MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT
CENTER FOR CONSTRUCTION RESEARCH AND EDUCATION

1.040/1.401

PROJECT MANAGEMENT

SPRING 2007

SYLLABUS

Instructor:
Dr. SangHyun Lee
Dr. Samuel Labi
Dr. Fred Moavenzadeh

Lectures:	Mon & Fri	1:00 PM – 2:30 PM	Rm. 1-371
Recitations:	Fri	4:00 PM – 5:00 PM	Rm. 1-371

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II. Contact Information

http://stellar.mit.edu/S/course/1/sp07/1.040/

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III. Course Description

As technological integration and construction complexity increase, so does construction lead times. To stay competitive companies have sought to shorten the construction times of new infrastructure by managing construction development efforts effectively by using different project management tools. In this course, three important aspects of construction project management are taught:

(1) the theory, methods and quantitative tools used to effectively plan, organize, and control construction projects;

(2) efficient management methods revealed through practice and research;

(3) hands-on, practical project management knowledge from on-site situations.

To achieve this, we will use a basic project management framework in which the project life-cycle is broken into organizing, planning, monitoring, controlling and learning from old and current construction projects (See Figure 1). Within the framework, you will learn the methodologies and tools necessary for each aspect of the process as well as the theories upon which these are built.

By the end of the term you will be able to adapt and apply the framework to effectively manage a construction project in an Architecture/Engineering/Construction (A/E/C) organization.

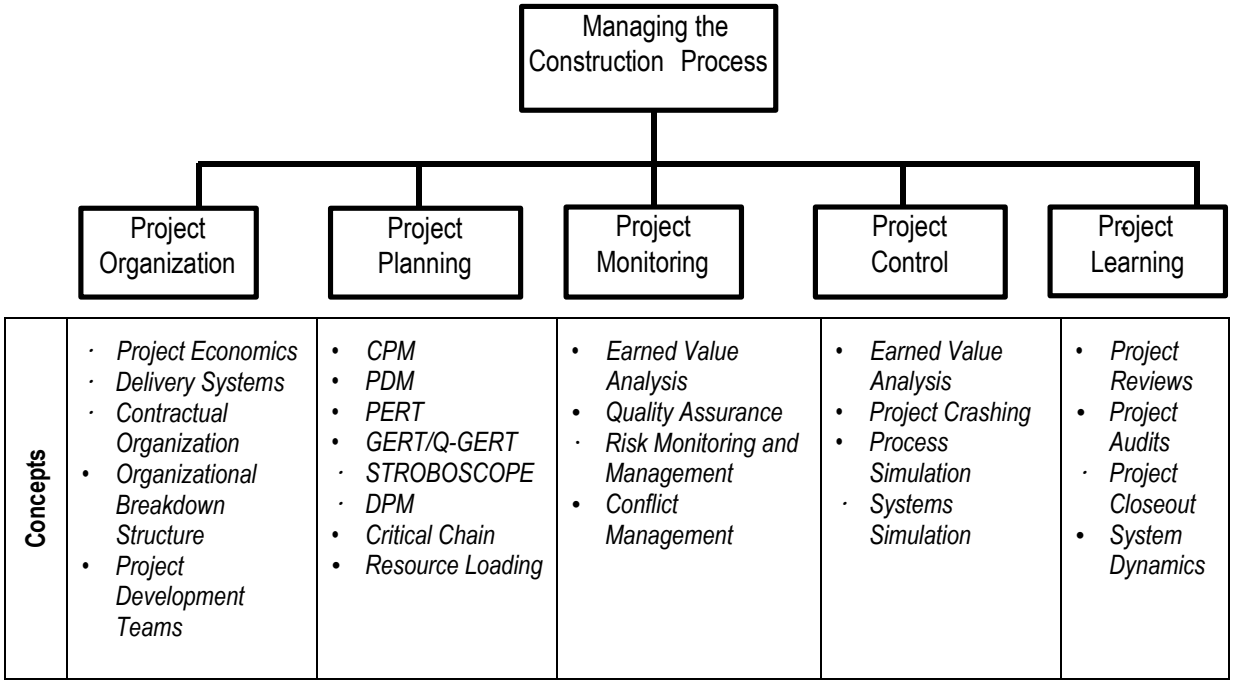

Figure 1: The organization framework, concepts & tools for the course

The material in the course is divided into five major sections (see Figure 1): project organization, project planning, project monitoring, project control, and project learning.

