PROPOSAL

GRADUATE CERTIFICATE IN

ENGINEERING PROJECT MANAGEMENT

TO BE OFFERED AT

PURDUE UNIVERSITY CALUMET

Proposal Received in the Graduate School

November 2008

Revisions Received in the Graduate School

March 5, 2009

Revisions Received in the Graduate School

March 25, 2009

Revisions Received in the Graduate School

August 25, 2009 and September 28, 2009
Proposal for Certificate Program

Title: Certificate in Engineering Project Management

Level of Certificate: Graduate

Proposed date of initiation: Spring 2009

I. Purpose, Need and Target Audience

The purpose of the Certificate in Engineering Project Management at Purdue University Calumet will be to increase the numbers of project managers and provide qualified managers for the local industry. That primary purpose will be accomplished as we 1) provide knowledge and experience in project management methods to enable qualified advanced engineers to assume the role of industrial managers, and 2) provide engineers the opportunity to advance their career and educational goals.

There is an extreme shortage of qualified project managers in the local industry due to retirements of skilled managers. While the local industry, especially steel and oil refining, are upgrading or expanding their facilities, many of their skilled managers are either retiring or on the verge of retirement. There are many studies and facts that demonstrate the crucial need for qualified industrial managers due to baby-boomers retirement. Government News on its March 15, 2007 reported “Immediate action is needed to respond to the project management skills-shortage and organizations must be prepared to make the investment to cultivate project manager capability for the long term, says a leading project management consultant.” Government Executive in March 17, 2008 reported that “A shortage of information technology project managers remains one of the biggest challenges the federal government faces, according to a report released Thursday by the Chief Information Officers Council.” Currently, there are not enough masters’ graduates with specialization or focus on engineering project management to supply the industry locally and nationally. In addition, the number of American students in engineering master’s degree programs has not kept up with the market demand. The shortage is neither a theoretical nor a distant problem to the local industry or to the industry in USA at large. To accommodate their need, the industry has resorted to hire foreign experts to fill the immediate needs.

The Certificate Program in Engineering Project Management will also encourage more students to pursue a master degree in engineering programs at PUC. All courses taken for certificate program can be used toward a master degree in engineering at PUC.

II. Admission Requirements

The admission process for the Certificate in Engineering Project Management will parallel that for students seeking a Master's Degree in Engineering. Specific requirements are:

1. Baccalaureate engineering degree or closely related fields with the approval of program coordinator and Engineering Department Head.
2. Minimum graduate GPA of 3.0/4.0 with the possibility of conditional admission for applicants who do not meet this requirement.
3. Minimum TOEFL score of 550 for applicants whose native language is not English, with the possibility of allowing exceptions, including substitution of alternate criteria. TOEFL Paper based 550; Computer based 213, Internet based: 77, with minimum scores as follows; Reading 19, Listening 14, Speaking 18, Writing 18; IELTS overall band score of 6.5.

4. A personal interview with a graduate program faculty advisor. Admission to this certificate program may be in three categories:

1. Students pursuing the Graduate Certificate in Project Management along with a degree of master of Science in Engineering (MSE), in which the required 12 credit hours are a part of 30 credit hours required for the MSE degree.
2. Students pursuing the Graduate Certificate in Project Management only
3. Students pursing the Graduate Certificate in Project Management after receiving their MSE degree.

III. Completion Requirements

Credit Hour Requirements:
The certificate requires students to complete 12 credit hours (4 courses). Two of 4 courses (6 credit hours) is a required course which is ME 597/ECE 595 and IE 545. The other two courses can be selected from three electives (IE530, IE 533, and IE 580). The titles of these courses are listed in the following:

Required courses (6 credit hours):
- ME 597/ECE 595 - Engineering Project Management 3 credits
  Prerequisite: ME 311/ECE 312 or equivalent course.
- IE 545 - Advanced Engineering Economics 3 credits

Elective courses (select two out of three courses, 6 credit hours):
- IE 530 - Quality Control 3 credits
  Prerequisite: basic statistics.
- IE 533 - Statistical Methods in Engineering 3 credits
- IE 580 - Systems Engineering 3 credits

GPA Requirements:
Students must maintain a minimum overall GPA of 3.0 for courses required for the certificate. Students must achieve a grade of "B" in courses to be applied toward the certificate.

