CIS 4140E

Implementing IT-Facilitated Business Processes

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Proposed Catalog Description

Implementing IT-Facilitated Business Processes. The three objectives of this course are: to enable students to implement a business process directly from a business process model using professional business process management software suite (BPMS); to develop and deploy the associated process interfaces with users, data stores and application software (where required); and to develop the knowledge and skills necessary to initially implement, then continuously evaluate, manage and improve the resulting process via the process model.

Course Description

This course continues the theme of business process management systems initiated with CIS 4120. CIS 4120 takes up the challenge of developing "as-is" and "to-be" models of a business process using open-standard business process modeling notation (BPMN), business rule specifications and form interaction, as well as the skills necessary to develop these models. This course focuses on the implementation of such models, both conceptually as well as practically, using a professional software platform capable of executing and monitoring the resulting business process model. Using the process intelligence derived from the executing process, techniques for developing the next iteration of improvement of the process are addressed.

To accomplish the first objective – implementation of a business process model, a specific business process modeling suite (BPMS) will be chosen. While there are many candidates for this choice in the market, this course will focus on what are sometimes called "BPMs-lite" platforms that are somewhat easier to initially implement and use, but lack more IT-centric features such as heavy integration with back-end application systems. For purposes of this course description, we'll use Ascentn's AgilePoint software as the software platform. However, there are other candidates with similar features that may be chosen (TIBCO, HandySoft, WebSphere and WebMethods are possible candidates). The student, formed into teams, will select a business process to implement on the chosen platform. The course will provide an overview of how to map standard business process models, as they would have developed in CIS 4120, into the specific process execution platform. The student is expected to read, experiment with, and eventually produce the working execution. Lab sessions will be provided in the course to facilitate this learning.

The second objective, the human- and data-interfaces to the business process will be accomplished in a similar manner to the first objective. Forms design will be adapted and

extended to the platform specific approach of the chosen platform. With Ascentn, for example, this implies the use of InfoPath (for forms design and specification) and SharePoint (as the process user/manager's portal). For data store interaction, web-service interfaces developed using "wizards" are commonly used.

For the third objective, the executing business process will be used to generate operational data from the system. These results will be used to motivate a more in-depth discussion and skill-development related to process simulation to assess alternative designs, and the development of process dashboards for on-going monitoring and process intervention.

Prerequisite: *CIS 4120.*

Course Details

Course	CIS 4140: *Implementing and Evaluating Business Processes* CRN: nnnnn
Semester	Spring 2009
Class Sessions	TBD
Instructor	Dr. Richard J. Welke Office: RCB 423 (4th Floor CBA building) email: rwelke@gsu.edu; phone: (404) 413-7863 Office hours: by appointment – phone, or an Elluminate Live "private meeting session" virtual conference can be set up

Courseware & readings

Readings – Books: As BPM and BPMS are relatively recent areas, there aren't at present, university-style textbooks for courses in this area. For this course we'll reference two professional books:

(WM) White, Stephen A. and Derek Miers, **BPMN Modeling and Reference Guide**, Future Strategies Inc., Lighthouse Pt, FL, 2008, ISBN-13: 978-0977752720

Readings – Reference Guide(s): Again, depending upon the BPMS platform selected, these will change. For AgilePoint they are:

(ASG) Ascentn Corporation, **Administrative Study Guide – AgilePoint BPMS Basic Skills**, Version 1, July, 2008

(APD) Ascentn Corporation, **Process Designer Study Guide – AgilePoint BPMS Basic Skills**, Version 3, July, 2008

(AFO) Ascentn Corporation, **AgilePoint Functional Overview**, July, 2008

(AUG) Ascentn Corporation, **AgilePoint User's Guide**, Version 1.09, July, 2008

This documentation will be provided free-of-charge in PDF format for the selected BPMS platform.

Required readings – Papers and reference materials. These will be made available on the course uLearn (GSU's WebCT/Vista) site in specified folders. This includes supporting user and reference manuals for the software tools we'll use, teaching notes developed by the instructor and articles related to specific topics that are otherwise available via the web, for free, or from GSU's electronic reference library. To the extent possible, they'll be referenced in the course syllabus. However, as additional readings or "new and improved" versions become available, these will be notified by email at your @student.gsu.edu email accounts.

Optional readings – Alternatives to the books above:

Jeston, John and Johan Neli, **Business Process Management, Second Edition: Practical Guidelines to Successful Implementations**, Butterworth-Heinemann; 2 edition (March 7, 2008) ISBN-13: 978-0750686563

(HA) Harmon, Paul, Business Process Change: **A Guide to Business Managers and BPM and Six Sigma Professionals**, Morgan-Kaufman Press, 2007 (Second Edition), ISBN-13: 978-0123741523

Debevoise, Tom and Rick Geneva, **The Microguide to Process Modeling in BPMN**, BookSurge Publishing (July 11, 2008), ISBN-13: 978-1419693106 (also used in CIS 4120)

Software. For the first segment of the course, we'll use the Ascentn's AgilePoint BPMS software suite. We will also continue the use of TIBCO's Business Studio 3 BPMN modeler, as this will provide a transition from the previous course, as well as providing simulation capability we'll use in the third segment of the course. The AgilePoint software will run on a virtual server administered by the CIS department. The plan is to have one such server for each student team. The servers will be available from the classroom as well as remotely. In addition to the AgilePoint platform software, AgilePoint makes use of MS Visio (for process modeling), MS InfoPath for forms specification, and MS SharePoint. The student will be expected to download and install both Visio and InfoPath on their computers. Interactions with the AgilePoint software are via a web browser. As with most professional software, there are a limited number of browsers that can be used. Generally IE7 is supported. The student should have access to a computer that's capable of running IE7, SharePoint, Visio and InfoPath.