In what follows, we describe in some detail the material covered in each major section of the course.

Section 1: Project Feasibility & Organization

Project organization involves evaluating possible projects, selecting contracting type, including a payment scheme, selection method, and delivery type. We will be covering both qualitative issues (such as discussion of financing mechanisms) in addition to quantitative methods for comparing and valuing projects, such as discounted cash flow, cost-benefit analysis, cost-effectiveness. We will be discussing the tradeoffs involved in different contract mechanisms, such as delivery types, and payment schemes, particularly looking at the incentive issues. A follow-on to choosing a delivery type is the selection of an appropriate project organization-structure and establishing the Organizational Breakdown Structure (OBS) for the project. Through an analysis of the project information-transfer needs (i.e., who needs information from whom), project teams and a reporting structure may be determined. A critical issue of this phase of the project is the handling of uncertainty and risk in projects.

Section 2: Project Planning

Project planning involves establishing the Work Breakdown Structure and mapping this structure to the established OBS. Furthermore, a project budget and Cost Breakdown Structure are developed and mapped to the OBS and WBS. The planning phase also includes establishing an appropriate timeline for the project in the context of resource constraints. Finally, the project manager must acknowledge that very few (if any)

of the estimates and predictions at hand will prove to be accurate in the future; he/she needs to account for risk factors and their possible consequences on the schedule, budget, quality and environment while planning a project.

Specific methodologies for planning include:

- The Critical Path Method (CPM)
- The Precedence Diagramming Method (PDM)
- The Program Evaluation and Review Technique (PERT)
- The Graphical Evaluation and Review Technique (GERT)
- Queue - Graphical Evaluation and Review Technique (Q-GERT)
- Simulation Language for Alternative Modeling (SLAM)
- Dynamic Planning and Control Methodology (DPM)
- Critical Chain Planning
- Resource Loading

Many software tools, such as MS Project, Primavera Project Planner, Primavera Monte Carlo, Crystal Ball, and ProChain are available to the project manager for deterministic and probabilistic planning. In this course we will mention several, including the following:

- Primavera P3 *for deterministic time and resource scheduling*
- Primavera Monte Carlo *for probabilistic time and resource scheduling*
- TreeAge Data *for decision and risk analysis*
- Crystal Ball *for risk analysis*
- STROBOSCOPE & CYCLONE *for detailed construction process simulation*
- Vensim *for system dynamics analysis*

Sections 3 & 4: Project Monitoring & Control

Project Monitoring refers to the configuration and metrics used to monitor the progress of a project throughout its life. Particular questions of interest to the project manager are:

- Is the project progressing according to the schedule?
- Will the project be completed within the allocated budget?
- Will the product perform as expected?
- If there are any deviations in schedule, budget or quality, how efficiently and how fast are they captured, reported and acted upon?

Earned Value Analysis is one project management tool used to help answer these questions. Reports are based on the organization and reporting structure established previously.

Based on the information gathered through the Project Monitoring system, corrective action may be required to keep a project on track. The Project Control section of the course describes techniques to help realign projects that have gone awry. Corrective action may be needed in many areas such as project scope, product performance, project schedule, and project budget. Project Control also requires a clear trace as to when and how changes are made to baselines as well as a clear understanding and documentation of project configurations.

Section 5: Project Learning

Project Learning is recognized by organizations as one of the most important factors for success in current and future projects. Through life-cycle and post-mortem analysis, the project manager may identify areas to be emphasized or more closely managed in future projects. Such areas include:

- Resource allocation
- Risk and uncertainty
- Budget constraints
- Project feasibility
- Change management.

