**Saint Leo University**

**COM 430**
**Software Engineering**

**Course Description:**
This course presents a variety of different view of the software development process, considering all important process models as well as system analysis and design methods with an emphasis on object-oriented techniques. Concepts, procedures, techniques and methods that enable a software team to assess software quality and manage and control a software development project are also discussed.

**Prerequisite:**
COM 301

**Textbooks*:***
Various articles listed in the module. No required text to purchase.

**Optional:**
Sommerville, Ian (2016). Software Engineering 10th Ed. Hoboken, NJ: Pearson.
The Mythical Man Month ISBN-13: 978-0201835953 ISBN-10: 0201835959
The Pragmatic Programmer ISBN-13: 978-0201616224 ISBN-10: 020161622X

**Learning Outcomes:**

The student will:

1. be able to define the software engineering approaches and the common process model components used in software infrastructure development;
2. describe and apply common methods for requirements elicitation, processes, specification, validation, and change;
3. identify, discuss and document software design based on systems architectural modeling, techniques, methods, patterns, and UML design;
4. develop and deploy a working software system using various development tools and processes outlined in this course;
5. discuss, illustrate, and integrate the relevance of Saint Leo Core Values: **Excellence** and **Integrity**, including the importance of Ethical Behavior, in the development and implementation of a software product.

**Core Values:**
*Excellence:* Saint Leo University is an educational enterprise. All of us, individually and collectively, work hard to ensure that our students develop the character, learn the skills, and assimilate the knowledge essential to become morally responsible leaders. The success of our University depends upon a conscientious commitment to our mission, vision, and goals.

*Integrity*: The commitment of Saint Leo University to excellence demands that its members live its mission and deliver on its promise. The faculty, staff, and students pledge to be honest, just, and consistent in word and deed.

**Evaluation:**

| | |
|---|---|
| A: Quiz (4) | 15% |
| B: Weekly Team Dev Project Assignments (5) | 30% |
| C: Team Term Project (3) | 40% |
| D: Participation/Discussion (8) | 15% |

**A. Quiz:**

The **quizzes** will consist of a small number of objective questions, followed by either a hands-on design task requiring diagramming or writing documentation or code.

**B. Weekly Team Dev Projects Assignments:**

These weekly dev assignments will require each student to projects aligned with providing a Dev Op experience in software development. The assignments will cover thinking processes, code submission and project management skills and reporting.

**C. Team Term Project:**

A project will be used to reinforce concepts and to teach students how to use tools which will aid in software engineering and programming practices. This may include using open source tools in the production of software projects and software engineering diagrams. Students will be required to work on a team to complete an assigned **Team term project** involving the analysis and design of a software product as a part of the course requirements. The software product can be any business or operation that needs computerization or upgrade of the existing computer system. Specific product to design will be selected by the students and approved by the instructor. In addition, students will be required to give a professional presentation of their reports using PowerPoint at each phase of the development, or at the end, at the discretion of the instructor.

**D. Participation/Discussions:**

Participation/Discussion grades can be used in a variety of ways depending upon the delivery method used. Students will also be required to participate in discussion similar to agile developers using industry tools.

**ASSESSMENT OF THE LEARNING OUTCOMES**

| Learning Outcome | Assessment Method(s) |
|---|---|
| 1 | Quiz Weekly Team Dev Project Assignments; Participation/ Discussion |
| 2 | Quiz, Weekly Team Dev Project Assignments; Participation/ Discussion |
| 3 | Quiz, Weekly Team Dev Project Assignments; Participation/ Discussion |
| 4 | Team Term Project; |
| 5 | Participation/ Discussion |

**Course Schedule:**

**Module 1**

**Objectives** When you complete this module, you should be able to:

- Identify components of Software Engineering along with processes from start to finish of a software project
- Explain how software developmental approaches influence and impact software product quality
- Apply software development approaches to a software engineering project
- Apply concepts of 6 Thinking Hats in a software engineering project

**Readings**

1) Read pages 1-4 of Sue Conger's PDF here, it will give you a brief overview of SE.

2) This website provides an overview of SE in relation to Computer. Basically, identifying where it lays in the realm of CS. Pay attention to the section on Software Engineering. While the additional information is good, it is not necessary for understanding the relationship between Software Engineering and Software System.

Read: http://compsci.ca/blog/6-degrees-of-computer-science/

3) Finding a History for Software

This article provides a historical perspective on Software Engineering. The author provides context by presenting three historical aspects that has assisted with guiding practitioners' understanding of software engineering beginnings.

4) A Brief History of Software Engineering

This article provides another supporting historical view of Software Engineering and follows it up to the current year of its writing. The author provides some context as to the need for software engineering and why it came about in the industry.

