

## SYLLABUS:

**Date / Revision** 23 May 2015 / 02 May 2017 / PP  
**Faculty** Life Sciences (LS)  
**Study Programs** Biomedical Engineering (BME), Chemical Engineering (CHE), Food Technology (FTE)

## SUBJECT: Engineering Economics

### 1 Basic Information

<b>1.01</b>	<b>Subject Name</b>	<b>Engineering Economics</b>
<b>1.02</b>	<b>Semester</b>	5
<b>1.03</b>	<b>Level</b>	1
<b>1.04</b>	<b>SKS</b>	2
<b>1.05</b>	<b>Mandatory / Curriculum</b>	D-02
<b>1.06</b>	<b>Subject Code</b>	EECO
<b>1.07</b>	<b>Subject Code</b>	BME-FTE-CHE-D-LS-117
<b>1.08</b>	<b>Year</b>	2017 (7)
<b>1.09</b>	<b>Quality Control</b>	Final Test, OFSE, see evaluation
<b>1.10</b>	<b>Limitations</b>	Min 12 and Max 32 students in one class
<b>1.11</b>	<b>Combined with</b>	All Faculty of Life Sciences Students
<b>1.12</b>	<b>Pre-requisite</b>	-
<b>1.13</b>	<b>Responsible</b>	Dr. Tutun Nugraha
<b>1.14</b>	<b>Revision</b>	15-05-2017/pp

### 2 Description of Subject

This course will provide students some introductory knowledge on the economical consideration side of engineering. Students will learn basic concepts such as interests calculation, cash flow calculations, profitability, return of investment, capital investment, depreciation as well as other fundamental concepts related to the initiation of a project.

### 3 Objectives

The course will enrich the knowledge of the students as they join the work force and is closely linked to the design course that they will experience in the 6th semester, in which the students will have to learn to

calculate the profitability projections, capital investments.

#### 4 Competency

After having the course, students are expected to understand

- time value of money,
- analysis of alternatives using net present value and internal rate of return,
- interest rates calculation,
- depreciation,
- taxes and inflation
- Evaluate economics feasibility of an engineering project (coupled with design course to be given in the 6th semester)

#### 5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers to build the projects;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.
- Writing assignments/presentations

#### 6 Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	5
5.3	Homework / Classwork/Report	15
5.4	Presentation /Simulation	-
5.5	Daily Quiz	20
5.6	Final Examination	60 Points
	<b>Total</b>	<b>100 Points</b>

#### 7 Text Book and Reference

<b>1</b>	<b>Main Text Book:</b> <ul style="list-style-type: none"> <li>Plant design and Economics for Chemical Engineers, Max Peters, Klaus D Timmerhaus, Ronald E West, McGrawHill Education, International Edition</li> </ul> Also: <ul style="list-style-type: none"> <li>Chan S Park, Fundamentals of Engineering economics, Pearson/Prentice Hall</li> </ul>
<b>2</b>	<b>Supplemental Textbooks:</b>

<b>8</b>	<b>Content / Topics of Lecture</b>
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Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	<b>Introduction: Overview of Engineering Project Design</b> <ul style="list-style-type: none"> <li>Process Design development</li> <li>Flowsheet Development</li> <li>Computer Aided Design</li> <li>Cost Estimation</li> <li>Profitability Analysis of investment</li> </ul>	Lecture, Group discusion, tutorial for exercise 2 x 50 minutes  Peters,	1 x 3 x 50 min
2	<b>Analysis of Cost Estimation</b> Cash Flow for industrial Operations <ul style="list-style-type: none"> <li>Factors Affecting Investment and Production Cost</li> <li>Cash Flow Cash Flow and Cummulative Cash positions</li> <li>Sources of Equipment</li> <li>Price Fluctuations</li> <li>Company Policies</li> <li>Operating time and rate of Productions</li> </ul>	Lecture, Group discusion, tutorial for exercise 2 x 50 minutes  Peters, Timmerhaus and West, Chapter 6	1 x 3 x 50 min