A valuable methodology used in recent years for managing learning is simulation. In this course we will introduce the System Dynamics simulation methodology for evaluating certain performance parameters of a project.

IV. Course Organization

Lectures and Recitations

The course materials will be taught through a series of lectures and recitations. Lectures are scheduled for Mondays and Fridays from 1:00 PM to 2:30 PM in Room 1-371. Lecture time will be used for both teaching course materials and class discussion. Classroom participation is strongly encouraged during lectures.

Recitations will be used to support and enhance the material covered in the lectures through a practical application. Specifically, recitations will provide videos to illustrate concepts discussed in lecture, discuss examples from the textbooks, and answer questions regarding the application of theory to practice. We will also hold most of our guest lectures during this time. Recitation times will be on Fridays from 4:00 PM to 5:00 PM in Room 1-371. Please note that attendance to recitations is **REQUIRED**.

Readings

For most lectures there will be required and recommended readings. Where possible, please try to take a close look at the readings before the corresponding session. In some cases, there will be readings required of graduate students but which are simply recommended (optional) for undergraduates.

Required Reading

The required reading material will be primarily drawn from two sources:

- The online textbook "Project Management for Construction" by Chris Hendrickson. The book is available for viewing at no charge at http://www.ce.cmu.edu/pmbook/.

In addition to the required reader, or when the required reader does not cover the material taught in class, there will also be printed materials to be handed out at the beginning of each class or provided electronically via the STELLAR site.

Recommended Reading

For each topic studied, there may be supplemental references and bibliography. They are the *recommended reading* for this course. Students are not required to read the recommended material but are encouraged to do so if they are interested in further study.

Particularly, students are highly encouraged to read:

- The book "Construction Nightmares" by O'Leary and Acret. This book contains a series of narratives (many based on real-life incidents), and may be purchased through the MIT Coop.

- The book by Meredith, J. and Mantel, S., (2000) *Project Management: A managerial Approach*, 4th Edition, J. Wiley & Sons New York, ISBN: 0471016268 [Dewey Library HD69.P75.M47 1995], which can be purchased through the MIT Coop also.

Other recommended readings are included later in this document.

Homework Submission and Evaluation

All homework will be distributed and submitted electronically using the STELLAR System at http://stellar.mit.edu/S/course/1/sp07/1.040/. Homework is to be submitted before **12 MIDNIGHT** on their respective due dates also shown in the Course Outline. Because feedback on the answers provided will be provided directly in the submitted file, it is important that you submit your homework in a form that is editable (MS Office or ASCII text). If you do not have access to the appropriate software, please see the lecturer after class.

The grade of the course will be assigned on an individual and team basis.

For the term project, the work is done by a set of students working together as a company. The team grade of the term project is obtained from the term project documents. From the term project grade, each member will get an individual term project grade depending on her/his efforts and contributions as evaluated by her/his peers in the group. Each individual will receive a grade equal to the term project grade times a multiplier. This multiplier can be lower or greater than one. The average of the individual grades will be equal to the team grade. In that case, working effectively in a team is a precondition to get a good grade, but in the case that circumstances on the team create a difficult environment, individuals will not be blamed for the fault of others. Problem sets that are prepared by a team will also be graded accordingly. The term project, problem sets and class participation account for 100% of the grade.

Your final grade will be calculated as follows (for students taking 1.040):

- Problem Sets 45%
- Term Project 40%
- Class Participation 15%

Assignment (45%)		
AS #	Grade %	Instructor
AS1	5%	Dr. Lee
AS2	10%	Dr. Lee
AS3	10%	Dr. Lee
AS4	10%	Dr. Labi
AS5	10%	Dr. Labi

Term Project (40%)		
TP #	Grade %	Instructor
TP1	5%	Dr. Lee
TP2	15%	Dr. Lee
TP3	20%	Dr. Labi

