

COURSE APPROVAL DOCUMENT  
UNIVERSITY STUDIES PROGRAM  
Southeast Missouri State University

Department: Industrial & Engineering Technology

Course No. MN-220

Revision: \_\_\_\_\_ New: XX

**Title of Course:** Engineering Economic Analysis

**I. Catalog Description and Credit hours of Course:**

Engineering economic topics include time-value of money effects, cost/benefit analysis, tax consequences, and capital depreciation related to manufacturing or engineering. (3)

**II. Interdisciplinary Nature of the Course:**

Not Applicable

**III. Prerequisite(s):**

- MA 134

**IV. Objectives of the Course:**

- Students will be exposed to the economic decision-making tools relevant to engineering and technical disciplines in the United States. (US objective 1, 2, 3, 7)
- Students will gain insight on how government regulations directly influence private and public sectors of industry. (US objective 1, 2, 3, 4, 7)
- Students will use practical applications (projects) to understand the economic ramifications of short- and long-term capital expenditures. (US objective 1, 2, 3, 4, 7)

**V. Expectation of Students:**

- Class attendance and participation are strongly encouraged.
- Students are required to read the assigned chapters for discussion.
- Students are required to apply prerequisite mathematics knowledge where warranted.
- Students will complete all assignments (written papers and online discussions) in a timely fashion. Late work is unacceptable.

**VI. Course Outline:**

Making Economic Decisions (US objectives 1, 2, 3, 4, 5, 7) \_\_\_\_\_ 6 hours  
    The role of engineering economic analysis  
    The decision-making process  
    Engineering decision-making  
Incremental Analysis (US objectives 1, 2, 3, 4, 5) \_\_\_\_\_ 6 hours  
    Present worth analysis with benefit-cost graphs  
    Incremental rate of return analysis  
Engineering Costs (US objectives 1, 2, 3, 4, 7) \_\_\_\_\_ 6 hours  
    Cost estimating  
    Estimating models

Estimating benefits	
Depreciation (US objectives 1, 2, 3, 4, 7)	3 hours
Straight-line depreciation	
Sum-of-years digit depreciation	
Interest and Equivalence (US objectives 1, 2, 3, 4, 7)	6 hours
Time value of money	
Equivalence	
Simple interest	
Replacement Analysis (US objectives 1, 2, 3, 4)	6 hours
Basic comparisons	
After-tax replacement analysis	
Present Worth Analysis (US objectives 1, 2, 3, 4, 7)	6 hours
End of ear convention	
Effect of inflation and deflation	
Rate of Return Analysis (US objectives 1, 2, 3, 4, 6)	3 hours
Internal rate of return	
Estimation of Future Events (US objectives 1, 2, 3, 4, 6, 7)	3 hours
Precise estimates	
Probability and risk	
Final Exam	

**VII. Textbook:**

Newnan, D. G., Lavelle, J. P. & Eschenbach, T. G. (2000). Engineering Economic Analysis (8<sup>th</sup> ed.).

**VIII. Basis of Student Evaluation:**

Three examinations, one research paper, on-line discussions, and a final examination will be the basis for calculating student's grades.

Exam 1	10%
Exam 2	10%
Exam 3	10%
Final	10%
Papers/Presentation/Projects	40%
Online discussions	20%
TOTAL	100%

Grading Scale	
A	90 - 100%
B	80 - 89%
C	70 - 79%
D	60 - 69%
F	0 - 59%

**IX. Justification for inclusion in the University Studies Program**

**Objective 1: Demonstrate the ability to locate and gather information.**

**Emphasis: Significant**

1. **Content:** The course will require that students locate, gather, evaluate, and use a diverse set of information related to engineering economy to solve problems. Examples of these

information sources are the Wall Street Journal, Economics Journals, Money magazines, and the like. Students will be directed to use both traditional library and Internet research approaches. Additionally, students will be asked to perform face-to-face interviews with relevant persons. In using a diverse package of information students will demonstrate their ability to evaluate the information pertaining to economic issues, perform the required analysis, and render a decision.

