CEN 4801 / 5805 - Systems Integration (3 Semester Credits)

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Course description
This course studies the process of integrating different systems and software applications by examining current and emerging trends, strategies, and techniques for developing systems integration solutions effectively. Example topics covered include, but are not limited to: documenting integration requirements using business process models, designing integration solutions reusing patterns, and implementing integration solutions using service oriented architecture. Students will extend course topics via library assignments, programming assignments, tool evaluation assignments, and other assigned activities.

Prerequisites for CEN 4801
COP 4813 - Internet Programming (or) CIS 4327 - Information Systems Senior Project I (or)
CGS 4308 - Information Processing: Requirements Identification and Specification

Prerequisites for CEN 5805
COP 5819 - Internet Programming (or) CEN 6016 - Engineering of Software I

Learning outcomes
On successful completion of this course, students should be able to:
- Explain key challenges, concepts, drivers, and strategies related to systems integration projects
- Explain and apply organizational and managerial issues related to systems integration projects
- Explain and apply key systems integration architecture, methodologies, and technologies
- Identify and assess current and emerging systems integration tools
- Define and analyze systems integration requirements using business process models
- Design feasible solutions for an integration problem that utilizes proven design solutions described in integration patterns
- Apply advanced integration technologies to implement system integration solutions
- Prepare a research paper and deliver professional presentation on fundamental concepts studied in the course

Method of Teaching:
Lecture, in-class activities, group projects, and presentations

Reference books:
There is no prescribed textbook for this course. However, listed books are good reference materials for different topics that will be covered in this course.

1. Enterprise Systems for Management (2nd Edition)

Author: Luvai Motiwalla and Jeffrey Thompson
Publisher: Prentice Hall
ISBN-13: 9780132145763

2. Concepts in Enterprise Resource Planning (1st Edition)
Author: Bret Wagner and Ellen
Publisher: Cengage Learning
ISBN-13: 9781423901792

3. Next Generation Application Integration: From Simple Information to Web Services (1st Edition)
Author: David S. Linthicum
Publisher: Addison-Wesley Professional
ISBN-13: 9780201844566

4. Enterprise Integration: The Essential Guide to Integration Solutions (1st Edition)
Author: Beth Gold-Bernstein and William Ruh
Publisher: Addison-Wesley Professional
ISBN-13: 9780321223906

5. Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions (1st Edition)
Author: Gregor Hohpe and Bobby Woolf
Publisher: Addison-Wesley Professional
ISBN-13: 9780321200686

6. Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services (1st Edition)
Author: Thomas Erl
Publisher: Prentice Hall
ISBN-13: 9780131428980

Deliverables
As part of this course, CEN 4801 students will work on first two projects only and CEN 5805 students will work on all three projects.

Project 1: Evaluation of Open Source Enterprise Resource Planning (ERP) Systems
The goal of this project is to teach students an important set of skills - how to install, learn, and evaluate new technologies. This goal is achieved through a set of assignments wherein students will critique the effectiveness open source Enterprise Resource Planning (ERP) Systems. This project is divided into a set of four assignments:

First Assignment
*   Install the selected ERP system and get the software to work
*   Describe the ERP system, its source, supported modules & sub-functionalities, target audience, cost, unique features, etc.

This is not intended to be a reproduction of the feature list or product brochure. Instead, you should identify the most relevant, distinguishing or otherwise important features.

Second assignment
- Analyze the ERP system's effectiveness using demo example provided by the ERP system producers.
- Complete evaluation report using criteria provided by the Instructor

Third assignment
- Analyze the ERP system's effectiveness by implementing a complex business process provided by the Instructor.
- Complete evaluation report using criteria provided by the Instructor

Fourth assignment
- Write a report documenting your experiences with installing and using the ERP system (including demo and complex business process).
- Present features the ERP system
- Provide a recommendation on whether the software should or should not be used in educational setting as means to teach ERP systems. Substantiate your recommendation.
- Provide a recommendation on whether the software should or should not be used in organizational setting as means to run business. Substantiate your recommendation.

Select one of the following Open Source ERP systems for project 1:
If you choose to evaluate any other ERP system, please talk to Instructor.

