As of January 10, 2017

CEN 4010: Software Engineering I

Spring 2017
Tuesday/Thursday, 5:00 – 6:15 PM, ECS132

INSTRUCTIONAL TEAM:

Professor
Dr. Monique Ross moross@fiu.edu Office: ECS 342B
Office hours: Mondays, Wednesday 9:00am – 11:00 a.m. or upon request

COURSE DESCRIPTION: Software process model, software analysis and specification, software design, and testing.

PREREQUISITES: COP 3530 and COM 3110 and CGS 3092

COURSE OBJECTIVES:

- Be **familia**r with the Software Development Life Cycle
- **Master** the techniques to <u>gather and specify the requirements</u> of a medium-size software system using UML
- **Master** the techniques to <u>design</u> and implement a medium-size software system
- Be **familiar** with software testing techniques
- Be **familiar** with software documentation
- Be **familiar** with <u>working in a </u>small software development <u>team</u>
- Be **familiar** with system walkthroughs

Software engineering is the application of computer science. This course is designed to provide breadth not depth in a number of topics. These topics coalesce in a project in an attempt to create a realistic, practical application of the content presented in this course.

COURSE OUTCOMES:

- Develop and articulate an engineering design approach to solving a complex problem.
- Develop a software artifact with consideration for implications and customer needs.
- Communicate with your teammates and work effectively in a small team.

COURSE ACTIVITIES: Course activities will involve:

- Explore software engineering – via textbooks, journal articles and discussion – and through reflection, writing and dialogue.
- Reflect on and discuss the implications of design decisions
- Develop a written argument for a design approach (e.g., the Project Paper described on subsequent pages).
- Developing an artifact under constraint, on-time, on-budget, with thoughtful and consistent results (Semester Project)

READINGS:

We will use the following **text**:

Bruegge, B., Dutoit, A.H. (2010). Object-Oriented Software Engineering using UML, Patterns, and Java, ISBN#: 978-0-13-606125-0

We will also use several articles that will be made available on Moodle.

- Diakopoulos, N. (2015). Algorithmic Accountability. *Digital Journalism*, *811*(February 2015), 1–18. http://doi.org/10.1080/21670811.2014.976411
- Glinz, M., & Wieringa, R. J. (2007). Guest Editors' Introduction: Stakeholders in Requirements Engineering. *Software, IEEE*, *24*(2), 18–20. http://doi.org/10.1109/MS.2007.42
- Berry, D. M., & Lawrence, B. (1998). Guest Editor´s Introduction: Requirements Engineering. *IEEE Software*, *15*(2), 26–29. http://doi.org/10.1109/MS.1998.663780
- Curran, B. (2001). What is software engineering?
- …more to come…TBD.

Other useful resources (Optional not required but useful)

- Humphrey, W.S. (2005). PSP: A self-improvement process for software engineers. ISBN# 0-321-30549-3
- Ashmore, S., Runyan, K. (2015). Introduction to Agile Methods. ISBN# 0-321-92956-X

TOOLS: We will be utilizing two additional tools for the class. A learning management system (LMS) – Moodle (https://moodle.cis.fiu.edu/v3.1/) for grades, quizzes, project submissions, and supplemental reading assignments. We will also use WReSTT-CyLE for supplemental learning objectives (http://wrestt.cis.fiu.edu/about-wrestt-com).

COURSE REQUIREMENTS AND GRADING:
Weekly quizzes (11)
In-class Activities (11)
Project (e.g., Drafts 1, 2, 3, 4, and Final), with bonus points for working executable
Team evaluations (2)

It is my hope that by being transparent with my course design philosophies and practices, you as the student will, hopefully, understand that I have been thoughtful in my development of this course to ensure you have an effective learning experience. Given the nature of the discipline and the course I am most interested in your ability to transfer the knowledge you learn in this course into your future work (e.g., senior design project, internships, career). It is my belief that through engaging in this learning environment you will master the content, draw connections to personal interests, and push yourself to a higher level of thinking in computer science.

Three assessment methods will be used to determine your final grade for this course.

1. **25%** of your grade will be earned through weekly quizzes that cover in-class and reading material (Note: I will drop your lowest quiz score, allowing you either one missed quiz or one bombed quiz).
2. **25%** of your grade will be earned by your class **participation** as measured by (1) participation in in-class activities and discussions (10%) and (2) presenting a poster that summarizes your project to the class (15%).
3. **50%** of your grade will be earned by writing a **final project paper**. See pages 4-5 for a detailed description of the elements that must be part of your paper. Only final draft of the project paper will be graded. You will receive detailed formative feedback (ungraded) on two (optional but HIGHLY recommended) drafts. Each section of the final paper will be assessed on the following three criteria: *clarity and meets the requirements* explicitly stated in this document.

COURSE DELIVERY: Each week we will meet twice a week for 1 hour 15 minutes. One class per week will be dedicated to course content, one class per week will be dedicated to project-specific tasking or discussions (see Course Schedule).