Maximum number of credits that can be transferred from another institution.
Students may transfer a maximum of three credits from another institution.

Maximum number of credits from undergraduate-level courses that may be used for certificate:
Students may not use any undergraduate credits toward the certificate in engineering project management education.

Maximum time to complete certificate:
Students must complete the required courses within 3 years of admission to the certificate program.
Credit that can be applied to more than one certificate:
   At the present time, there is not another certificate program that includes any of these courses.

Number of credit hours taken prior to admission to the certificate program that may be applied toward certificate:
   Students may apply a maximum of six credit hours taken prior to admission to the certificate program toward completion of the certificate in engineering project management education.

Special conditions for completing the certificate:
   Students who are currently enrolled in a master's degree program in engineering must complete the courses required for the master's degree in addition to the required Certificate in Engineering Project Management Education courses before the certificate can be awarded.

IV. Administration

Transcripting:
   The certificate will be recorded in the following manner:
   Graduate Certificate: Engineering Project Management
   Major: Interdisciplinary Engineering

Process for certifying completion of requirements
   To certify completion of certificate program requirements, the Coordinator of the Graduate Program at the Departments of Engineering at Purdue University Calumet will perform the following.
   • Evaluate progress of all students enrolled in the certificate program on an annual basis.
   • Forward the names of students who have met the certification requirements, and are currently enrolled in the master's program, to the Graduate School upon completion of the master's degree.
   • Forward the names of post-graduate students to the Graduate School upon completion of the certificate requirements.

Dissemination of the certificate
   Upon notification from the Graduate School that a student has completed the requirements for the Certificate in Engineering Project Management, the Registrar will mail the certificate of completion to the student.

References
Responses to Purdue Graduate Committee Review Comments

Comment 1: The certificate requirements are unclear: While the certificate proposal states that 12 credits are needed for the graduate certificate, it lists 15 credits of required courses.

Response: To be more clear, the credit hour requirements in section III have been modified as follows on page 3:

“Credit Hour Requirements:

The certificate requires students to complete 12 credit hours (4 courses). Two of 4 courses (6 credit hours) is a required course which is ME 597/ECE 595 and IE 545. The other two courses can be selected from three electives (IE530, IE 533, and IE 580). The titles of these courses are listed in the following:

Required courses (6 credit hours):

- ME 597/ECE 595 - Engineering Project Management 3 credits
  Prerequisite: ME 311/ECE 312 or equivalent course.
- IE 545 - Advanced Engineering Economics 3 credits

Elective courses (select two out of three courses, 6 credit hours)

- IE 530 - Quality Control 3 credits
  Prerequisite: basic statistics.
- IE 533 - Statistical Methods in Engineering 3 credits
- IE 580 - Systems Engineering 3 credits”

Comment 2: There are no syllabi provided for the required courses. The lack of syllabi leaves a number of concerns unanswered.

Response: Please see the Syllabi of all courses as attached.

Comment 2a: The defacto standard of practice for project management is the Project Management Institute's Project Management Book of Knowledge. That book is the basis for the certification of 311,677 project managers worldwide (March 2009). Nationally, there are many academic courses that are teaching material that is either outdated or inconsistent with the state of practice. It is important to assess the proposed project management curriculum to ascertain whether it is consistent with the current state of practice. In fact, PMI will certify project management programs. Has Calumet sought PMI certification of their educational program or at least is compliant with their guidelines.

Response: The courses are designed to cover PMI latest requirements and will be continually updated for any new requirements in the future.

Comment 2b: Three of courses are listed as ME597 which means they haven't been approved by Purdue. It is not clear whether they have been taught in the past or whether the certificate proposal is relying on future course development.
Response: The proposal has been modified and only one course has a temporary number. Three of the courses (Advanced Engineering Project Management, Advanced Engineering Economics, and Statistical Methods in Engineering) have been taught since 2006, and the one with temporary number will be given Purdue permanent course number in the fall semester.

Comment 2c: There is insufficient information with which to ascertain the core knowledge areas. Will the course sequence will teach critical topics such as scheduling, resource allocation, earned value, negotiation, CAIV or DTC?

Response: The aforementioned materials are part of the courses as seen in the syllabi (Advanced Project Management and Advanced Engineering economics).