Course Learning Objectives

The overall course learning objectives are stated in the course description. More specific learning objectives, related to those three overall objectives are:

1. Successfully deploy and implement a business process on a professional business process management suite (BPMS) software platform.
    a. Be able to map a generic BPMN-notated business process model to the constraints of a specific implementation model
    b. Understand when, where and how to use simple web services to provide extended functionality
    c. Surface and deploy basic business rules processing

2. Design and deploy a useful and usable user and manager interface to the business process.
    a. Further develop and apply user-interface design best practices
    b. Design, extend and deploy user portals for the delivery of business process tasks, content and management
3. Develop the skills necessary to continuously evaluate and improve business processes at both the design/transformational level and the on-going, real-time adaptation of a running process. Do this by knowing how to:
    a. Select relevant event data from a running business process
    b. Develop report, display and alert mechanisms drawn from data available from the BPMS and associate this with methods to adapt the process
    c. Generalize and evaluate broader process design alternatives using discrete-event process simulation models and simulators.
4. Develop a deeper understanding and methods for handling process implementation challenges.

Pedagogical Approach: Problem-based Learning (PBL)

Problem based learning gives you opportunities to examine and try out what you already know; discover what you need to learn; develop your people skills for achieving higher performance in teams; improve your writing and speaking abilities, to state and defend with sound arguments and evidence your own ideas; and to become more flexible in your approach to problems that surprise and dismay others. Despite the work and effort it requires, PBL is never dull and can be fun.

Instead of instructors giving answers and then testing to see if students have memorized them they present problems to tackle before teaching begins. Beginning with a problem puts students in the driver's seat. They can use and explore what they already know, their hunches, and their wildest ideas to try for a solution. In the process they can develop an inventory of what they know and what they need to know. Once students get a sense of what they need to know they can set off to question instructors or classmates, plunder the library, surf the net, or seek out experts to satisfy their curiosity.

In PBL, the student isn't expected to simply memorize knowledge. They are expected to apply knowledge to real situations. This shows that they have an understanding of what is being taught, instead of just the ability to restate facts. So before students learn new information, instructors present them with a problem. They select and pose the problem so students will discover that they need to learn new knowledge and skills. Often this involves failures as students discover that what they already know won't work. It involves a lot of talking – stating ideas, defending propositions, and criticizing. Students have to unlearn to acquire new knowledge so they can solve the problem.

PBL is team based. Most of the work on problems and projects is done in teams of three to six students. This requires instructors to design problem scenarios that raise the bar for thinking and searching. It also requires students to become effective managers of time, projects and meetings. Both requirements demand creative efforts to succeed. Research shows team-based PBL to be effective but also fraught with unintended outcomes such as slacking, pressure on

ambitious students to do all the work, and divided work so no new learning has to be done. Both students and instructors need to be diligent in spotting and correcting such failures.

A more complete discussion of PBL, extracted from Penn State University's School of Information Science and Technology web site (http://pbl.ist.psu.edu/pbl) is provided as an appendix to this syllabus.

Our adaptation of PBL to CIS 4140

In this course we'll conduct the class sessions in three phases. The first phase of approximately forty-five minutes will be devoted to the previously assigned at-home exercise or activity that you will have individually completed. During this period you will share your results with your team, arrive at a "team solution" and be prepared to present this to the rest of the class. During the end of this phase, several teams will be called upon to present their results and the other teams are expected to critique this work.

The second phase will be an in-class, instructor-led presentation/discussion regarding the topic of the session. This will vary from a formal lecture/presentation to an interactive discussion of the topic.

The third and final phase of the session will be given over to an in-class exercise that the students are to complete, as a team and be prepared to present their solutions to the remainder of the class. Normally, this in-class exercise will be a simple version of the assigned "at-home" individual assignment, that in turn leads off the next session's reconciliation and discussion (see above phase one). Breaks of five to ten minutes will be provided between each phase.

During what are designated as "lab sessions," the entire session will generally be devoted to working through an in-class exercise, using the software of the course. This may involve replicating an instructor-led version of the exercise first, then a variant done by the student teams using their virtual server.

Guest lecturers and instructors

If I am absent for one or two sessions of our class. a "professor-in-training" Tim Olsen, a Ph.D. student doing research in both the business process space as well as the PBL space, take my place for these sessions.