LEARNING ENVIRONMENT:

The research is clear - long-term learning takes place only when accompanied by **deliberate, distributed practice**. To accomplish that end, this class is structured so that there is opportunity for reflection and iteration. Detailed feedback will be provided as you develop your ideas. My philosophy is that:

- Successful learning is fostered by clear objectives and expectations.
- Learning is a social activity, and you will be encouraged to "think together" with your classmates.
- Reading and writing are essential parts of the thinking process and you will be asked to use writing to DEVELOP your ideas (not only to document your "final" project).

I expect that you will:

1. Attend all classes. If you must miss a class, please let me know and make arrangements with other class members for a summary and review.
2. Fully engage in all classes. Full engagement requires reading and reflecting on all assigned materials by the assigned time, actively participating in class discussions and activities, and completing quality work. Full engagement also means being attentive in class and limiting use of electronic devices to class-related activities such as taking notes or viewing slides.
3. Develop your final project throughout the semester by submitting drafts and continually reflecting on how course material relates to your project.
4. Follow scholastic conduct policy: http://undergrad.fiu.edu/academic-integrity/
5. Complete and submit a thoughtful course evaluation.

You can expect that I will:

1. Provide a supportive learning environment that fosters your success.
2. Create assignments and exercises that are meaningful to you.
3. Provide detailed, constructive formative feedback on your project drafts.
4. Honor and respect your interests.

From experience teaching this course, I have found that the most successful students:

1. Create early drafts that are thoughtful and complete.
2. Think deeply about their course project.
3. Are open to new ways of thinking about design and the target domain of their project.

ASSESSMENT

Weekly Quizzes (11) There will be weekly class quizzes that assess any material covered in class or assigned readings. They will be no longer than five questions long. The intent is not to torture you but to a) ensure that you keep up with reading assignments, attend class, pay attention, and most importantly provide opportunities to practice memory retrieval. Studies show that multiple opportunities to retrieve new knowledge helps to create new neural pathways and helps you retain information longer (Lang 2016). Blame it on all that reading I do on how best to learn.

In-class Activities Where appropriate there will be in-class activities (e.g., creating concept maps, minute-papers, muddiest-point, etc.) that require your preparation and participation…another opportunity to establish those neural pathways.

Semester Project

The principal assignment for the course is a **group project (and paper)** that is **due** 11:59pm Friday, **April 25, 2017**. The actual project/digital artifact (e.g., language, type, etc.) is left to the discretion of your team with an explicit explanation of decisions captured in your project paper. The production of the final software engineering project paper will occur in a series of stages:

1. A first draft that begins to show the development of your ideas as well as an assessment of its social or societal need either with an actual customer or through scholarly literature.

2. A second draft that further develops your ideas. Ideally, this draft will contain the requirements of your final project.
3. A third draft that further develops your ideas. Ideally, this draft will contain the design of your final project.
4. A fourth draft that further develops your ideas. Ideally, this draft will contain the verification plan of your final project.
5. A final draft that integrates all the stages and incorporates feedback from previous drafts. Only the final draft will be assigned a grade. You will receive ungraded formative feedback to improve your final draft on your first and second drafts.
6. A poster presentation of your project.

The final paper will include the following areas:

0. A title for your project that identifies your audience/customer/consumer, artifact and setting
    a. i.e., "Binary Learning Application for Elementary Students"

1. Introduction
    a. Description of the customer/setting for the project
        i. Salient characteristics of the *customer* or sponsoring organization
        ii. Description of the salient characteristics of the *application/tool*
            1. What is the background of the project idea? What is the problem?
            2. How is your application/tool different from what already exists?
            3. What are the implications of the tool you develop?
        iii. Other important contextual issues especially any external constraints placed on the application/tool.
        iv. Outline (visually) a proposed schedule for your project
        v. Describe your team and the proposed roles and responsibilities for your teammates
    b. Your motivation for selecting this project
        i. Your own expertise in the area
        ii. How this might be useful to you in your career

2. Requirements
    a. Define requirements elicitation
    b. Introduce your requirements elicitation process
    c. Create a concept map (graphic) of the elicitation process. The concept map should show the **relationships** among the **stakeholders** of the product.
        i. Describe your concept map in words.
        ii. Describe in words, in a table, or by using color-coding, how your concept map aligns with your requirements.
    d. Explicitly state the software requirements specification
        i. External interface requirements (e.g., inputs and outputs)
        ii. Functional requirements - Functions (including validity checks on inputs, responses to abnormal situations, etc.)
        iii. Non-functional requirements - Performance requirements
        iv. Design constraints
3. Design
    a. Define design
    b. Introduce your design process
    c. Demonstrate the design graphically
        i. Use cases
        ii. State diagrams (if applicable)
        iii. Flow Charts

            iv. Sequence diagrams
   d. Document design process attributes
      i. Data design (i.e., data structures)
      ii. Architectural design (i.e., classes)
      iii. Interface design (i.e., interface between the units/classes)
      iv. Procedural design (i.e., algorithms of each method)
   e. Rationale Management – be sure to provide a justification for design decisions made during the project (hint* - take notes as you are going through the process, journal even…this will help you with this portion of the project).
      i. The issues that were addressed
      ii. The alternatives that were considered
      iii. The decisions that were made to resolve the issues
      iv. The criteria used to guide decisions
      v. The debate developers went through to reach a decision