Comment 4: There are no short form vitae for proposed faculty. Does any of the faculty have project management certifications (i.e., PMP, CAPM, etc.) project management experience or other indicators of proficiency.

Response: Dr. Mojtahed has completed a certificate program in Advanced Engineering Project management, and has extensive experience in engineering project management as seen in his short Resume. He served as the coordinator of Technical Assistance Program at the Calumet 1996 -2002, and Technical/Business Assistance program 2006 – 2008. As a result, he supervised and completed over 60 industrialized projects throughout the State of Indiana. He has developed courses in engineering project management and economics at graduate and undergraduate levels, and has offered workshops in Advanced Engineering Project Management to senior project managers at MDII (Management Development Institute of Iran), Tehran, Iran. He has also worked on long and short projects at Argonne National Laboratory, Argonne, IL and NASA Glenn Center, Cleveland, OH.

Comment 5: At one place in the proposal it is given, "students may apply a maximum of six credit hours taken prior to admission to the certificate program", elsewhere it is given, "students may not use any undergraduate credits.", and again it is given that students who are currently enrolled in the MSE Interdisciplinary Engineering must complete the courses required for the master's degree in addition to the required certificate courses. These requirements do not seem to be aligned together.

Response: The certificate program is at a post bachelorette level. As a result, no undergraduate course will be accepted as a transferred course. To be more clear, the following paragraph was added in the Section II Admission Requirements on page 3:

“Admission to this certificate program may be in three categories:
4. Students pursuing the Graduate Certificate in Project Management along with a degree of master of Science in Engineering (MSE), in which the required 12 credit hours are a part of 30 credit hours required for the MSE degree.
5. Students pursuing the Graduate Certificate in Project Management only
6. Students pursing the Graduate Certificate in Project Management after receiving their MSE degree.”

**Comment 5:** The certificate program has courses that come from two fields of study, ME and IE. It is not clear if baccalaureate students in these disciplines who have taken some of the required courses for the certificate, can get credit towards the certificate. For IE students, there are two courses, IE 530 and IE 533. In addition, it is not clear if these two courses will be offered at Calumet or will be video streamed from Purdue WL.

**Response:** The students who have taken or will take the required streamed video courses offered in West Lafayette will be able to use them toward their certificate. All these courses are scheduled to be offered at the Calumet campus through Purdue Professional Engineering Education.

**Comment 7:** For ME students, there is one course, ME 311 Engineering Project Management for both undergraduate and graduate levels. ME students who have taken this course, will they get credit for ME 597A Engineering Project Management? How about MSE Interdisciplinary Engineering students if they select ME 311 in their plan of study?

**Response:** ME 311 is an undergraduate course that is prerequisite for two of the graduate courses. This course can not be used for the certificate program. Students who have not taken this course or an equivalent course in their program of study before will be required to take the course or pass the course with an exam to satisfy the requirement of prerequisite.

**Comment 8:** The proposal does not indicate the fraction of the students who are expected to participate in the certificate program will also be concurrently working toward a graduate degree at Purdue.

**Response:** There are many students that have taken or are enrolled in one or more of the certificate courses since 2006 (Classes are run with 20 -50 student enrollment). But, since the certificate program is not officially offered yet, the percentage of MS students who are expected to enroll in the program is unclear.

**Comment 9:** There seems to be a misprint in the requirements of 12 credit hours which should be 15 instead.

**Response:** The requirement is 12 credit hours. Please see the Response to Comment 1.
EDUCATION


M.S. (1979)  Engineering Mechanics, Iowa State University, Ames, Iowa

B.S. (1975)  Physics, Tehran, Iran

EXPERIENCE

1986-Present  Professor of Mechanical Engineering, Purdue Univ. Calumet, Hammond, IN

2006-2008  Director of Technical and Business Assistance Program, Purdue Univ. Calumet, Hammond, IN

1996-2002  Purdue Calumet Coordinator and Faculty Technical Staff, Technical Assistance Program, Purdue University, West Lafayette, IN

1985-1986  Instructor, Occidental College, LA, CA

1984-1985  Instructor, Iowa State University, Ames, Iowa. Des Moines Area Community College, Boone, IA

1983-1984  Research Assistant, Iowa State University, Ames, IA

1982-1983  Instructor, Iowa State University, Ames, IA

1976-1982  Teaching Assistant, Iowa State University, Ames, IA

PROJECTS and INDUSTRIAL ACTIVITIES

2006-Present  Design and Failure Analysis of Mechanical Devices, Purdue-T/BAP and Lilly Foundation
2005-Present  NASA Glenn Research Center, Cleveland, OH, Conducting research on Analytical Modeling and Analysis of Human Musculoskeletal System for Long Duration Spaceflights

2004-Present  Conducting research on Thermo-Mechanical Issues in BGA packages in Electronics.