Students taking 1.401 (the graduate student version of the class) will be expected to complete additional assignments (AS #6) during the course of the term. Thus, final grade will be:

- Problem Sets 45%
- Term Project 40%
- Class Participation 15%

Assignment (45%)		
AS #	Grade %	Instructor
AS1	5%	Dr. Lee
AS2	10%	Dr. Lee
AS3	10%	Dr. Lee
AS4	10%	Dr. Labi
AS5	10%	Dr. Labi

Term Project (40%)		
TP #	Grade %	Instructor
TP1	2%	Dr. Lee
TP2	8%	Dr. Lee
TP3	15%	Dr. Labi
AS6	15%	Dr. Labi

10% PER DAY WILL BE DEDUCTED from late problem sets or term project phases up to a maximum of seven days**. PROBLEM SETS AND TERM PROJECT PHASES RECEIVED AFTER SEVEN DAYS WILL NOT RECEIVE ANY CREDIT**. Under certain extenuating circumstances extensions may be granted. Please contact instructor or teaching assistant prior to the due-date if an extension is required.

Collaboration among students on problem sets or term project phases to be completed **INDIVIDUALLY** is limited to discussing concepts and clarifying issues. Nonetheless, each student is expected to produce his or her **OWN SOLUTIONS** to the homework problems. For a further discussion, please see the section on Academic Honesty.

Collaboration among students on problem sets or term project phases to be completed as a **TEAM** is encouraged. The team needs to submit only **ONE DOCUMENT** for the whole team.

The term project for this course is divided into three phases with three deliverables (TP I through TP III)—one for each phase—and is to be performed by a set of students working as a company. As mentioned before, a final term project grade is assigned to each team based on these three deliverables. Project grades are adjusted for each individual based on each individual's contribution to the project. To establish individual contributions, a peer evaluation is performed during the final project phase. This evaluations will ask each team member to distribute a financial "bonus" among the team members, provide a recommendation for each member of the team, evaluate the effect of each member to the morale of the team, evaluate the contribution of the team member to the term project and assign a "title" to each member of the team including the person filling out the form. There is the expectation that such evaluation will be filled **INDIVIDUALLY** and maintained **CONFIDENTIAL**. It is also expected that team members will behave **PROFESSIONALLY** and **HONESTLY** while filling the evaluation. Any **CONSULTATION** with other team members when filling the evaluation is strictly **FORBIDDEN**.

NOTE. Individual class participation involves participation in lectures, laboratories, in-class discussions, office hours as well as in email and surveys.

The class will be graded in a strict fashion, but with the philosophy that students who wish to enhance their learning by performing additional investigation and assignments should receive corresponding credit. It is expected that there will be a number of opportunities for "extra credit" assignments during the term to assist in this fashion. For example, undergraduates may choose to take on graduate assignments for extra credit.

V. ACADEMIC HONESTY

The Department of Civil and Environmental Engineering adheres to the strictest standards of academic honesty. An important aspect of achieving these standards is to be sure that students are aware of faculty expectations regarding academic honesty. This statement is an attempt to clarify these expectations as they apply to this course.

Assignments, Problem Sets and Term Projects

Assignments, problem sets and term projects performed by students for submission serve the following two purposes:

- Assignments, problem sets and term projects are seen as educational devices to help students master the course material. This includes the concepts, theories, methodologies, and tools presented in class and recitation as well as such skills as working in teams.
- Assignments, problem sets and term projects help the faculty evaluate how well each student has mastered the course material.

Thus, departmental policies regarding academic honesty are intended to balance these two purposes and, unless otherwise stated, apply to all assignments.

Students currently taking this class can work together to conceptualize general approaches to assignments. However, unless otherwise specified for a particular assignment, the work you submit must be done completely on your own. This includes text, numerical calculations, mathematical derivations, diagrams, graphs, computer programs and output. You are also expected to properly reference the source of any information used in a submission that is not your own. This includes any book, article, web page, presentation or personal correspondence that you used for your work.