2. **Teaching Strategies:** A lecture-research-discussion model will be utilized. The teaching strategy will utilize the specific format outlined in the lesson plans. Each lesson will include the topic to be discussed, purpose, objectives, reading references, course notes, and supplementary handouts. Students will be presented a topic during their class session and asked to extend the discussion after external research is performed. The discussion may take place on-line or face-to-face. In addition to discussing the topic, emphasis will be given to the quality of information retrieved and location of information. The secondary intent of these exercises will be to teach students to judge the credibility, perspective, and relevance of information retrieved.
3. **Student Assignments:** Class preparation assignments will include readings outlined in the lesson plan, locate, gather, and utilize library and in-house resources, along with the completion of assigned problem solving activities. During the first phase of the course, assignments to collect information from a variety of sources will be important for students to understand how information is essential to critically analyze and engage in rational decision-making in engineering economy. During the second phase of the course, students collect information pertaining to the projects assigned to them. Goal and objective of the project will be provided to each of the student groups. Based on gathered information, groups will engage in the process of studying the problem, assembling relevant data, identifying feasible alternatives, select the criterion to determine the best alternative, constructing a model, predict each alternative's outcomes or consequences, choosing the best alternative, and rendering the most logical engineering decision. Groups will be required to provide an oral presentation of their work, as it is typically required in all organizations.
4. **Evaluation of Student Performance:** Students will be evaluated on the basis of their performance in periodically administered exams and assignments during the course of the semester. This progress evaluation will assess the students' ability to understand information for each lesson. In addition to this, student performance will also be evaluated on their thoroughness and accuracy of their research, and the rational decision-making process as demonstrated in the ensuing group research project. Success in these projects will rely heavily on the ability of the students to collect and organize relevant information.

**Objective 2: Demonstrate capabilities for critical thinking, reasoning, and analyzing.**

**Emphasis: Significant**

1. **Content:** This course relies heavily on the basic principles of engineering economics essential for rational decision-making. Rational decision making from the perspective of engineering economy is a complex process that contains nine essential elements, all of which

require critical thinking, reasoning, and analyzing. The course content therefore provides students an excellent vehicle by which they can demonstrate critical thinking, analysis, reasoning, and problem-solving skills toward rational decision-making on economics issues that focus on technical projects.

2. **Teaching Strategies:** The course content is organized around topics that require and stimulate critical thinking during lectures, discussion sessions, and problem solving activities. The instructor will use economic and engineering concepts to help students analyze numerous case studies and evaluate the decisions rendered. In addition, students will be required to assess the soundness of these decisions and propose other suitable alternatives, if necessary. Students will demonstrate critical thinking skills in analyzing and synthesizing information as it applies toward the nine essential elements of the decision making process in engineering economy. This teaching strategy is also expected to hone the development of skills required for analysis and criticism.
3. **Student Assignments:** Due to the heavy reliance of this course on using engineering economics to analyze problems and issues, all assignments will require critical thinking, reasoning, and analyzing skills. These assignments include daily problem-solving activities, classroom discussions, analysis of case studies, exams, and the student project.
4. **Evaluation of Student Performance:** Students will be evaluated on the basis of their success in demonstrating their critical thinking skills in analyzing and synthesizing information as it applies to the nine essential elements of decision-making process in engineering economy. This applies to the daily problem solving activities, classroom discussions, analysis of case studies, student projects, and examinations alike.

### **Objective 3: Demonstrate effective communication skills.**

#### **Emphasis: Significant**

1. **Content:** Written and oral communications are vital skills of this course. The content requires for students to demonstrate written and oral communication skills in classroom discussions, written assignments, oral presentation, and examinations. Written projects will represent the findings of research supporting the decision-making process of engineering economics for a given scenario. Additionally, students will communicate their research and analysis orally to the class.
2. **Teaching Strategies:** The teaching strategy will include instructor presentations on how to use productivity software (Microsoft Word, Excel, and PowerPoint) to communicate an engineering economic analysis. In addition, the instructor will teach students how to prepare analytical reports on the engineering economy analysis so they communicate to both technical and non-technical personnel. As deemed appropriate, impromptu presentations or on-line discussions will be used to illustrate the dynamism and diversity (individual, group, face-to-face, and electronic) of communications.