5) Software Engineering

This article provides supporting reasons of why software engineering is needed from a historical perspective. The author addresses the problems with software development at the time of the writing. In addition, pay attention to the suggestion of the new tools needed and potential models to use.

6) A new breed: the software engineer

This article expresses the need for software engineers. The author identifies the growing demand and what was currently being taught at the time of the writing. As you read, pay attention to the content that speaks on the cost of errors and think about how it relates to today.

7) Exploring the Relationship between Systems Engineering and Software Engineering

This article explores the relationship between systems engineering and software engineering. The authors present a study on exploring and recommending approaches to projects. Pay attention to the aspects that identify the current state and the inter-dependency.

8) Managing Large Software Projects

This article talks about the need for managing software projects. The author presents a current issue with project management. Pay attention to the cases identified in the reading.

9) Engineering Effective Software

This article discusses the need for effective software engineering. The author presents trends in development and the need for approaches to meet the new market needs at the time of the writing.

10) Revolutionizing Software Defined Radio

This article describes Software Defined Radio as a Use case in Software Engineering. The relevance is the software that goes into running hardware and the tools for digital communication

**Assignments**

| **Items to be Completed:** | **Due No Later Than:** |
|---|---|
| Post an introduction to the class | Thursday 11:59 PM EST/EDT |
| Post an initial response to the discussion question | Thursday 11:59 PM EST/EDT |
| Post responses to at least one classmates | Sunday 11:59 PM EST/EDT |
| Complete Group Formation Survey | Wednesday 11:59 PM EST/EDT |
| Complete Quiz 1 | Sunday 11:59 PM EST/EDT |

**Module 2**

**Objectives** When you complete this module, you should be able to:

- Explain the evolution of the Software Development Lifecycle (SDLC)
- Apply the SDLC concepts to a software engineering project
- Define important agile development practices
- Describe the rationale for agile software development methods, the agile manifesto
- Explain the differences between agile and plan-driven development

**Readings**

1) Read the following pages in Sue Conger's Book: pg. 23- 40

The readings in Sue Conger's book provides an overview of the types of project life cycles and methodologies. These readings provide enhancement to development of software applications. Project management is an essential aspect of the development process.

2) Waterfall Vs. V-Model Vs. Agile

The authors in this article provide a comparative study on three models- waterfall, v-model, and agile model. Each model provides an overview of the processes needed to be completed during the development of software applications.

3) Adopting an Agile Methodology

The authors in this article provide an evaluation of the Agile method approach. They also provide an evaluation of failures of the agile adoption process. Pay attention to the what worked and what didn't work, and why.

4) Quantifying the effect of Kanban versus Scrum

The authors in this article provide a study on quantifying the effect of Kanban and scrum. This study provides an overview of the usefulness of the approaches based on data collected over 3 years. Students should pay attention to the claims being made and the actual outcome based on the data.

5) The Scrum Software

This study provides an overview of the scrum process. In this study, students should pay attention for the reasons for scrum use and why.

6) Lean Software

This study provides an evaluation the evolution of lean software development, what it means, how it relates to well-known agile development practices, and future evolution.

7) Engineering Design it's Importance

This study provides an overview of software design and importance.

8) View the following webpage here:
https://www.tutorialspoint.com/sdlc/sdlc_overview.htm

This tutorial provides an overview of SDLC. It will go over all currently popular models. View all sections:

http://www.architecting.co.uk/papers/An%20Introduction%20to%20the%20Rational%20Unified%20Process.pdf

https://www.ibm.com/developerworks/rational/library/content/03July/1000/1251/1251_bestpractices_TP026B.pdf

9) View all sections:

http://www.architecting.co.uk/papers/An%20Introduction%20to%20the%20Rational%20Unified%20Process.pdf

https://www.ibm.com/developerworks/rational/library/content/03July/1000/1251/1251_bestpractices_TP026B.pdf

Both of these articles provides the background on the RUP.

**Assignments**

| **Items to be Completed:** | **Due No Later Than:** |
|---|---|
| Post an initial response to the discussion question | Thursday 11:59 PM EST/EDT |
| Post responses to at least one classmates | Sunday 11:59 PM EST/EDT |
| Submit Team Dev Op Project Submission 1 - Outline | Sunday 11:59 PM EST/EDT |
| Complete Quiz 2 | Sunday 11:59 PM EST/EDT |

**Module 3**

**Objectives** When you complete this module, you should be able to:

- Apply the components of design with patterns, XML, software components and data representation in SE
- Apply the concepts of Dev ops by creating a project plan to meet milestones.

