1.011 Project Evaluation

Prereq: none
U(spring)
3-0-6

Methodologies for evaluating civil engineering projects, which typically are large-scale, long-lived projects involving many economic, financial, social, and environmental factors. Basic techniques of engineering economics, including net present value analysis, life-cycle costing, benefit-cost analysis, and other approaches to project evaluation. Resource and cost estimation procedures appropriate for large-scale infrastructure systems. Incorporating service quality, risk, environmental impacts, and other factors within the evaluation process. Examples drawn from building design & construction, transportation systems, urban development, environmental projects, water resource management, and other elements of both the public and private infrastructure.

Required Text

1999
# 1.011 Project Evaluation
## Assignments 2003

### Exams

<table>
<thead>
<tr>
<th>Exams</th>
<th>Date</th>
<th>% of Grade</th>
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<tbody>
<tr>
<td>Quiz #1</td>
<td>Fri. Feb. 28</td>
<td>10%</td>
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<td>Quiz #2</td>
<td>Fri. Mar. 21</td>
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<td>Quiz #3</td>
<td>Wed. Apr. 24</td>
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### Problem Sets

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<th>Assigned</th>
<th>Due</th>
<th>% of Grade &amp; Main Topic</th>
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<tr>
<td>#1</td>
<td>Feb. 5</td>
<td>Feb. 10</td>
<td>5% Panama Canal Case Study</td>
</tr>
<tr>
<td>#2</td>
<td>Feb. 10</td>
<td>Feb. 18</td>
<td>5% Cost &amp; Revenue Functions</td>
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<td>#3</td>
<td>Feb. 18</td>
<td>Feb. 24</td>
<td>5% Equivalence of Cash Flows</td>
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<td>#4</td>
<td>Mar. 3</td>
<td>Mar. 10</td>
<td>5% Does Discounting Hurt Future Generations?</td>
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<td>#5</td>
<td>Mar. 10</td>
<td>Mar. 19</td>
<td>5% &quot;Skyscraper&quot; Case Study</td>
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<td>#6</td>
<td>Mar. 31</td>
<td>Apr. 14</td>
<td>5% Cost &amp; Benefit Models (for your project)</td>
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<tr>
<td>#7</td>
<td>Apr. 14</td>
<td>Apr. 25</td>
<td>5% Risks &amp; Uncertainty (for your project)</td>
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### Term Paper

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<tr>
<td>Topic Overview</td>
<td>Feb. 5</td>
<td>March 5</td>
<td>5%</td>
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<tr>
<td>Presentation</td>
<td>Feb. 5</td>
<td>May 7</td>
<td>10%</td>
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<tr>
<td>Final Report</td>
<td>Feb. 5</td>
<td>May 15</td>
<td>20%</td>
</tr>
</tbody>
</table>

### Class Participation Bonus

10%
1.011 References

Text Books:

William G. Sullivan, James A. Bontadelli, and Elin M. Wicks, "Engineering Economy", Prentice Hall, Upper Saddle River, NJ, 11th edition, 1999 (this covers the basic methods along with chapters on probabilistic risk analysis, decision trees, cost accounting, and activity-based costing; it has a supplement "Electronic Spreadsheets for Engineering Economy Applications", and it has a web site for support)

Ruegg, Rosalie T. and Harold E. Marshall, "Building Economics: Theory and Practice", Van Nostrand Reinhold, 1990 (a very practical text with chapters on each of the evaluation methodologies; the focus is on the construction of buildings, so this book has a narrower focus than the course)


Books About CEE Projects:

Fredich, A.S., “Sons of Martha - Civil Engineering Readings in Modern Literature”, ASCE, 1989 (pure fun!) [RESERVE]

Halliday, Stephen, “The Great Stink of London: Sir Joseph Bazalgette and the Cleansing of the Victorian Metropolis”, Sutton Publishing, Stroud, Gloucestershire, UK, 1999 (the installation of sewers and the creation of the Thames embankment as a means of cleaning up the Thames in the mid-1800s)


McCullough, David, "The Great Bridge" (the building of the Brooklyn Bridge) [RESERVE]