In addition, I expect to enlist one or more "real-world" guest speakers for the course. The timing and topic will of course depend upon who they are and their availability.

Project & Exams

Course Project (Group of Three). The learning objectives of this course are best (and perhaps only) met by applying it to a real-world situation. Groups are to be formed by the end of the second class session. There will be two kinds of project contexts possible. The first is to draw from one of the project groups members a real-world application from their own company setting. The second is to examine a business process that exists within the College of Business. For the latter, several such possibilities will be developed and contact persons identified by the third week of the course. In either case it is the project group's responsibility to scope the

collaborative process and determine the best approach (BPMS or HIM) to take to the process after first understanding and modelling the process, and determining its problems, shortcomings and opportunities for improvement.

There will be **two exams** in the course; a mid-term exam and a final exam. The mid-term will cover concepts related to BPMS; the final will cover BPMS concepts as well as specifics related to your implementation experiences. The nature of these exams will depend upon our collective experiences with the concepts and software, and how well we progress.

Class Schedule

The following scheduled list of topics **is subject to change.** The assigned reading material for each session is available from the study.net course website. Please refer to the previous section for the cross-reference of the codes used below in the readings, to the fuller description of them.

Wk	Dates	Topic	Outcome	Events and Assignments	Basic Readings (to be read prior to the session associated with the row in which they appear)
1	Jan.	Course Overview	• Understand course objectives and expectations • Rules and conditions for individual work and team formation	• Initial group selection	1. Review of BPMN (Debeboise, Briol or Miers)
2	Jan.	BPM modeling	• Review of CIS 4120 process models & related • Introduction to course BPMS platform	• Convert Employee-Onboarding basic scenario provided to BPMN (review)	1. AFO (all)
3	Jan.	AgilePoint process modeling	• BPMS process modeling & modeler • Mapping to the platform process modeler	• Install AgilePoint Envision (MS-Visio extension) and develop basic model	1. APD (pp. 1-38)
4	Feb.	AgilePoint implementation	• Developing a first model implementation	• Convert previous On-Boarding BPMN to AgilePoint Envision model	1.
5	Feb.	Implementation lab #1	• Understand how process models are executed in AgilePoint	• Implement basic business process in AgilePoint	1. APD (pp. 1-41)
6	Feb.	Overview of web services and their use in BPM	• Understand and use basic web services	• Define web service for On-Boarding example	1. WS reading; DB as Web Services reading
7	Feb.	Web services implementation lab	• Formulate a web service for DB access/update		1. AUG (pp. 128-158)
	Mar.				

8	Mar.	Forms and the user interface	• Examining the AgilePoint capabilities related to user interactions – InfoPath and forms handling	• Install and familiarize with Microsoft InfoPath • Implement InfoPath form in AgilePoint	1. Forms design reading 2. MS-InfoPath usage 3. APD (pp. 41-65)
9	Mar.	Forms and the user interface #2	• Create an AgilePoint form from InfoPath and expose it to the user	• Define forms-based human-interactions for on-boarding scenario	1. MS-InfoPath usage 2. AUG (pp. 219-225)
10	Mar.	Outlook, SharePoint Portal interaction points	• Embedding business process actions and functionality in Outlook and SharePoint portals	• Define SharePoint object for interaction • Create SharePoint form library	1. MS-SharePoint usage 2. AUG (pp. 161-207)
11	Apr.	Implementation Lab #1	•	• Create operational "as-is"	1. ASG, AUG (selected sections)
12	Apr.	Implementation Lab #2	• Operational SharePoint user(s) interface	• Develop and implement first-cut "to-be"	1. ASG, AUG (selected sections)
13	Apr.	Simulating business processes #1	• Using process models as simulation platforms	•	1. Readings will vary depending upon simulation platform used (IBM, TIBCO)
14	Apr.	Simulating business processes #2	• Evaluating as-is and to-be process alternatives using simulation	•	1. Readings will vary depending upon simulation platform used (IBM, TIBCO)
15	Apr.	Presentations	• Project presentations	• Project **Reports** are due to me by Tuesday, May nn; 12:00 noon EST	
FE	May	Final Exam	• Time/place as determined by registrars schedule		

Course Session layout

The course will be conducted in the spirit of a combined seminar, lecture and lab. Each of the main topics will be introduced with an overview lecture. After that, we will move to a more interactive format in which each student is expected to contribute and participate in terms of questions, comments, critique, issues raised and problems solved, etc. As the course makes use of several pieces of software time will be spent discussing its use and student's problems with and ways to solve the problems. From time-to-time I will ask external professionals to contribute to the course, either physically or virtually (web conferencing).

Grading

The final grade will be based on the following components and their weights:

Component	**Weight**
In-class PBL assignments	15 %
Graded at-home assignments	20 %
Project presentation	20%
Written project report	20 %
Concepts review exam (mid-term)	15%
Concepts review exam (final)	10 %
Total	***100%***

The course grading, as required by the College will be on a +/- grading system. The final grade is determined by computing your total weighted score out of 100, rounding off to the nearest integer value. The final grade will be determined by computing your total weighted score out of 100, rounding off to the nearest integer value.