It is also inappropriate to use assignments, problem sets or projects submitted in previous years as a source, unless otherwise indicated.

If you have any questions about how these policies relate to a specific situation, please speak to the teaching staff of this course for clarification.

VI. RECOMMENDED READING.

Below is a list of the recommended reading material according to lecture subjects. For a complete mapping of each lecture to the *required* reading material, please see the course schedule (Section VII, pp.15).

Project Organization

Engineering Economics

- Peña-Mora, F., C. Anumba, J. Lyneis, L. Soibelman, M. Park, M. Samii, and K. Kalligeros. "Engineering Economy with Uncertainity." In *System and Project Management.* MIT/Prentice Hall Textbook Series on Civil, Environmental and Systems Engineering. (Forthcoming)

Project Organization

- Schtub, A., Bard, J., and Globerson, S., (1994). *Project Management: Engineering Technology, and Implementation*, Prentice Hall, New York, NY, Sections 5.1 thru 5.3. [Dewey Library: TA190.S58 1994]
- Iansiti, M. and MacCormack, A. (1997) *Developing Products on Internet Time*. Harvard Business School Press; ISBN: B00005RZ6Z.
- Ward et. al. (1995) *The Second Toyota Paradox: How Delaying Decisions Can Make Betters Cars Faster.* Sloan Management Review 36 (3): 43-61
- Henderson, R. (1994) *Managing Innovation in the Information Age.* Harvard Business Review 72 (1): pp. 100-105
- Hameri AP, Nihtila J. (1997). *Distributed New Product Development Project Based on Internet and World-Wide Web*: Journal of Production Innovation & Management 14 (2): 77-87. A Case Study Hameri and Nihtila study the use of the World Wide Web to assist a large, geographically distributed team in the development of a new, technologically complex product.
- Chambers, C.A., (1996). *Transforming New Product Development*. Research-Technology Management 39 (6): 32-38 NOV-DEC 1996. Chambers identifies nine "best-practices" used in product development efforts.
- McCord, KR and Eppinger SD. (1993) *Managing the Integration Problem in Engineering.* MIT Sloan School of Management Working Paper, no. 3594, August 1993. This working paper describes a case study where the Design Structure Matrix (DSM) was used to identify complex technical coupling between subsystems of a large-scale development effort. Knowing the coupling allowed the development sub-team to more effectively communicate relevant information to other sub-teams.
- Thamhain, H., (1992), *Engineering Management*, Wiley-Interscience, 1st Ed. ISBN: 0471828017. [Dewey Library - TA190.T45 1992]. Chapter 11. Identifying organizational needs and planning and executing organizational change initiatives are discussed. The use of TQM to develop "the technology-based organization" is also described. Chapter 12 (Describes how to design, build, and evaluate effective teams for today's engineering activities)

Estimating

- Schtub, A., Bard, J., and Globerson, S., (1994). *Project Management: Engineering Technology, and Implementation*, Prentice Hall, Sections 5.1 thru 5.3. [Dewey Library: TA190.S58 1994] Chapter 10.
- Suh, N. (1990). *Principles of Design*, Oxford University Press ISBN: 0195043456 [Barker Library - TS171.4.S84 2001] Chapters 4 & 6
- Naylor, H.F., (1995) *Construction Project Management*, Delmar Publishers, New York. ISBN: 0827362218 [Rotch Library TH438.4.N38 1995] Chapter 2. Describes how to effectively establish a project WBS.
- Schtub, A., Bard, J., and Globerson, S., (1994). *Project Management: Engineering Technology, and Implementation*, Prentice Hall, Sections 5.1 thru 5.3. [Dewey Library: TA190.S58 1994] Chapter 5. Describes different organizational structures (e.g. functional, product line, matrix, etc.) and how to select an appropriate organizational for a given product/firm combination. Developing the WBS and mapping this to the OBS is also described. Chapter 8. Establishing a project budget using

several techniques is described. Furthermore, developing and using an effective project reporting structure are discussed. Appendix 11A. An example of a WBS is presented.