3. **Student Assignments:** Student work should reflect the effectiveness and demonstrate competent communication in both the domains of oral and written skills. Analyses of case studies require students to actively participate in class discussions, which in itself lends to means of expressing and communicating ideas. The culminating research project at the end of the semester will provide students the opportunity to present their work in the form of a formal presentation and in the written form.
4. **Evaluation of Student Performance:** Evaluation of student performance in this course will directly reflect on their effectiveness in communicating the analysis and decision making for various engineering economic issues and situations. Students' contributions to classroom discussions pertaining to the analyses of case studies will be assessed, as will the formal presentation of the end of semester project work. In addition, all students must demonstrate effective written communications in presenting the analysis of the problem solving activities, presentation of gathered information, analysis of the case studies, and a written report of the project. Evaluation of the written work will be evaluated not only on content, but also on the quality of the communications used in presenting the information.

**Objective 4: Demonstrate an understanding of human experiences and the ability to relate them to the present.**

**Emphasis: Considerable**

1. **Content:** Since the topic of engineering economics affects almost all aspects of human life students will be charged to relate each of the course topics to their current lifestyles. Engineering economic practices have governed the way individuals and public/private enterprise purchase capital items since the early 1700s. Since the concepts of engineering economics is not reserved solely for engineering applications, the course will utilize everyday common-sense application that a variety of students can understand and relate to. For example, examples will focus on topics such as retirement, buying a house, investing in mutual funds or stocks, or buying versus leasing a car.
2. **Teaching Strategies:** The primary teaching method will be lecture-discussion of case studies of past and current engineering economic practices. Additionally, students will be tasked to discover and evaluate the “whys” of a recent economic decision. These cases will be derived from both personal experiences and examples that are collected from current situations in our society. In general, students will determine the influences (parental, societal, generational, etc.) of their economic decision-making process.
3. **Student Assignments:** Textbook examples and real-world projects will serve as the main source of assignments. Student will use experiential learning techniques to investigate and report on the different economic techniques a consumer can use when planning the purchase of a “high-dollar” item. For example, students may be asked to determine the pros/cons of buying a car with “0”% interest versus 2.9% and \$500.00 cash back. In attempting to complete these assignments students will utilize real companies located in the Southeast Missouri region.

**Objective 5: Demonstrate an understanding of various cultures and interrelationships.**

**Emphasis: Some**

1. **Content:** The course content will provide students an opportunity to investigate, analyze, and synthesize the cultural influences on national and international economic systems. The course content will illustrate a variety of perspectives on how engineering economy is being influenced by the social and cultural values of the society in which they originate. Course topics will facilitate students working with students of various cultural backgrounds to gain personal insight on how their economic systems are developed and interrelated with global economic systems.
2. **Teaching Strategies:** Given that the international economic system has considerable influence on the American economic status, a multitude of approaches will be utilized to facilitate learning. The primary mode of instruction will be delivered in lecture-discussion format. However, there will be a considerable amount of discovery learning, where students are tasked to uncover relevant topics (information) related to the course content. This will be accomplished through multiple Internet searches of national and international sociology publications or websites and guest lecturers from the International Programs Office.
3. **Student Assignments:** Textbook and journal article reading will serve as the primary source for student assignments. Beyond reading the aforementioned items, students will be asked to choose a country and study its cultures and compare it to the cultures of the United States to determine if there are any similarities. These assignments will be in the form of presentations or papers.
4. **Evaluation of Student Performance:** Students' assignments will be graded utilizing the standard rubric for written and oral assignments as provided by the Writing Center and the Oral Communication Across Curriculum committee.