Peters, Tom, "Building the 19th Century", MIT Press [RESERVE]

Pierce, Patricia, “Old London Bridge: the Story of the Longest Inhabited Bridge in Europe”, Headline Book Publishing, London, UK, 2001 (the 750-year history of a bridge that at one time was the retail center of London and the site of many trendy homes)

Schodek, Daniel L., "Landmarks in American Civil Engineering", MIT Press, 1987 (more detail than "The Builders") [RESERVE]


"The Builders: Marvels of Engineering", National Geographic Society, Washington, DC, 1992 (great pictures and good overviews of major projects in all areas of civil engineering; a relatively inexpensive reference with a lot of excitement, but not too much detail concerning evaluation) [RESERVE]

"Early American Mills" (a history of the construction of water-powered mills and mill-towns throughout New England during the 1800s)

Articles:

Brocard, Dominique N., Brian J. Van Wheels, and Lawrence A. Williamson, "The New Boston Outfall", Civil Engineering Practice, Vol. 9, #1, pp. 33-48 (the engineering options for the new sewer system in Boston Harbor, with consideration of the geotechnical, water and pollution concerns)

Breen, Cheryl, Jekabs Vittands, and Daniel O'Brien, "The Boston Harbor Project: History and Planning", Civil Engineering Practice, Vol. 9, #1, pp. 11-32 (very good overview of the history, need, and options considered for the whole program)

Griggs, Francis E. Jr., "Thomas W.H. Mosely and His Bridges", Civil Engineering Practice, Vol. 12, #2, Fall/Winter 1997, pp. 19-38 (One of the first to use iron for bridges, Mosely developed standard designs and worked with a prefab company to market railway and highway bridges at an advertised price per foot during the 19th century).

Griggs, Francis E. Jr., "The Panama Canal: Uniting the World for Seventy-Six Years", Civil Engineering Practice, Vol. 5, #2, Fall/Winter 1997, pp. 71-90 (a 20 page synopsis of the Path Between the Seas that focuses on the trials and tribulations of building the canal)

Hecker, George E., "Hydraulic Engineering in China", Civil Engineering Practice, Vol. 6, #1, pp. 7-24 (provides an interesting perspective on the magnitude of China's major water resource projects)

Grimm, Mike, "Floodplain Management", Civil Engineering, March 1998, pp. 62-66 (because Fort Collins was a leader in the systems approach to flood control, they escaped the 500-year flood with little property loss and only 5 deaths versus the expected $2.75-5.5 million damage and 98 fatalities if they had not implemented their control system - a good, short example of a post audit)
("It was the Middlesex Canal that proved, through low freight rates and expanded traffic, that canal transportation in the US was practical and economical." Holly has written a series of interesting, short articles on local CEE projects.)

Holly, H. Hobart, "The Charles River Basin", Civil Engineering Practice, Vol. 8, #2, pp. 77-80


Holly, H. Hobart, "The Cape Cod Canal" Civil Engineering Practice, Vol. 2 or 3?, #?, pp. 109-113

Kohn, Melvin J. and Walter Kudlick, "Maintaining Urban Mobility for the Construction of Boston's Central Artery", Civil Engineering Practice, Vol. 4, #2, pp. 45-59 (overview of the need for the project and of the project)

Peters, Tom, "How Creative Engineers Think", Civil Engineering, March 1998, pp. 48-51 (he uses historical examples including Brunel's bridges, the Crystal Palace, the Palm House at Kew Gardens, and the Thames tunnel to illustrate what he calls "technological thinking", a combination of the linear, objective scientific method and the subjective matrix method. In every case, the project required new thinking and new technology to succeed.)

Scheader, Edward C., "The New York City Water Supply: Past, Present and Future", Civil Engineering Practice, Vol. 6, #2, pp. 7-20 (A very readable overview of NYC's water supply history written by the director of the Department of Environmental Protection; benefits are discussed only briefly and qualitatively to indicate that the city needs the water. (This was the John R. Freeman Lecture at MIT on April 2, 1990)