**Readings**

1) Read the following pages in the Sue Conger Book: Pg. 148-153; Pg. 213-216; 217-225; and 228-247

This section will cover various components of SDLC, project planning, and feasibility. Pay attention to Pg. 151 and feasibility activities. Also pay attention to the data flow diagram, use case and the documentation tools in this reading. It talks about JAD; however, we are not focused on the system design process (this would have been covered in COM 320), only the data diagram tools as part of a refresher to ensure the proper infrastructure is developed for your project.

2) Read the article: Process model for e-business Standards

This article provides an explanation of XML use in eBusinesses. This article offers an evaluation of a process model necessary to assist the complexity of business needs today and the development of web technologies.

3) Read the article: UML Software

This article provides a summary of UML and why it is necessary in software engineering.

**Assignments**

| Items to be Completed: | Due No Later Than: |
|---|---|
| Post an initial response to the discussion question | Thursday 11:59 PM EST/EDT |
| Post responses to at least one classmates | Sunday 11:59 PM EST/EDT |
| Team Dev Op Project Submission 2 - Project Plan | Sunday 11:59 PM EST/EDT |
| Complete Quiz 3 | Sunday 11:59 PM EST/EDT |

**Module 4**

**Objectives** When you complete this module, you should be able to:

- Explain the components of modeling and system specification.
- Explain how to perform measurement and estimation of SE
- Apply the concepts of modeling, system specification measurement and estimation of SE
- Apply the concepts of Dev ops by completing a topology and report to meet milestones

**Readings**

1) Read the following article: Analyzing Software Measurement Data with Clustering Techniques

The authors in this article provide an evaluation of estimation and measurement using clustering techniques. They provide some definitions and issues with software development and identify the need for measurement.

2) Read the following article: TRENDS IN MEASUREMENT, ESTIMATION, AND CONTROL

This article provides a historical overview of measurement, estimation, and control in software engineering. The authors share a view of current views and trends in the 1990's and where they go from there. They also provide "basic measures that have been used successfully in management and describes the direction that measurement is being driven by the pressure of quality management." L. H. Putnam, "Trends in measurement, estimation, and control (software engineering)," in IEEE Software, vol. 8, no. 2, pp. 105-107, March 1991. doi: 10.1109/52.73762

3) Read the following article: Model-Driven Engineering and Safety-Critical Embedded Software

The author in article provide an evaluation of embedded software systems from model-driven engineering. The author provides a solution and example of model-driven engineering and the need for verification.

4) Read the following article: Estimation Tools and Techniques

The authors in this article provide an analysis on estimation in software engineering. They define and identify estimation technologies.

5) Read the following article: Dual Application Model for Agile Software Engineering

This article provides a review of agile development from the point of dual application model approach. Specifically: “The Dual Application Model involves the development of a logical software application focused on capturing the functional requirements and a physical software application focused on transforming the logical application to meet the non-functional requirements.” A. Aitken, "Dual Application Model for Agile Software Engineering," 2014 47th Hawaii International Conference on System Sciences, Waikoloa, HI, 2014, pp. 4789-4798. doi: 10.1109/HICSS.2014.588

6) Read the following article: Collaborative Repositories in Model- Driven Engineering

The authors in this article provide an overview of model-driven engineering. They describe its use and need. They conclude by identifying future tools to address insufficiencies in model-driven approaches.

7) Read the following Tutoralspoint on diagrams:

- Generalization: https://www.tutorialspoint.com/dbms/dbms_generalization_aggregation.htm
- Class: https://www.tutorialspoint.com/uml/uml_class_diagram.htm
- Use Case: https://www.tutorialspoint.com/uml/uml_class_diagram.htm
- Sequence/ Interaction: https://www.tutorialspoint.com/uml/uml_interaction_diagram.htm
- Overview:https://www.tutorialspoint.com/uml/uml_modeling_types.htm
- https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_uml_behavioural_diagrams.htm

**Assignments**

| **Items to be Completed:** | **Due No Later Than:** |
|---|---|
| Post an initial response to the discussion question | Thursday 11:59 PM EST/EDT |
| Post responses to at least one classmates | Sunday 11:59 PM EST/EDT |
| Team Dev Op Project Submission 3 – Topology | Sunday 11:59 PM EST/EDT |

**Module 5**

**Objectives** When you complete this module, you should be able to:

- Apply the various tools available for software development
- Apply the use of a repository for use in software development
- Apply the concepts of Dev ops to meet milestones

**Readings**

1) https://theagileadmin.com/what-is-devops/

Read the following Blog on Dev Ops: This blog covers DevOp concepts as a whole, but pay attention to the ‘tools’ and think about this as you read: what are defined as tools?