3,4,5	<p><b>Analysis of Cost Estimation</b></p> <ul style="list-style-type: none"> <li>• Capital Investment</li> <li>• Cost indexes</li> <li>• Cost Components in Capital Investment <ul style="list-style-type: none"> <li>• Purchased equipment</li> <li>• Estimation Equipment cost by scaling</li> <li>• Equipment delivery</li> <li>• Equipment Installation</li> <li>• Instrumentation and controls</li> <li>• Piping</li> <li>• Electrical system</li> <li>• Buildings</li> <li>• Yard improvement</li> <li>• Service facilities</li> <li>• Health Safety and Environment</li> <li>• Land</li> <li>• Engineering Supervision</li> <li>• Legal Expenses</li> <li>• Construction expenses</li> <li>• Contractor's fees</li> <li>• Contingencies</li> </ul> </li> </ul>	Lecture, Group discussion, tutorial for exercise 3 x 2 x 50 minutes  Peters, Timmerhaus and West, Chapter 6	3 x 3 x 50 min
6,7	<p><b>Methods of estimating capital investment</b></p> <ul style="list-style-type: none"> <li>• Estimation of capital investment</li> <li>• Estimation of revenue</li> <li>• Manufacturing cost</li> <li>• Variable production costs</li> <li>• Plant overhead costs</li> <li>• General expenses</li> <li>• Quiz/evaluations</li> </ul>	Lecture, Group discussion, tutorial for exercise 2 x 2 x 50 minutes  Peters, Timmerhaus and West, Chapter 7	2 x 3 x 50 min
8	Midterm Break		
9, 10	<p><b>Interest, Time value of money</b></p> <ul style="list-style-type: none"> <li>• Interest: Simple interest, Compound interest, Nominal and effective interest rates, Continuous interests</li> <li>• Cost of capital: income tax effects, Loan payments</li> <li>• Time Value of Money</li> </ul>	Lecture, Group discussion, tutorial for exercise 2 x 2 x 50 minutes	2 x 3 x 50 min

11,12	<p><b>Cash Flow Patterns and Compounding/Discounting factors</b></p> <ul style="list-style-type: none"> <li>• Discrete cash flows</li> <li>• Continuous cash flows</li> <li>• Income taxes (central government taxes, taxable incomes, capital gains tax, Losses, provincial tax, non-income tax)</li> <li>• Fixed charges (Depreciation, Depreciation and income tax, Depreciable investment, Current value, Salvage value, Recovery period, Methods for calculating depreciation, insurance and self-insurance)</li> <li>• Examples</li> </ul>	Lecture, Group discussion, tutorial for exercise 3 x 2 x 50 minutes  Peters, Timmerhaus and West, Chapter 7	2x 3 x 50 min
13, 14	<p><b>Profitability, Alternative investment and replacements</b></p> <ul style="list-style-type: none"> <li>• Profitability standards <ul style="list-style-type: none"> <li>○ Cost of capitals</li> <li>○ Minimum acceptable Rate of return</li> </ul> </li> <li>• Methods for calculating profitability <ul style="list-style-type: none"> <li>○ Without time value of money</li> <li>○ With time value of money</li> <li>○ Selecting a profitability method</li> <li>○ Effect of inflation</li> <li>○ Start up cost</li> <li>○ Spread sheet for economic evaluation calculations</li> </ul> </li> <li>• Alternative investments <ul style="list-style-type: none"> <li>○ Alternatives when an investment must be made</li> <li>○ Alternatives</li> </ul> </li> <li>• Replacements <ul style="list-style-type: none"> <li>○ Methods of profitability evaluation for replacement</li> <li>○ Typical example of replacement policy</li> <li>○ Book values and amortized values</li> <li>○ Investment on which the replacement comparison is made</li> <li>○ Quiz</li> </ul> </li> </ul>	Lecture, Group discussion, tutorial for exercise 3 x 2 x 50 minutes  Peters, Timmerhaus and West, Chapter 8	2 x 3 x 50 min
15	<b>Review/Evaluation</b>		1 x 3 x 50 min
16, 17	<b>Final Examination</b>		