1996-Present  Consultant, Technical Assistance Program, Purdue University, West Lafayette, IN. Completed over 60 research and development projects.

1988-1992  Argonne National Laboratory, Argonne, IL. Worked on a joint Argonne National Laboratory, NRC, GE, and European partners project analyzing nuclear reactors subjected to seismic loadings.

1975-1976  Luzon Construction Co., Tehran, Iran. Manager of Maintenance & Transportation Department. Managed and supervised machineries, heavy construction equipments, and construction supplies for the construction of 1000 residential units for Bell Helicopter employees in Shahinshahr, Iran

PROFESSIONAL ACTIVITIES

2002-Present  Accreditation Board for Engineering and Technology (ABET), Evaluator

1991-2008  Chairman, American Society OF Mechanical Engineers (ASME) Calumet Subsection

1991-2008  Board Member, American Society of Mechanical Engineers Chicago Section

1992-Present  Reviewer for Journal of Experimental Mechanics

1992-Present  Reviewer for Journal of Experimental Techniques

1992-Present  Reviewer for ASME, ASEE conference papers and publications

COURSES TAUGHT


COURSES LABORATORY DEVELOPMENTS

- Developed new courses in Engineering Project Management, Engineering Economics, Introduction to Modern Manufacturing Engineering. In addition, developed a manufacturing laboratory consisting of an automated manufacturing cell, CMM machine, and an industrial robot.

- Developed a new graduate course in Advanced Engineering Project Management and Advanced Engineering Economics.
HONORS AND AWARDS

2005  NASA Glenn Center, Cleveland, OH, Summer Faculty Fellowship Award
2004  Purdue University Calumet Summer Research Grant
2002  Purdue University XL International Grant, West Lafayette, IN
1999  Brown & Sharpe Corporation Laboratory Equipment Grant
1999  Purdue University XL International Grant, West Lafayette, IN
1995  Purdue University XL International Travel Grant, West Lafayette, IN
1991  NSF Laboratory Development Grant, co-applicant
1991  Purdue University XL International Travel Grant, West Lafayette, IN
1989  Purdue University XL Research Grant, West Lafayette, IN
1988  Purdue University XL Research Grant, West Lafayette, IN
1988  Argonne National Laboratory, Argonne, IL, Faculty Research Participation Program

PUBLICATIONS

Over 50 Refereed Journal, Conference Papers, and technical reports

CERTIFICATES

Certified Senior Project Manager, University of California, Irvine, CA, 2006
Certified MSC-NSTRAN User, 2001
Certified Using ANSYS User, 1988, 1997
Mechanics-Materials Linkage at the University of California-San Diego, La Jolla, CA, 1994
Certified Adept Robot User, Adept Manufacturing, San Jose, CA
Certified in Manufacturing Methods, Massachusetts Institute of Technology, Cambridge, MA, 1989
Certified in DADS - Dynamic Analysis and Design Computer Software, Iowa City, Iowa, 1988