The percentage grade will be converted to a letter grade where a percent grade is assigned, as follows:

Letter grade	Nominal value	Range conversion	Meaning
A	95	93-100	Excellent; hard to improve upon
A-	91	90-92	Very professional
B+	88	87-89	Above normal professional expectations
B	85	83-86	Expected professional performance
B-	81	80-82	Slightly below what would be professionally expected
C+	78	77-79	A significant flaw or multiple minor flaws, but generally acceptable
C	75	73-76	One or more significant flaws that would require professional rework
C-	71	70-72	Both significant and minor flaws that border on unacceptable professional work
D	65	60's	Unacceptable as it stands but possibly salvageable with work
F	0	< 60	Reject; well below minimal expectations

Student Behavior

Behavior in class should be professional at all times. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to learning will not be tolerated and may be referred to the Office of the Dean of Students for disciplinary action.

Discrimination and Harassment

Discrimination and/or harassment will not be tolerated in the classroom. In most cases, discrimination and/or harassment violates Federal and State laws and/or University Policies and Regulations. Intentional discrimination and/or harassment will be referred to the Affirmative Action Office and dealt with in accordance with the appropriate rules and regulations.

Unintentional discrimination and/or harassment is just as damaging to the offended party. But, it usually results from people not understanding the impact of their remarks or actions on others, or insensitivity to the feelings of others. We must all strive to work together to create a positive learning environment. This means that each individual should be sensitive to the feelings of others, and tolerant of the remarks and actions of others. If you find the remarks and actions of another individual to be offensive, please bring it to their attention. If you believe those remarks and actions constitute intentional discrimination and/or harassment, please bring it to my attention.

University Policy on Disabilities

GSU provides accessibility and reasonable accommodations for persons with disabilities. Students with disabilities are responsible for contacting the Office of Disability Services to assess their needs. Students must identify themselves and their needs to the professor no later than the first day of class.

Official CIS Department Class Policies

1. Prerequisites are strictly enforced. Students failing to complete any of the prerequisites with a grade of "C" or higher will be administratively withdrawn from this course with *loss of tuition fees*. **There are no exceptions, except as granted by the instructor with the approval of the department.**
2. Students are expected to attend all classes and group meetings, except when precluded by emergencies, religious holidays, or bona fide extenuating circumstances.
3. Students who, for non-academic reasons beyond their control, are unable to meet the full requirements of the course should notify the instructor, by email, as soon as this is known and prior to the class meeting.
4. A "W" grade will be assigned if a student withdraws before mid-semester if (and only if) he/she has maintained a passing grade up to the point of withdrawal. Withdrawals after the mid-semester date will result in a grade of "WF". See the GSU catalog or registrar's office for details.
5. Spirited class participation is encouraged and informed discussion in class is expected. This requires completing readings and assignments **before** class.

6. All exams and individual assignments are to be completed by the student alone with **no** help from any other person.
7. Collaboration within groups is encouraged ***for project work***. However, collaboration between project groups will be considered cheating.
8. Copying work from the Internet without a proper reference is considered plagiarism and subject to disciplinary action as delineated in the GSU Student Handbook.
9. Any non-authorized collaboration will be considered cheating and the student(s) involved will have an Academic Dishonesty charge completed by the instructor and placed on file in the Dean's office and the CIS Department. All instructors regardless of the type of assignment will apply this Academic Dishonesty policy equally to all students. See excerpt from the Student Handbook below on **Academic Honesty**:

   (Abstracted from GSU's *Student Handbook* Student Code of Conduct "Policy on Academic Honesty and Procedures for Resolving Matters of Academic Honesty" - http://www.gsu.edu/~wwwreg/ugcat2000/academic/honesty.htm)

   As members of the academic community, students are expected to recognize and uphold standards of intellectual and academic integrity. The University assumes as a basic and minimum standard of conduct in academic matters that students be honest and that they submit for credit only the products of their own efforts. Both the ideals of scholarship and the need for fairness require that all dishonest work be rejected as a basis for academic credit. They also require that students refrain from any and all forms of dishonorable or unethical conduct related to their academic work.

   Students are expected to discuss with faculty the expectations regarding course assignments and standards of conduct. Here are some examples and definitions that clarify the standards by which academic honesty and academically honorable conduct are judged at GSU.

   Plagiarism. Plagiarism is presenting another person's work as one's own. Plagiarism includes any paraphrasing or summarizing of the works of another person without acknowledgment, including the submitting of another student's work as one's own. Plagiarism frequently involves a failure to acknowledge in the text, notes, or footnotes the quotation of the paragraphs, sentences, or even a few phrases written or spoken by someone else. The submission of research or completed papers or projects by someone else is plagiarism, as is the unacknowledged use of research sources gathered by someone else when that use is specifically forbidden by the faculty member. Failure to indicate the extent and nature of one's reliance on other sources is also a form of plagiarism. Any work, in whole or part, taken from the Internet or other computer based resource without properly referencing the source (for example, the URL) is considered plagiarism. A complete reference is required in order that all parties may locate and view the original source. Finally, there may be forms of plagiarism that are unique to an individual discipline or course, examples of which should be provided in advance by the faculty member. The student is responsible for understanding the legitimate use of sources, the appropriate ways of acknowledging academic, scholarly or creative indebtedness, and the consequences of violating this responsibility.