1. ADempiere
http://www.adempiere.com/ADempiere_ERP
Download the latest release:
http://sourceforge.net/projects/adempiere/files/ADempiere%20Official%20Release/
Installation instructions (Manually):
http://www.adempiere.com/Installing_ADempiere_Manually
Reproduce the Libero Manufacturing example:
http://www.adempiere.com/A_Step_by_Step_Guide_to_Libero_Manufacturing

2. BlueERP
http://open.mitija.com/blueerp/home
Download the latest release:
http://open.mitija.com/blueerp/download
Installation instructions:
http://open.mitija.com/blueerp/install
Reproduce the demo example:
http://dev.mitija.com/blueerp/index.php?menuaction=addressbook.addressbook_ui.index

3. Compiere ERP
http://www.compiere.com/products/open-source/index.php
Download the latest release:

http://www.compiere.com/products/download/index.php
Installation instructions:
http://www.compiere.com/support/installation.php
Reproduce Compiere Manufacturing and MRP demos:
www.compiere.com/resources/product-demos/index.php

4. Dolibarr ERP
http://wiki.dolibarr.org/index.php/Main_Page
Download the latest release:
http://sourceforge.net/projects/dolibarr/files/
Installation instructions:
http://wiki.dolibarr.org/index.php/Installation_-_Upgrade
Reproduce the Module Customers Invoices demo example:
http://wiki.dolibarr.org/index.php/Module_Customers_Invoices

5. ERP5
http://www.erp5.org/
Download the latest release:
http://svn.erp5.org/erp5/
Installation instructions:
http://www.erp5.com/download
Reproduce the ERP5 CRM (Customer Relationship Management) example:
http://www.erp5.com/documentation/user

6. FrontAccounting
http://frontaccounting.com/wb3/
Download the latest release:
http://sourceforge.net/projects/frontaccounting/
Installation instructions:
http://frontaccounting.com/wb3/pages/download/installation-guide.php
Reproduce the Sales demo example:
http://frontaccounting.com/fawiki/index.php?n=Help.Sales

7. webERP
http://www.weberp.org/HomePage
Download the latest release:
http://sourceforge.net/projects/web-erp/
Installation instructions:
http://web-erp.svn.sourceforge.net/viewvc/web-erp/trunk/doc/INSTALL.txt?revision=4516
http://www.weberp.org/weberp/doc/Manual/ManualContents.php?ViewTopic=GettingStarted
Reproduce the demo example:
http://www.weberp.org/weberp/doc/Manual/ManualContents.php?ViewTopic=CreatingNewSystem

8. JFire
http://www.jfire.net/home

Download the latest release:
http://www.jfire.net/download
Installation instructions:
https://www.jfire.org/modules/phpwiki/index.php/Installation
Reproduce the Invoice booking process example:
https://www.jfire.org/modules/phpwiki/index.php/Invoice%20booking%20process

9. Apache OFBiz
http://ofbiz.apache.org/
Download the latest release:
http://ofbiz.apache.org/download.html
Installation instructions:
https://cwiki.apache.org/OFBADMIN/demo-and-test-setup-guide.html
Reproduce the demo example:
https://cwiki.apache.org/OFBIZ/ofbiz-tutorial-a-beginners-development-guide.html

10. Openbravo
http://www.openbravo.com/
Download the latest release:
http://www.openbravo.com/downloads/files/
Installation instructions:
http://wiki.openbravo.com/wiki/Installation
Reproduce the demo example:
http://wiki.openbravo.com/wiki/Quick_Guide

11. OpenERP
http://www.openerp.com/
Download the latest release:
http://www.openerp.com/downloads
Installation instructions:
http://doc.openerp.com/v6.0/install/index.html#installation-link
Reproduce the demo example:
http://doc.openerp.com/v6.0/book/1/1_3_Real_Case/1_3_Real_Case_use_case.html

12. Opentabs
http://www.opentaps.org/
Download the latest release:
http://sourceforge.net/projects/opentaps/
Installation instructions:
http://www.opentaps.org/docs/index.php/Opentaps_Installation_Manual
Reproduce the Customer Management Processing Power example:
http://www.opentaps.org/docs/index.php/Opentaps_Users_Manual#Using_Customer_Management_Processing_Power

13. xTuple PostBooks
http://www.xtuple.com/postbooks

Download the latest release:
http://sourceforge.net/projects/postbooks/
Installation instructions:
http://www.xtuple.org/docs/admin-and-setup
Reproduce the Quote-to-Cash and Project Tracking example:
http://www.xtuple.org/sites/default/files/prodguide/Service-HTML/index.html

14. LedgerSMB
http://ledgersmb.org/
Download the latest release:
http://ledgersmb.org/download
Installation instructions:
http://ledgersmb.org/help/install
Reproduce the Quotations and Order Management example (see section 11):
http://ledger-smb.svn.sourceforge.net/viewvc/ledger-smb/trunk/doc/LedgerSMB-manual.pdf