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of American Society of Mechanical Engineers
Member of Society of Experimental Mechanics
Member of American Society of Automotive Engineers
Member of Society for Engineering Education
COURSE SYLLABUS
IE 580 – System Engineering (3 credits)
Prerequisites: Graduate standing
COURSE DESCRIPTION
In today's environment, there is an ever-increasing need to develop and produce systems that are robust, reliable, high quality, supportable, cost-effective, and responsive to the needs of the customer or user. Reflecting these worldwide trends, System Engineering course introduces students to the full range of system engineering concepts, tools, and techniques, emphasizing the application of principles and concepts of system engineering and the way these principles aid in the development, utilization, and support of systems. The course covers systems engineering from both a technical and a management perspective.
TEXTBOOK
COURSE OBJECTIVES
Students will understand how to deal with increasing system complexities; extended system life cycles versus shorter technology cycles; higher costs and greater international competition; the interrelationship of project management and systems engineering as they work together at the project team level; life-cycle approach that system engineers can follow to reduce costs; streamline the design and development process; improve reliability, and win customers; and the changing areas of system requirements.
CLASS SCHEDULE
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<td>System Engineering Concepts</td>
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<td>The System Design Process, Product</td>
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<td>Competitiveness and Life Cycle Engineering</td>
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<td>3</td>
<td>Conceptual Design-Requirements Analysis, Performance Measures, Allocation &amp; Evaluation</td>
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<td>4</td>
<td>Conceptual Design-Functional Analysis, Specifications, Design Reviews, Builder-Architected Systems -</td>
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<td>5</td>
<td>Preliminary System Design</td>
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<td>Manufacturing Systems-Architecting</td>
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<td>Software Systems-Architecting</td>
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<td>Detail Design and Development Test and Evaluation</td>
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<td><strong>Finals Exam</strong></td>
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COURSE SYLLABUS
IE 545 - Advanced Engineering Economics (3 Credits)
Prerequisite: ME 311/ECE 312 or equivalent course, and basic statistics
Instructor: Masoud Mojtahed
Office: ANDR 240
Phone: (219)989-2480
Email: mojtahed@calumet.purdue.edu

COURSE DESCRIPTION
Effective project managers have complete command of their project costs and a thorough understanding of the financial aspects of their business. This course reviews the fundamentals of accounting; examines project cost accounting principles, applications, and impact on profitability; examines the principles of project costing; covers the elements involved in cash management; introduces the framework for how projects are financed and the potential impact financing has on the projects; and a framework for using an effective project cost system.

TEXTBOOKS

COURSE OBJECTIVE
Students will understand how the project cost system works and how it functions in the context of corporate accounting. They will learn: how to set fees to make a profit; how to read corporate financial statements and understand what the numbers mean; concepts of budgeting; and, does the data tell a story. Students will understand the basics they need to be effective project managers (and to some extent, firm managers) having full command of the project cost accounting system and its roll in delivering a project on time and in budget. Finally, the students will learn to analyze engineering costs and capital investments, and the ability to compare and select individual projects

GRADING
Grading is based on: class participation including in-class case studies (10%), homework (10%), midterm exam (30%), term project (20%), and final exam (30%).

CLASS SCHEDULE
Review of engineering economics (2 sessions)
Labor Analysis (1 session)
Material Analysis (1 session)
Accounting Analysis (1 session)
Forecasting (1 sessions)
Estimating Methods (1 sessions)
Product Estimating (2 sessions)
Cost Analysis for Engineering Designs (3 sessions)
Capital Investment (2 sessions)
Enterprise and Entrepreneurship (1 session)
COURSE SYLLABUS
IE 530 - Quality Control (3 credits)
Prerequisite: basic statistics
Course Description – This course examines the design in order to acquire a better product/process quality. Other aspects of design included are robust design, parameter design, or Taguchi Techniques. This course also gives students a current understanding of the techniques and applications of design of experiments in quality engineering design. The students will learn design of quality control systems in manufacturing, use of advanced statistical process controls, sampling inspection techniques, process capability, and other statistical tools. Also included are vendor sourcing and control tools, methods for establishing specifications and tolerances, quality function deployment, and other quality control techniques. In addition, Six Sigma will be included.

TEXTBOOK
2. Reliability for Technology, Engineering, and Management by P. Kales, Published by Prentice Hall 1998

COURSE OBJECTIVES
The students will understand the design of quality into products and processes using design of experiments including robust/parameter design and tolerance design techniques. They will learn that design of experiments is a systematic and efficient method of design optimization for performance, quality, and cost in quality engineering. Students will be able to use Statistical quality control to improve the product and/or process quality for a given design.