   Cheating on Examinations. Cheating on examinations involves giving or receiving unauthorized help before, during, or after an examination. Examples of unauthorized help include the use of notes, texts, or "crib sheets" during an examination (unless specifically approved by the faculty member), or sharing information with another student during an examination (unless specifically approved by the faculty member). Other examples include intentionally allowing another student to view one's own examination and collaboration before or after an examination if such collaboration is specifically forbidden by the faculty member.

   Unauthorized Collaboration. Submission for academic credit of a work product, or a part thereof, represented as its being one's own effort, which has been developed in substantial collaboration with another person or source or with a computer-based resource is a violation of academic honesty. It is also a violation of academic honesty knowingly to provide such assistance. Collaborative work specifically authorized by a faculty member is allowed.

   Falsification. It is a violation of academic honesty to misrepresent material or fabricate information in an academic exercise, assignment or proceeding (e.g., false or misleading citation of sources, the falsification of the results of experiments or of computer data, false or misleading information in an academic context in order to gain an unfair advantage).

Multiple Submissions. It is a violation of academic honesty to submit substantial portions of the same work for credit more than once without the explicit consent of the faculty member(s) to whom the material is submitted for additional credit. In cases in which there is a natural development of research or knowledge in a sequence of courses, use of prior work may be desirable, even required; however the student is responsible for indicating in writing, as a part of such use, that the current work submitted for credit is cumulative in nature.

CIS 4140 Class Policies

Student Email Accounts and Use

The class instructor makes significant use of email in his communication with students. All email will be addressed to your @student.gsu.edu account. **It is your responsibility to ensure that if you forward this email to another address that this forwarding works and accepts email from the GSU account on an on-going basis.** This is not only the class policy but the University policy as well.

Classroom Attendance

To buttress the (CIS) departmental policy that attendance is generally expected at all classes, class participation grades will be significantly reduced for *unexcused* absences. Furthermore, students are responsible for receiving all administrative and course announcements given in class—in person or by proxy. If you do not expect to attend a session, please email the instructor along with the reason for your absence.

Class Contribution

Individual contributions to class sessions are *very* important and will be evaluated as a component of the course grade (participation). This component will be based upon your questions asked and answers, discussion of in-class topics, assignments and on-going group project discussions.

Project

Students will contribute one (group) practical project during the course and several group project assignments. The guidelines for the project will be provided in a separate ***CIS 4140 Student Project Handbook*** (download from uLearn).

Instructor Expectations

Expectations Regarding Attendance and Participation

Since this is an advanced course with materials assembled from multiple sources, regular attendance and participation is required as the class interactions will form a significant part of the course learning experience. In evaluating your class participation in discussions, both the quantity and quality of participation will be taken into account.

Absences will count against your participation score for the course. Students are therefore expected to attend all classes, except when precluded by emergencies, religious holidays, or other extenuating circumstances. If you will be absent from class for any reason, please notify me in advance if possible.

It is reasonable to expect an on-time start for each course session (we're not Delta). This is true in our professional lives and should be true for this class. Classes will begin on time. Material

missed due to late arrival should be acquired from classmates or project team members. Exams or other required presentations missed due to late arrival will be graded an F (zero).

Simply showing up for class, important as it may be, **is not** to be equated with participation. Students should make an effort to contribute to *each and every* class. Before coming to class, thorough preparation in terms of readings and assigned problems is essential. Further, students should expect to be *cold called* throughout the course and should prepare accordingly. As a general guideline, the quality of a contribution will be assessed on the following criteria:

Things viewed positively in evaluating participation include:

- Does the contribution represent a solid analysis and some insight into the case or is it just a reiteration of case facts?
- Does the contribution demonstrate an ability to listen to and build from what others have said?
- Does the contribution demonstrate useful ideas, coherently and succinctly expressed
- Does the contributor regard, respect and acknowledge other's contributions If the contributor disagrees with other's positions or analysis does s/he offer constructive disagreement
- Does the contributor demonstrate a good sense of humor'
- Does the contribution move the discussion to an important area or does it just rephrase what has already been said?
- If "cold called," was the student prepared?

Things viewed negatively in evaluating participation include:

- Lack of involvement - silence, detachment or disinterest
- Leading the discussion into unrelated topics
- Spending undue amount of time on minor points
- Long, rambling comments
- Commenting with "authority" but lacking the underlying knowledge to do so
- Being unprepared, or passing on a cold call

I will keep notes regarding each student's participation in class. I will give an indication of how you are doing in this regard at several points during the course.