15. SQL-Ledger
http://www.sql-ledger.com/
Download the latest release:
http://www.sql-ledger.com/cgi-bin/nav.pl?page=source/index.html&title=Download
Installation instructions:
http://www.sql-ledger.com/cgi-bin/nav.pl?page=source/windows/sql-ledger-windows-howto.html
Reproduce the demo example:
http://www.sql-ledger.com/misc/samplechapter.pdf

Project 2: Service-oriented Systems Integration Design Solutions
For this project, students are required to identify a particular systems integration problem and design a service-oriented solution to address the problem. This project is divided into a set of three assignments:

First Assignment
Provide detailed description of systems integration problem for a specific organization. Integration problem and organization can be real or fictitious. The integration problem should be complex enough to warrant utilization of advanced service integration technologies. The problem must involve more than three applications and five interactions among them. Here are some integration problem examples from Enterprise Integration Patterns book:
http://eaipatterns.com/SystemManagementExample.html
http://eaipatterns.com/BondTradingCaseStudy.html
http://eaipatterns.com/Chapter1.html (see Widget-Gadget Corp example)

Second assignment
Provide preliminary analysis and design for the identified systems integration problem. This preliminary solution should contain a conceptual service-oriented architecture design, depicting different service components along with existing applications/systems and interactions among these components. Provide detailed description for each component and interaction. For

example, provide details on the application modules involved within a service component and existing application/system; whether a service component is atomic service or composed services; details of messages and documents exchanged between components; application programing interface details; data exchange format details; user interface details; service client interface details; and utilization of protocols and standards. Provide example scenarios and use cases to demonstrate the actual usage of your solution.

Third assignment
Provide detailed design solution and implementation plan for the identified systems integration problem. Discuss assumptions made to analyze the problem and design the solution. Justify your assumptions, design decisions, and solutions adopted. Justify why you made such decisions and why they make sense. Provide detailed plan to implement designed solution along with details of service-oriented frameworks, platforms, servers, orchestration engines, etc. Discuss the feasibility of the implementation plan. Provide recommended products that will be used for the implementation. Provide comparative feature set evaluation of similar products to justify your selection. Discuss shortcomings of the solution developed and how it could be improved.

Project 3: Research Paper
Write a research paper on a topic relevant to systems integration and web service technology. Research paper should provide detailed review of literature and state of art report of the topic. Research paper should demonstrate student's deeper understanding of the topic. Research paper should contain logical and factual statements supported by valid arguments and references.

Following are the expected deliverables:
- Research paper topic and one paragraph overview description of the topic
- Two-page detailed overview of the topic
- Detailed literature review
- Complete research paper and presentation

Method of Evaluation:

Method of Evaluation	CEN 4801 Assessment	CEN 5805 Assessment
Project 1 – Assignment 1	10%	5%
Project 1 – Assignment 2	10%	5%
Project 1 – Assignment 3	10%	5%
Project 1 – Assignment 4	5%	5%
Project 1 Presentation	5%	5%
Project 2 – Assignment 1	10%	5%
Project 2 – Assignment 2	10%	5%
Project 2 – Assignment 3	15%	5%
Project 2 Presentation	5%	5%
Research Paper		30%
Research Paper Presentation		5%
In-Class Assignments	10%	10%
Class Participation	10%	10%

Letter grades will be based on:
94 – 100   = A
90 – 93.99 = A-
87 – 89.99 = B+
84 – 86.99 = B
80 – 83.99 = B-
77 – 79.99 = C+
70 – 76.99 = C
60 – 69.99 = D
less than 60=F

The penalty for cheating or plagiarizing on assignments will be F grade in the course. Work which is similar beyond coincidence will automatically be considered cheating by all parties.

Class participation and In-Class Assignments:
Regular class attendance and participation in the in-class activities are a necessity to excel in this class. Students are expected to maintain good student standing by regularly attending the class (more than 90% of the scheduled class) and participating in the different topic discussions. If a student cannot attend a class, please inform your team mates and instructor.

Class attendance will be taken on random basis and will be utilized for calculating the in-class assignments and class participation points. You will lose most of the in-class assignments and class participation credits if you do not maintain good student standing.

Late Assignments:
There will be a penalty of 10 % per day for late submission of assignments & project deliverables (including weekends and holidays).

Academic dishonesty:
No type of academic dishonesty will be tolerated. If you are caught cheating or plagiarizing on the assignments, the punishment will be the most severe penalty allowed by the university policy. The policy on academic integrity and misuse of computer equipment and computer accounts found at http://www.unf.edu/ccec/computing/Policies___Guidelines.aspx applies to this course.

School of Computing Student Symposium
CEN 4801 and CEN 5805 students are expected to attend the School of Computing Student Symposium. Final project presentations will be held as part of the student symposium.