4. Verification
   a. Define verification
   b. Introduce your verification process
   c. Describe/demonstrate your testcases
   d. Demonstrate (preferably a table) **traceability** between the testcases/plan and requirements

5. Reflection
   a. In one or two paragraphs, discuss the lessons you learned during this project (e.g., teamwork, project selection, software life cycle, implications, schedule).
      i. Share the **actual** timeline for execution of the project. Compare the **proposed** schedule with the **actual** timeline. Describe and explain the deviation from the planned or proposed.

TEAM SELECTION: Be sure to use the CATME tool to aid in team selection. The tool is available Wednesday, January 11 – Monday, January 16th (at midnight). You should have received an email on Wednesday when the survey is available. CATME will also be utilized for team evaluations. There will be two team evaluations – midyear and year end. I will wait until week two to discuss team size until the class roster normalizes.

ACCOMODATIONS: If you are a person with special circumstances that you believe will affect your class performance (e.g., visual, hearing or learning disabilities or language differences) please let me know if I can make appropriate accommodations. The Disability Resource Services website is located at: http://studentaffairs.fiu.edu/get-support/disability-resource-center/

COURSE SCHEDULE for Spring 2017

Week	Date	Class focus	Assigned readings *due*	Deliverables *due*
1	Jan 10	Course overview, introductions,		
	Jan 12	Introduction to Software Engineering	Text Ch. 1 (pp. 3 - 20) Curran, B. (2001)	Quiz 1
2	Jan 17	Introduction to Software Engineering	Text Ch. 1 (pp. 21-23) Assigned reading (see Moodle)	Quiz 2
	Jan 19	Project brainstorm session	Project Guidelines	
3	Jan 24	Project Organization and Communication Project Management • Traditional • Agile	Text Ch. 3 (pp. 78-113) Assigned reading (see Moodle) Text Ch. 14 (pp. 575-601, 603-615) Assigned reading (see Moodle)	Quiz 3 (Speaking engagement – **NO CLASS** but reading and quiz will be posted.
	Jan 26	**Peer Review Training and Exercise** • Communication • Peer reviews • Roles • Schedule • Meeting Agenda		
4	Jan 31	Requirements Elicitation	Text Ch. 4 (pp. 121-134) Berry, D. M., & Lawrence, B. (1998)	Quiz 4
	Feb 2	Elicitation activity/discussion		
5	Feb 7	Requirements Elicitation	Text Ch. 4 (pp. 135-151) Glinz, M., & Wieringa, R. J. (2007)	Quiz 5
	Feb 9	Elicitation activity/discussion		**Introduction Due (Sections 0-1)**
6	Feb 14	Analysis/ Algorithmic Accountability/ SW Safety/Ethics	Text Ch. 5 (pp. 173-175) Diakopoulus, 2014	Quiz 6
	Feb 16			
7	Feb 21	Analysis	Text Ch. 5 (pp. 189-190, 196-203) Assigned reading (see Moodle)	Quiz 7
	Feb 23			
8	Feb 28	Modeling with UML	Text Ch. 2 (pp. 29-37,	Quiz 8

			59-71) YouTube Videos	
	Mar 2			**Requirements Due (Sections 0-2)**
9	Mar 7 (Conference)	(Pre-recorded) System-Design: Decomposing the System	Text Ch. 6 (pp.223-230, 249-254) Assigned reading (see Moodle)	Quiz 9
	Mar 9 (Conference)	Discussion Project Work		
	Mar 14	SPRING BREAK		
	Mar 16	SPRING BREAK		
10	Mar 21	Verification WReSTT-CyLE	Assigned reading (see Moodle)	Quiz 10
	Mar 23	Discussion Project Work		
11	Mar 28	Rationale Management	Text Ch. 12 (pp. 493-504, 511-529) Assigned reading (see Moodle)	Quiz 11
	Mar 30	Discussion Project Work		**Design Due (Sections 0-3)**
12	April 4	Configuration Management	Text Ch. 13 (pp. 537-550) Assigned reading (see Moodle)	
	April 6	Discussion Project Work		
13	April 11	Discussion Project Work		
	April 13	Discussion Project Work		
14	April 18	Discussion Project Work		**Verification Due (Sections 0-4)**
	April 20	Discussion Project Work		
	April 25	FINALS – Presentations **Final Paper/Project (Sections 0-5)**		
	April 27			
	YOU MADE IT!			

*Syllabus format and key points credited to Dr. Ruth Streveler, Purdue University