Expectations for Written Assignments and Presentations

I expect professional looking documents which give proper credit to all sources of intellectual material. Deliverable documents must be:

- Typed, (word processed) spell checked and paginated, with suitable. The norm for layout is 1-1/2 line spacing, 11 pt. New Times Roman (or equivalent) font, with at least ¾" borders on all edges. For longer documents, a header and footer should be used and include the submitters, the date of submission and the page number.
- Have a cover page that clearly indicates the assignment and the name(s) of the submitter(s).

- All citations must be identified in the text (in short form) and in an attached bibliography. Use any standard format as long as it is used consistently.
    - See the Turabian Manual of Style, Chicago Manual of Style, Harvard Manual or other suitable reference guide for writers if you are not familiar with this requirement. Papers that do not properly cite sources will be returned ungraded.

In addition to paper copies of assignments, **electronic (and certifiably virus free) copies should be emailed to me on the day they are due.** Further guidelines regarding software-based assignments will be provided shortly.

- File names should clearly identify you by last name followed by the assignment number. E.g., CIS4140 YourLastName assign#1

Expectations Regarding Software and Electronic Communication

- Please read the statement regarding email (above) and ensure your email forwarding works.
- The student must make reasonable efforts to overcome any problems arising from the use of the prescribed software for this course. As graduate students of CIS, "reasonable" should mean: serious concerted effort.

Appendix: Problem-Based Learning

What is Learning?

"The real goal of teaching is to persuade students to initiate their internal learning processes."
— Robert Leamnson

The cognitive sciences contradict notions that the mind records like a camera and that learning is merely absorption. We know that the mind builds mental constructions that order experience. The brain represents rather than records reality. Even sight is an act of construction and depends as much on brain processes as on the actual world it seeks to represent. Like an artist, the brain selects and seeks constancies to make up our images of the world. From sound and light waves, combined with previous models, it constructs information like "The cat is eating a mouse." And it creates knowledge like "Cats eat mice" that can be used later to predict and control.

In the last thirty years we have discovered more about how people learn than in the rest of human history. Much of the knowledge resulted from the invention of computers. Computers have provided new ways of thinking about computation, memory, and perception. In some ways the human brain is like a computer but in important other ways it is not. The brain is a "computer" that is wet, emotional, self-programming and far, far more powerful and flexible than any device ever built.

The good news is that this new knowledge contains ideas on how to make learning more effective and more efficient for students. The bad news is that what we usually do in classrooms contradicts those ideas. As a result, trying to become a good student means acquiring learning habits that promote poor memory, practicality, and creativity. Worst of all we lose the joy and excitement of learning. Since we are all humans who learn all of the time, we have other habits of learning we use outside of school that promote long term memory, easy transfer to other situations and many new ideas. Now, your job is to reduce the bad habits (memorize stuff to regurgitate on tests) and promote the good ones (start with what you know, try it out, and improve).

Why is how you learn important? If you read papers and magazines or watch television it appears that our educational system is a disaster. That is not exactly true. Today the world of work, citizenship, and daily tasks require more knowledge and thinking skills than ever. The days of going to work and having someone tell you what to do are disappearing fast. We call our times the age of information. It means that we all need to be experts, leaders, managers, creators, and innovators. The necessary knowledge to do these things, changes rapidly. What you will learn in college quickly will be obsolete when you graduate. As a result, you must prepare to learn throughout your lifetime.

Political issues concerning the Internet, social security, education, and defense require sophisticated citizen understanding. We need to know what information to seek and what positions to support. No longer can we decide such issues the way our parents would or according to some party or ideology. Purchasing everything from communication and computing devices to cars, homes and air travel requires knowledge. We need to know our own needs, the range of options and costs in time and money. Deciding on what work to do, where to live, what kind of a family to have, all requires extensive knowledge. Again, that knowledge changes rapidly.

Chris Galvin, CEO of Motorola says, "Motorola no longer wants to hire engineers with a four-year degree, we need our employees to have a 40- year degree."

One of the major reasons that you and your parents are paying for a college education is so you will have a more interesting and fulfilling life. Such a life has challenging jobs, better income (which allows you to live in good communities, to have comfortable surroundings, to travel, and to enjoy hobbies), and the ability to think and communicate that makes a difference in the safety, prosperity, and freedom of your community.

To get and hold a good job according to leading companies requires that you be able to do seven basic things:

- Learn to learn
- Communicate and collaborate with others
- Think creatively to solve novel problems
- Be technically competent
- Understand the opportunities and constraints of the global economy
- Lead as well as follow, always taking initiative
- Manage your career to develop new skills and knowledge.

What is wrong with the old teacher-stand-up-and-talk-student-sit-and-listen learning? It doesn't meet the needs. It is too slow, too shallow, too inefficient and not much fun. Students retain little of what they learn after even a few weeks. Students rarely can apply what they have learned to the unpredictable problems of life and work. Students get little practice in thinking for themselves or framing problems that interest them. As a result, students come to see learning as something grim to be avoided.

Learning is an active process of making changes in the mind's representations by reasoning about the world -- not just taking it as it comes. Learning means breaking, making, and remolding connections in our brains. The physical structure of the brain and the inferred representations of the mind depend not only on innate processes, but also on prior experience and knowledge.