Project Planning

Deterministic Scheduling

- Callahan, M., Quackenbush, D., and Rowings, G., (1992). *Construction Project Scheduling,* McGraw-Hill, New York, ISBN: 0070097011 [Barker Library - TH438.C26 1992], Chapter 5.
- Moder, Philips, and Davis (1983). *Project Management with CPM, PERT, and Precedence Diagramming,* Van Nostrand Reinhold, New York. ISBN: 0442254156 [Barker Library - T56.8.M63 1983].
- Meredith, J. and Mantel, S., (2000) *Project Management: A managerial Approach*, 4th Edition, J. Wiley & Sons New York, ISBN: 0471016268 [Dewey Library HD69.P75.M47 1995] Chapter 8. Project scheduling techniques are presented. Specific tools include CPM, PERT, and Gantt Charts.

Probabilistic Scheduling

- Schtub, A., Bard, J., and Globerson, S., (1994). *Project Management: Engineering Technology, and Implementation*, Prentice Hall, Sections 5.1 thru 5.3. [Dewey Library: TA190.S58 1994] Chapter 7.
- Taylor, B.W. and Moore, L.J. (1980) *R&D Project Planning with Q-GERT Network Modeling and Simulation*. Management Science 26 (1): 44-59
- Moder, Philips, and Davis (1983). *Project Management with CPM, PERT, and Precedence Diagramming,* Van Nostrand Reinhold, New York. ISBN: 0442254156 [Barker Library - T56.8.M63 1983] Chapter 9 and 10.
- Pritsker, A. and Alan, B., (1983). *Management Decision Making*, Prentice-Hall, Englewood Cliffs, NJ. ISBN: 0135481643 [Dewey Library - HD30.23.P75 1983]. Chapters 16 through 19. Extensive description of the use of Q-GERT for planning projects including scheduling and resource constraints.

Resource Planning

- Badiru, A.B, (1996). *Project Management in Manufacturing and High Technology Operations*, J. Wiley & Sons, New York, ISBN: 0471127213 [Dewey Library - T56.8.B33 1996] Chapter 4.
- Schtub, A., Bard, J., and Globerson, S., (1994). *Project Management: Engineering Technology, and Implementation*, Prentice Hall, Sections 5.1 thru 5.3. [Dewey Library: TA190.S58 1994] Chapter 9. Describes techniques available to the project manager for establishing a project schedule under resource constraints. Resource leveling and resource allocation subject to availability constraints are described.
- Meredith, J. and Mantel, S., (2000) *Project Management: A managerial Approach*, 4th Edition, J. Wiley& Sons New York, ISBN: 0471016268 [Dewey Library HD69.P75.M47 1995] Chapter 9. Methods of scheduling resources under different constraints are described. Specifically, resource leveling, time-constrained resources, and maximum availability are considered. Additionally, scheduling resources across multiple projects is discussed.
- Moder, Philips, and Davis (1983). *Project Management with CPM, PERT, and Precedence Diagramming,* Van Nostrand Reinhold, New York. ISBN: 0442254156 [Barker Library - T56.8.M63 1983] Chapter 7.

- Elton and Roe. Bringing Discipline to Project Management.

Critical Chain

- Goldratt, E.M., (1997). *Critical Chain*. North River Press, Great Barrington, MA. ISBN: 0884271536, [Barker Library - PR9510.9.G64.C7 1997].