2) https://www.atlassian.com/blog/devops/how-to-choose-devops-tools

Read the following blog from Atlassian: This article provides an overview of tools. Pay close attention the concepts that the author is trying to convey.

3) https://xebialabs.com/periodic-table-of-devops-tools/embed

Review the following table of tools: This Table is an interactive table that lists current tools used in DevOps.

4) https://devops.com/successful-failure/

Read the following on DevOp Failure:

**Assignments**

| **Items to be Completed:** | **Due No Later Than:** |
|---|---|
| Post an initial response to the discussion question | Thursday 11:59 PM EST/EDT |
| Post responses to at least one classmates | Sunday 11:59 PM EST/EDT |
| Team Dev Op Project Submission 4 – (Version 1 to Test) | Sunday 11:59 PM EST/EDT |
| Complete Quiz 4 | Sunday 11:59 PM EST/EDT |

**Module 6**

**Objectives** When you complete this module, you should be able to:

- Explain the current topics, trends and tools in Software Engineering

**Readings**

1) Read the article in the following link: http://www.incose.org/AboutSE/WhatIsSE

This page provides an overview of Systems Engineering.

2) Read the overview page
here: http://sebokwiki.org/wiki/Systems_Engineering_Overview

This page provides another brief overview on Systems Engineer.

3) Enterprise, Systems, and Software Engineering—The Need for Integration

The authors in this article argue the integration of systems and software. Pay attention to the explanation of Software Engineering.

4) Systems Engineering for Industrial Cyber–Physical Systems Using Aspects

This article provides an evaluation of modeling techniques in systems engineering. The authors look at model-based design.

**Assignments**

| Items to be Completed: | Due No Later Than: |
|---|---|
| Post an initial response to the discussion question | Thursday 11:59 PM EST/EDT |
| Post responses to at least one classmates | Sunday 11:59 PM EST/EDT |
| Team Dev Op Project Submission 5 – (Version 2 to Test) | Sunday 11:59 PM EST/EDT |

**Module 7**

**Objectives** When you complete this module, you should be able to:

- Apply the concepts of Dev ops to meet milestones
- Apply concepts of SE to develop a functioning program
- Explain the relevance of Security in Dev Op/ SE
- Explain the concepts of Dev Ops in a Report

**Readings**

The following articles provide context on the necessity of securing software in the software engineering process. The reading here is a short compilation of readings that provide a brief overview.

Read the following articles:

1) Exploring software security approaches

The authors in this article identifies software engineering security approaches used in SDLC. The authors identify the study as a means to understand the approaches and then modify approaches as necessary to meet the needs of the development process.

2) Tracing known security vulnerabilities

The authors in the article present a study evaluating a model approach to linking information silos and the vulnerabilities. The authors present the new challenges with sharing not only code but the vulnerabilities of the code from software reuse and globalization.

3) Cloud security engineering

The authors in this article provide world case examples of cloud software service development life cycle, processes and vulnerabilities. The authors provide a framework to assist with further development processes.

4) A Development Framework for sc

The authors in this article present a secure development process for software development. Using the need to protect nuclear facilities, the authors present a framework in understanding regulatory requirements and applying them to the development process.

**Assignments**

| Items to be Completed: | Due No Later Than: |
|---|---|
| Post an initial response to the discussion question | Thursday 11:59 PM EST/EDT |
| Post responses to at least one classmates | Sunday 11:59 PM EST/EDT |
| Final Project Submission 1 - Project | Sunday 11:59 PM EST/EDT |

**Module 8**

**Objectives** When you complete this module, you should be able to:

- Apply the concepts of Dev ops that leads to the development of a functioning program to meet milestones
- Describe the concepts of Dev Ops and apply lessons learned in an official report

**Readings**

1) https://aws.amazon.com/devops/what-is-devops/

Read the above AWS documentation on DevOps: The AWS article provides a background of what DevOps is and adoption concepts.

2) Look at the following summary from Wikipedia: https://en.wikipedia.org/wiki/DevOps

3) Continuous Integration, Delivery.

Read the above article: This article provides an overview of continuous development, continuous integration in software development.

4) Developing in the Cloud

Read the above article: The authors in this article present an evaluation of DevOps by identifying the tools of the trade in cloud development.

5) DevOps

Read the above article: The authors in this article present an overview of DevOps used in software development today.

**Assignments**

| Items to be Completed: | Due No Later Than: |
|---|---|
| Post an initial response to the discussion question | Thursday 11:59 PM EST/EDT |
| Post responses to at least one classmates | Sunday 11:59 PM EST/EDT |
| Final Project Submission 2 - Presentation | Sunday 11:59 PM EST/EDT |
| Final Project Submission 3 - Report | Sunday 11:59 PM EST/EDT |