Everyone has a different brain configuration because everyone has a unique body of experience. Imagine a theory-driven robot that navigates the world by generating maps and acting upon them. When it fails -- hits something or careens off a curve -- it changes its internal maps until these become more accurate and useful, but never complete. Though our brains work like this, we aren't robots. This gives us an advantage: Learning gives us pleasure, just as eating, sleeping, or an enjoyable afternoon at the beach.

What is Problem-based Learning?

Problem based learning is the simple but revolutionary idea that problems should come before answers.

Problem based learning gives you opportunities to examine and try out what you already know; discover what you need to learn; develop your people skills for achieving higher performance in teams; improve your writing and speaking abilities, to state and defend with sound arguments and evidence your own ideas; and to become more flexible in your approach to problems that surprise and dismay others. Despite the work and effort it requires, PBL is never dull and can be fun.

Instead of instructors giving answers and then testing to see if students have memorized them they present problems to tackle before teaching begins. Beginning with a problem puts students in the driver's seat. They can use and explore what they already know, their hunches, and their wildest ideas to try for a solution. In the process they can develop an inventory of what they know and what they need to know. Once students get a sense of what they need to know they can set off to question instructors or classmates, plunder the library, surf the net, or seek out experts to satisfy their curiosity.

In PBL, the student isn't expected to simply memorize knowledge. They are expected to apply knowledge to real situations. This shows that they have an understanding of what is being taught, instead of just the ability to restate facts. So before students learn new information, instructors present them with a problem. They select and pose the problem so students will discover that they need to learn new knowledge and skills. Often this involves failures as students discover that what they already know won't work. It involves a lot of talking – stating ideas, defending propositions, and criticizing. Students have to unlearn to acquire new knowledge so they can solve the problem.

PBL is team based. Most of the work on problems and projects is done in teams of three to six students. This requires instructors to design problem scenarios that raise the bar for thinking and searching. It also requires students to become effective managers of time, projects and meetings. Both requirements demand creative efforts to succeed. Research shows team-based PBL to be effective but also fraught with unintended outcomes such as slacking, pressure on ambitious students to do all the work, and divided work so no new learning has to be done. Both students and instructors need to be diligent in spotting and correcting such failures.

Problem Solving

Problem solving is not the same as doing an exercise. In "exercise solving" we recall and apply past routines. We work forward from the past to the solution. Usually there is one right answer. In "problem solving" we begin unsure about how to proceed and what new knowledge we need for a solution. We work backwards by starting with a plausible solution and then search for the necessary knowledge to support it, change it, and apply it. There is no single right answer, but better and worse solutions. Solving problems is more difficult. The good news is you have been doing it for years. Your first task is to think about how you go about solving problems like buying a car, choosing a major, or getting your roommate to pick up clothes. Jot down some of the steps you took and then read on.

There are many ways to solve problems and lots of experts to tell you how. Nearly all of them agree that groups can solve problems better than individuals if they plan and take certain steps. This outline will introduce you to the basics.

Step 1: Explore the issues. What do I already know and believe about this topic and how can I share that with my teammates?

Suppose you have been assigned the problem: "Do computers improve learning?" Everyone on your team probably has experience with computers in classrooms, has read articles, and heard opinions. What is the best way to get that information at everyone's disposal? One time-honored method is tell each other stories about your experiences – what you have seen, what you have done, and what you have heard. Taking the time to do that will give you a good foundation to take the next step. Besides, telling stories is fun and it is a prime skill in an information-saturated world. Stories organize information and knowledge in forms that are easy to remember and easy to adapt and apply to new experiences.

Step 2: Define the problem. What do I think is the problem we have to solve and how can my team agree on a problem statement?

Defining the problem requires much discussion and inquiry. The goal is to understand the problem and create rich mental images of the situation that includes the conditions, constraints, and criteria of an acceptable solution. (Send your problem statement to the instructor to see if you are on the right track.) If you are assigned the question: "Do computers improve learning?" you can see that there are many different ways to frame the problem in the question. You might conclude that the problem is research – A) "What studies have been done about student learning improvement when they use computers and what do they tell us?" You might decide that the issues are more complicated by taking the question as a hypothesis – a possibly true generalization. Then the problem is: B) "Is this a reasonable hypothesis that is worth the time and cost to test?"

Step 3: Investigate solutions. What do we have to know and do to solve this problem? This step requires much discussion. Play around with the problem statement and your knowledge and experience. Search for links, uncover assumptions, and identify what your team knows and what it needs to know. Make sure you agree on a solution.

- If the problem above were A) for example, you might need to review the research to find the latest and most comprehensive studies concerning computers and learning.

  You would need to discover what kinds of studies have been done, estimate their reliability (which might take you on a side-trip in statistics), and judge what you can infer from the cumulative evidence.

- If the problem were B) you might look for theories of learning that support or debunk the hypothesis and indicate whether it is worth investigating. You would be asking: What do we know about how people learn and does that suggest that computers could help?

Step 4: Research the knowledge and data that supports your solution. Your team needs to plan the work, assign tasks, and set deadlines.