Project Monitoring

Risk Monitoring and Management

- Stump, E.J. and Ferguson, K. (1998). *The Value of Integrated Project Risk Management*. 1998 INCOSE Symposium.
- Armstrong. Risk in Risk Management.
- Paté-Cornell, M. E. and R. L. Dillon. (1998) *Analytical Tools for the Management of Faster-Better-Cheaper Space Missions*. Proceedings of the 1998 IEEE Aerospace Conference, Vail, Colorado, March 1998
- Kenley and Creque. Predicting Technology Operational Availability Using Technical Maturity Models. Kenley and Creque present and evaluate the Technical Maturity Assessment methodology for predicting availability of programs with high schedule risk due to technology.
- Hall, EM. (1998) *Risks to Riches: Risk Management Return on Investment*. 1998 INCOSE Symposium. "This paper presents a standard definition for measuring risk management return on investment (ROI(RM))…. ROI(RM) is defined as the ratio of savings to cost that indicates the value of risk management." (from abstract)
- Duncan, W.R. (1996) *A Guide to the Project Management Body of Knowledge,* Project Management World Today, Project Management Institute, Inc. (USA), Chapter 11.
- Callahan, M., Quackenbush, D., and Rowings, G., (1992). *Construction Project Scheduling,* McGraw-Hill, New York, ISBN: 0070097011 [Barker Library - TH438.C26 1992], Chapter 12. Presents a four-stage risk management program: Risk Identification, Risk Quantification, Risk Response Development, and Risk Response control.
- IEEE 1220. (1998) *Application and Management of the Systems Engineering Process*, Section 6.8.2.4. A brief description of a Risk Management process using four steps: Preparation, Assessment, Handling; and Control.

Conflict Management Plan

- Peña-Mora, F., Cosa, C., McCone, D. S., (2002). *Introduction to Construction Dispute Resolution*, MIT/Prentice Hall Textbook Series on Civil, Environmental & Systems Engineering, New Jersey
- Chitester, D. D. (2003), *The Measured Mile: Going the Distance to Calculate Lost Productivity*, http://www.chitester.com/techpdf/MeasuredMile.pdf

Project Control

Principles of Control

- Schtub, A., Bard, J., and Globerson, S., (1994). *Project Management: Engineering Technology, and Implementation*, Prentice Hall, Sections 5.1 thru 5.3. [Dewey Library: TA190.S58 1994] Chapter 11.

Performance Analysis

- Schtub, A., Bard, J., and Globerson, S., (1994). *Project Management: Engineering Technology, and Implementation*, Prentice Hall, Sections 5.1 thru 5.3. [Dewey Library: TA190.S58 1994] Chapter 12. Project management techniques useful for R&D projects are described. Factors considered include risk, technological versus commercial success, changing requirements, and technology leapfrogging are discussed.

Project Control Actions

- Thamhain, H., (1992), *Engineering Management*, Wiley-Interscience, 1st Ed. ISBN: 0471828017. [Dewey Library - TA190.T45 1992]. Chapter 6. Methods of effectively and controlling engineering work are described.

Project Learning

Project Reviews

- INCOSE. *Systems Engineering Measurement Primer*, Sections 1-5. Kaplan and Norton. The Balanced Scorecard—Measures that drive performance.
- IEEE 1220. *Application and Management of the Systems Engineering Process*, Section 6.8.2.5 through 6.8.7.Sub-section titles: Performance-based progress measurement; Systems analysis and test data; Requirement and design changes; Progress against project plans; Progress against technical plans; and Product and process metrics.

Project Audits

- Meredith, J. and Mantel, S., (2000) *Project Management: A managerial Approach*, 4th Edition, J. Wiley& Sons New York, ISBN: 0471016268 [Dewey Library HD69.P75.M47 1995], Chapter 12.
- Gulliver, F.R., (1987). *Post Project Appraisals Pay.* Harvard Business Review 65 (2): 128-& MAR-APR 1987

Project Closeout

- Meredith, J. and Mantel, S., (2000) *Project Management: A managerial Approach*, 4th Edition, J. Wiley& Sons New York, ISBN: 0471016268 [Dewey Library HD69.P75.M47 1995], Chapter 13.

System Dynamics

- Sterman, J., (2000), *System Dynamics Modeling for Project Management.* http://web.mit.edu/jsterman/www/SDG/project.html

- Sterman, J., (2000), *Business Dynamics,* McGraw-Hill, Boston, MA. ISBN: 0072311355, [Dewey Library - HD30.2.S7835 2000]
- Lee, S. and Peña-Mora, F. (2007), *Understanding and Managing Iterative Error and Change Cycles in Construction*, 24 (1), System Dynamics Review.