CLASS SCHEDULE
Week Subject
1 Fundamentals of Quality/Deming’s Theory
   Fundamentals of Statistical Studies
2 Documenting and Defining a Process
   Basic Probability and Statistics
3 Stabilizing and Improving a Process
4 Attribute Control Charts
5 Attribute Control Charts
6 Variables Control Charts
7 Out-Of-Control Patterns
   Diagnosing a Process
8 Process Capabilities and Improvement Studies
   Design of Experiments, Taguchi Examples
9 Midterm
10 Defining Reliability
11 Computing Reliability Parameters
12 Reliability Predictions
13 Data Evaluations
14 Graphical Evaluation
15 Systems Modeling
16 Final Exam Project Presentations
COURSE SYLLABUS
ME 597/ECE 595
Advanced Engineering Project Management (3 credits)
Prerequisite: ME311/ECE 312 or equivalent course
Instructor: Masoud Mojtahed
Office: ANDR 240
Phone: (219)989-2480
Email: mojtahed@calumet.purdue.edu

Course Description - The fundamentals of project management including: Overview and concepts of project management (principles, body of knowledge, strategies); planning successful projects (defining, specifying, delivery options, scheduling, budgeting); implementing (organizing the team, work assignments, team building, team launch, effective leadership); risk analysis; executing (performance measurement, maintaining the schedule, adjustments/mid-course corrections, record keeping, status reporting, communications, managing conflict, time management); and closeout (performance measurement, maintaining the schedule, adjustments/midcourse corrections, record keeping, status reporting, communications, managing conflict, time management).

TEXTBOOK

COURSE OBJECTIVE
The student will understand the basics of project management including the importance and interrelationship of all the components. They will be fluent in the Project Management Institute’s process group functions (initiating, planning, executing, controlling, and closing) and the project knowledge areas (integration, scope, time, cost, quality, human resources, communications, risk, and procurement). They will know the various tools and software that are appropriate to support the analysis integral to each of the functions.

GRADING
Grading is based on: class participation including in-class group case studies (10%), homework & individual case studies (10%), mid-term exam (30%); term project (20%); and final exam (30%).

CLASS SCHEDULE
Review of project management principles (1 sessions)
Strategic planning and analysis (3 sessions)
Team building and motivation (2 sessions)
Team launch and conflict management (1 session)
Risk principles and analysis (2 sessions)
Project planning and execution (2 sessions)
Multi project planning and execution (1 session)
Large and small projects (1 session)
Leadership principles (1 session)
Project monitoring and closure (1 session)
Statistical Concepts in Engineering Management

ECE 595K/ME 597K, Sec 1 (CRN: 65165,65220,65166)        Yeow K. Siow
Spring 2009                                             siow@calumet.purdue.edu
Lectures: T,R 3:30pm-4:50pm CLO 132                     Office: CLO 381
Office Hours: R 10am-12pm                                Phone: 219-989-4039

ISBN: 978-0131877061

Prerequisites: Graduate standing & proficiency in calculus

https://technology.calumet.purdue.edu/met/siow/stats.html

Course Objective
This course is directed toward the graduate student who has never had a statistics course or whose last
statistics course was taken some time ago and a refresher course is required. The primary purpose of this
course is to provide a basic understanding of fundamental probability and statistical principles, their underlying
assumptions, and their use in data analysis using real-world engineering problems.

Software
Excel, or any similar and compatible spreadsheet software such as OpenOffice Calc, as well as Matlab, SAS,
SPSS, may be used as statistical analysis/application tools. Spreadsheet software is used because of the almost
universal acceptance of spreadsheets in the workplace. It is required that students be already familiar (or
become familiar) with Excel (or Calc, etc.). Prior knowledge of Matlab, SAS, or SPSS may be helpful but not
required.

Grading
Homework                                          10% (See below)
Exams                                              30% (10% each)
Projects                                           60%

Homework
Keep all your work in a folder or do all homework on a notepad. During Exam 3, your homework folder or
notepad will be collected and assessed.

Make-up
Prior permissions are required if you must miss an exam.

HONOR CODE:
I understand that academic dishonesty will not be tolerated at Purdue University Calumet. I am here to learn.
Through learning, I will strive to become a better person and a more valuable contributor to society. I understand
that dishonesty in the classroom, through cheating, plagiarism or other dishonest acts, defeats this purpose and
disgraces the mission and quality of a Purdue University Calumet education. Therefore, I make the following
pledge: in accordance with the Honor Code, I will not engage in dishonesty in my academic activities, and I will
not tolerate such dishonesty by other students.

Emergency Preparedness
When In Doubt…Call University Police at 219-989-2911
<table>
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<th>Week</th>
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