Other remarks:
- A grade of incomplete will not be given except for catastrophic illness or calamity.
- All university rules regarding classroom behavior and attendance apply.
- If a student misses a class, the student is still responsible for the material that is covered and for completing any assignments by the due date that may have been handed out by the professor in class.

Course Topics

It is expected that the student will read the chapter assigned prior to the class meetings and will have questions for the instructor on any topics the student is not sure of, or does not understand. The student is responsible for all topics presented in the text regardless of their coverage. In addition, the students will be responsible for all lecture material that is not included in the text.

Please note that below listing of chapters does not mean that all text in those chapters would be covered in this course. Only that material that very closely pertains to course would be covered. Throughout the course, Instructor would provide other supplementary materials to provide targeted guidance to team project deliverables.

Week	Topics	Chapters	
1	Introduction and syllabus		
2	Overview of Systems Integration: challenges and drivers	TB1 – Chapters 1 and 2	
3	Types of systems integration	TB2 – Chapters 1 to 5; TB3 – Chapter 10 to 13	Project 3 – Research paper topic
4	Systems integration technologies	TB3 – Chapters 4 to 9; TB2 – Chapters 6 to 10	Project 1 – First Assignment
5	Enterprise Resource Planning Systems and business process models	TB4 – Chapters 3 to 6	
6	Integration methodologies	TB2 – Chapter 18	Project 1 – Second Assignment Project 3 – 2 page overview
7	Designing systems integration solutions and Enterprise integration patterns	TB5 – Chapter 1	
8	XML and Application Integration	TB2 – Chapter 11; TB6 – Chapter 2	Project 1 – Third Assignment
9	Systems integration tools assessment presentations		Project 1 – Fourth Assignment
10	Service-oriented Architecture and Web Services	TB6 – Chapter 3	Project 3 – Detailed literature review
11	Spring Break		
12	Advanced Web Services technologies	TB6 – Chapter 4	Project 2 – First Assignment
13	Integrating Web Services into Applications	TB 6 – Chapter 6	
14	Selecting Commercial-off-the-shelf Products	TB1 – Chapter 6	Project 2 – Second Assignment
15	Project Presentations		

Week	Topics	Chapters	
16	Project Presentations		Project 2 – Third Assignment Project 3 – Research paper

Please Note
Instructor reserves the right to modify course to meet the student's needs.
Legends
TB1 – Enterprise Systems for Management
TB2 – Next Generation Application Integration: From Simple Information to Web Services
TB3 – Enterprise Integration: The Essential Guide to Integration Solutions
TB4 – Concepts in Enterprise Resource Planning
TB5 – Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions
TB6 – Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services

Students with Disabilities
Students with disabilities who seek reasonable accommodations in the classroom or other aspects of performing their coursework must first register with the UNF Disability Resource Center (DRC) located in Building 57, Room 1500. DRC staff members work with students to obtain required documentation of disability and to identify appropriate accommodations as required by applicable disability laws including the Americans with Disabilities Act (ADA). After receiving all necessary documentation, the DRC staff determines whether a student qualifies for services with the DRC and if so, the accommodations the student requires will be provided. DRC staff then prepares a letter for the student to provide faculty advising them of approved accommodations. For further information, contact the DRC by phone (904) 620-2769, e-mail drcexams@unf.edu, or visit the DRC website www.unf.edu/drc

Military and veteran students may need both physical and academic accommodations and may contact the DRC to find further information. Military and veteran students who return from combat exposure may be utilizing the post 9/11 GI bill to continue postsecondary education goals. Contact Military and Veterans Resource Center by phone (904) 620-2655 or e-mail mvrc@unf.edu

Satisfactory Progress Policy
The School of Computing enforces the "one repeat" rule for all prerequisite and core courses offered by the School for its major programs. Students who do not successfully complete a prerequisite or core requirement for a School of Computing course on the first attempt (i.e., earn a grade of D, F, W, WP or WF) will be granted one chance to repeat the course. Students who do not successfully complete a prerequisite or core requirement within two attempts will not be permitted to register for courses offered by the School in future semesters. This stipulation applies whether or not the student has declared a major in a School of Computing program.
http://www.unf.edu/ccec/computing/PoliciesGuidelines/Satisfactory_Progress_Policy.aspx

Community-Based Transformational Learning
Community-Based Transformational Learning is about providing students with first-hand experiences that take them outside the walls of the classroom and into the community. By engaging in these activities, UNF students learn how to translate theory into practice, strengthen their sense of civic and ethical responsibility, and gain from professional and career development opportunities. In many cases, these experiences transform the lives of students. (http://www.unf.edu/ccbl/What_is_Community-Based_Transformational_Learning.aspx)