VII. SCHEDULE

Classes will be held as per schedule:

Lectures:	Mon & Friday	1:00 PM – 2:30 PM	Rm. 1-371
Recitations:	Fri	4:00 PM – 5:00 PM	Rm. 1-371

Please see below for a **preliminary** schedule diagram

Class	Day	Date	Forum	Topic	Assignment Out	Assignment Due	Instructor
L1	F	Feb-9	L	Course Introduction	PS1		All
R1	F	Feb-9	R	Video: Hong-Kong Shanghai Bank			
L2	M	Feb-12	L	Project Financing & Evaluation Part 1	TP1/PS2	PS1	Dr. Lee
L3	F	Feb-16	L	Project Financing & Evaluation Part 2			Dr. Lee
R2	F	Feb-16	R	Video: Skyscrapper Part 1			
L4	T	Feb-20	L	*Project Organization Part 1	TP2	TP1/PS2	Dr. Lee
L5	F	Feb-23	L	Project Organization Part 2	PS3		Dr. Lee
R3	F	Feb-23	R	Video: Skyscrapper Part 2			
L6	M	Feb-26	L	Project Organization Part 3			Dr. Lee
L7	F	Mar-2	L	Project Estimation Part 1			Dr. Lee
R4	F	Mar-2	R	Video: Skyscrapper Part 3			
L8	M	Mar-5	L	Project Estimation Part 2			Dr. Lee
L9	F	Mar-9	L	Planning Basics			Dr. Lee
R5	F	Mar-9	L	**Deterministic Planning Part 1		PS3	Dr. Lee
L10	M	Mar-12	L	Deterministic Planning Part 2			Dr. Lee
L11	F	Mar-16	L	Probablistic Planning			Dr. Lee
R6	F	Mar-16	L	**Project Dynamics Part 1			Dr. Lee
L12	M	Mar-19	L	Project Dynamics Part 2		TP2	Dr. Lee
L13	F	Mar-23	L	Resource Scheduling Part 1	PS4		Dr. Labi
R7	F	Mar-23	R	Video: Skyscrapper Part 4	TP3		
Spring Break	M	Mar-26					
	F	Mar-30					
	F	Mar-30					
L14	M	Apr-2	L	Resource Scheduling Part 2			Dr. Labi
L15	F	Apr-6	L	Simulation			Dr. Labi
R8	F	Apr-6	R	GUEST			
L16	M	Apr-9	L	Project Monitoring and Control Basics			Dr. Labi
L17	F	Apr-13	L	GUEST			
R9	F	Apr-13	R	GUEST			
		Apr-16					
L18	F	Apr-20	L	Changes and Claims			Dr. Labi
R10	F	Apr-20	R	Video: Building Big			
L19	M	Apr-23	L	Earned Value Analysis	PS5	PS4	Dr. Labi
L20	F	Apr-27	L	Quality, Reviews and Audits			Dr. Labi
R11	F	Apr-27	R	GUEST			
L21	M	Apr-30	L	Risk and Uncertainty			Dr. Labi
L22	F	May-4	L	GUEST			
R12	F	May-4	R	GUEST			
L23	M	May-7	L	Student Presentation Part 1		PS5	Dr. Labi
L24	F	May-11	L	Student Presentation Part 2		TP3	Dr. Labi
R13	F	May-11	R	GUEST			
L25	M	May-14	L	Wrap-Up			Dr. Moavenzadeh

Codes

Lecture	L	Monday & Friday 1-2:30PM	Rm 1-371
Recitation	R	Friday 4-5PM	Rm 1-371
TPi		The ith Term Project Assignment	
PSj		The jth Problem Set Assignment	
Note		10% per day penalty for late submissions. Assignment and Term Projects are not graded if submitted more than 7 days late. * Monday class will be held on Tuesday. ** Instread of Recitation, Lecture will be given.	