in OO development
4. List a few object oriented metrics
5. Know how to develop a good architecture

Required Readings:

1. A6: Process
2. A7: Pragmatics

Review DQs in the weekly discussion forum and participate in discussion activity. You should post minimum 4 valuable posts on 4 different days.

Turn-Ins: Assignment-3: Application Summary: Review all the details about Satellite-Based Navigation application covered this week and review all the details closely. Then, write a two page summary in your own words. Highlight any interesting or strange idea used in the application. I encourage you to point out any extensions you can think of.

Professor Notes: Write your response in MS Word document and upload the file into your folder. Refer to Announcements in your online classroom.

Week 6 – Applications

This week we will study and understand the Software LifeCycle and a sample OO application

Objectives: Successful students will be able to:

1. Understand the need for evolving software
2. Describe the purpose of XML in modern software applications
3. Define object persistence
4. Know to save the objects in a flat file
5. Describe how to work with database from OO application

Required Readings:

1. A9: Control System: Traffic Management
2. A10: Artificial Intelligence: Cryptanalysis
3. B11 Objects and Portable Data: XML
4. B12 Persistent Objects: Serialization and Relational Databases

Supplemental Reading: None

Review DQs in the weekly discussion forum and participate in discussion activity. You should post minimum 4 valuable posts on 4 different days.

Turn-Ins: Assignment-4: Application Summary: Choose your favorite one between 2 applications covered this week and review all the details closely. Then, write a two page summary in your own words. Highlight any interesting or strange idea used in the application. I encourage you to point out any extensions you can think of.

Professor Notes: Write your response in MS Word document and upload the file into your folder. Refer to Announcements in your online classroom.
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Week 7 – More Applications

This week we will cover 2 more sample Object Oriented applications and review the OO languages.

Objectives: Successful students will be able to:

1. Explain a few points in history of OO languages
2. List the major differences between C++ and Java
3. Explain the steps to develop a web-based application
4. List a few concerns specific to real-time application
5. Write code in Java/C++ for simple classes

Required Readings:

1. A11: Data Acquisition: Weather Monitoring Station
2. A12: Web Application: Vacation Tracking System
3. Appendix A: Object-Oriented Programming Languages

Supplemental Reading: None

Review DQs in the weekly discussion forum and participate in discussion activity. You should post minimum 4 valuable posts on 4 different days.

Turn-Ins: Assignment-5: Application Summary: Choose your favorite one between 2 applications covered this week and review all the details closely. Then, write a two page summary in your own words. Highlight any interesting or strange idea used in the application. I encourage you to point out any extensions you can think of.

Professor Notes: Write your response in MS Word document and upload the file into your folder. Refer to Announcements in your online classroom.

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Week 8 – Implementation

Scope: This week we will learn the latest trends in software applications and how to meet those requirements.

Objectives: At the end of these lessons the student will be able to

1. Describe the evolution of distributed computing
2. Deal with distributed objects in the enterprise.
3. Explain why Client/Server Applications became popular over the years.
4. Explain how design patterns can shorten development time
5. Understand the purpose of Web services.

Required Readings:
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1. B13 Objects and the Internet
2. B14 Objects and Client/Server Applications
3. B15 Design Patterns

Supplemental Readings: None

Review DQs in the weekly discussion forum and participate in discussion activity. You should post minimum 4 valuable posts on 4 different days.

Turn-Ins:

1. Complete your Final Project/Assignment - The Final Project/Assignment is a comprehensive examination on all the topics discussed in the course. The Project/Assignment contains Blanks and Short answer questions.

Professor Notes: Time to take the FINAL EXAM