- Discuss possible resources: A) course sources such as textbooks, lectures, and instructor supplied citations and suggestions, B) library sources (ask a librarian for help in locating the best sources and search strategies, and C) web sources (web sites are easy to access, but they are risky because they differ greatly in reliability. You have to discriminate between the sites of experts and sites like "Ralph's pretty good solutions." (When in doubt about reliability, ask the instructor.)

- Schedule assigned tasks, setting deadlines that allow you time for each team member to teach others about their findings.

- If your solution seems well supported and you can create a compelling argument for it, proceed to the next step. If not, re-do steps 3 and 4.

Step 5: Write your solution and submit. Use your best communication skills to state your solution clearly and support it with relevant arguments and evidence. Leave enough time for reviews of organization, lively writing and proofreading. Don't mess up good thinking and research with a sloppy presentation.

Step 6: Review your performance. This step is easy to overlook, but it is crucial to improving your problem-solving skills. When you get an evaluation of your solution go over it

individually and as a team to see what you did well and what mistakes you made. Mistakes are opportunities for learning. Discuss them to plan improvements on the next problem.

What About Grades?

Problem based learning provides learners with the opportunity to become self-coaching. It helps you learn to evaluate your own performance and figure out how to improve. Every first-rate athlete does that. Mark McGuire listens to his manager and to the hitting coach, then he uses their comments to improve his swing, his timing, his stance and all the little details that when he gets them right mean record-breaking homeruns. He is his own coach ultimately, changing other players' and coaches' ideas about what is possible in homerun hitting. That should be your goal as developing information scientist and technician – to use your instructors' evaluations and their models of expert performance to develop your own theory of coaching.

"But what about grades?" Grades are one of the most vexing problems of education. They are meant to tell students how well they are performing so they can change. If we were learning jump shots, the "grades" would be all the balls bouncing off the rim – the F's and D's and all the balls twitching the nets – the A's and B's. We wouldn't need any coach to tell us about our performance. Her job would be to help us perform better by watching our shooting stance, the arch of our ball, our follow-through and so on.

How do you know if your argument is sound, your presentation effective, your explanations meaningful, and your understanding useful? Schools use the mechanism of grades to tell you and to introduce coaching activities. They can also use grades to control – to force you to read assignments, be quiet in class and regurgitate back to teachers what they want you to say or write. Students can use grades to reflect on and improve performance or they can use grades to avoid the struggle of learning. "What do I have to do to get an A" becomes a frequent and vexing question.

Grades as feedback help you learn and become self-coaching. Grades as rewards and punishments take the fun out of learning and make classes boring, but without risks. Do you remember that learning is fun and rewarding in itself? In fact, when the brain learns something it releases the chemicals that produce the same delirious happiness that runners sometimes achieve. Learning is also frustrating and demanding. There are times when we would just rather someone tell us what to do so we don't have to go through all the practice and failures. If you don't have periods of frustration and periods of excited happiness you aren't learning – or not very much.

Problem based learning was invented to promote a passion for learning. Medical schools found that after earning their degrees a large percentage of doctors quit reading any medical research. That meant that many physicians were prescribing treatments that were out of date. The cause of this lack of life-long learning was simple. The doctors had come to hate learning. Listening, reading, and regurgitating memorized descriptions, terms, and formulas had wrecked their ability to enjoy medical learning.

A similar problem occurs among I/S graduates at many schools. People who hire them into the information technology sector report that graduates don't like to learn. "What do you professors do to them?" one CEO asked me. "Whatever it is, you make them hate learning."

The best way to get some fun out of learning is to use the grades instructors give you as scores that you want to improve. Like dropping a pass or missing a free throw, a low score on an

exercise doesn't mean you are a bad person – it means you made a mistake. You have to find out what you did wrong and try something different. That's the way we learn best -- by failing.

As strange as it seems the human brain is failure machine. It generates models of reality, acts on them, and adjusts or creates new models based on failures. Look at the life of a successful entrepreneur, author, artist or scientists and you will find a history of failures. Successful people use the failures to improve. Others worry over failure and try not to take chances. But there is not much to learn from success – indeed, we often learn the wrong things.

If you don't understand what you did wrong, contact your instructor or teaching assistant. Don't relax until you know exactly what you did, why you did it, and how to do it better the next time. If you read an assignment and can't understand it, don't keep reading it over and over. Get a classmate and talk about it. Discussion is a great learning tool. It helps you find out what you already know and it helps you look at ideas through different perspectives.

The less you worry over grades, the more likely you will learn. Don't work for the grade, work for the joy of doing a job well. The correlation between grade point averages and success in life – measured by satisfaction with work, family, community, plus income level – is close to zero. What does that mean? Mostly that the ability to memorize stuff doesn't help much in the work world. The abilities to understand and solve problems do pay off, but both require students to fail and learn.

Go for the learning. Watch yourself get better at arguments, at explanations, at finding sources. Take every opportunity to teach others. As your skills and performance improve your grades will follow. Your job is to become a passionate and life-long learner. That only comes from inner motivation – not the desire to please others.