**Objective 6: Demonstrate the ability to integrate the breadth and diversity of knowledge and experience.**

**Emphasis: Some**

1. **Content:** The course content will provide students an excellent opportunity to investigate, analyze, and synthesize economic systems of the national and international marketplace. The course content will illustrate a variety of perspectives on how engineering economy is being utilized by national and international private enterprise. Course topics will facilitate students working with a variety of economic systems to develop optimal conditions an organization, regardless of it location.
2. **Teaching Strategies:** Given that the international economic system has considerable influence on the American economic status, a multitude of approaches will be utilized to

facilitate learning. The primary mode of instruction will be delivered in lecture-discussion format. However, there will be a considerable amount of discovery learning, where students are tasked to uncover relevant topics (information) related to the course content. This will be accomplished through multiple Internet searches of national and international economic publications or websites, tracking a company's financial status throughout the semester. And if possible, site visitations to local companies.

3. **Student Assignments:** Textbook and journal article reading will serve as the primary source for student assignments. Beyond reading the aforementioned items, students will be asked to choose a country and compare how its engineering economic system is similar and/or different from that of the United States. This assignment will utilize approximately 50% of students' out-of-class time. Additionally, students will have in-class and on-line discussions/debates concerning the in-class presentation of their discovery. Furthermore, students will be asked to give attention to the implications international economies have on local and international social conditions regarding employment.
4. **Evaluation of Student Performance:** Students will be evaluated on the breadth and diversity of inputs selected when completing assignments for this area. Students will have to clearly show that perspectives of different social and economic systems, both nationally and internationally influenced the development of their assignments. This will be best assessed in their presentations and on-line discussions. Oral presentations will be graded using the rubric provided by the Oral Communication Across Curriculum committee and on-line discussion will utilize OIS Forum software provided by the Center for Scholarship in Teaching and Learning.

**Objective 7: Demonstrate the ability to make informed, intelligent value decisions.**

**Emphasis: Considerable**

1. **Content:** The valuing is an important component of engineering economic systems as it is used in all individual and social activities in which economy and efficiency are achieved. In general, for an engineering design or business project to be successful, it must be technically sound and produce benefits. The field of engineering economic analysis deals with the systematic evaluation of the benefits and costs of projects to determine if they make (or save) enough money to warrant their capital investments. After completing this course, students will use the principles and methodology of engineering economic analysis to assist decision-making. Thus, engineering economic analysis studies provide information on which current decision pertaining to the future operation of an organization can be based.
2. **Teaching Strategies:** The instructor will illustrate the basic economic principles and methodology required to make the decisions. Students are helped to discover the values (explicit and/or implicit) of the textbook author, or the author of an economic article or essay. Through this process, students will be encouraged to begin to identify the basis for their own values. In class discussions, students will be encouraged to clarify values and issues. Students can be given a "test" on some engineering economy or business project topic(s) that involve valuing. Then, the instructor presents data and facts and attempts to determine if this

information affects the values of the students. This leads to a discussion of values based on correct information. It can also lead to a discussion of different sources of information, why information differs and how to select reliable sources of information. Computer simulation and modeling are also introduced to the class to predict the behavior of an engineering system. Using the simulation software, the systems are optimized by tracking the movement in the money-time relationships.

3. **Student Assignments:** Students will be asked to take a position on a particular class project and defend it, making their values explicit. This may be done orally or in writing, and students will be required to support their value decisions by facts, research, or computer simulation whenever possible.

**Objective 8: Demonstrate the Ability to Make Informed, Sensitive Aesthetic Responses.**

**Emphasis: None**

**Objective 9: Demonstrate the ability to function responsibly in one's natural, social, and political environment.**

**Emphasis: None**

- X. **Background:** To be considered an eligible instructor for this class, the individual must possess significant academic background in which mathematics, engineering economics, and critical thinking are core. More specifically, individuals who possess advanced degrees in Engineering, Engineering Technology, Physics, and like will be considered. Additionally, the individual must have first-hand knowledge and application of Engineering Economics in public or private enterprise.

- XI. **Class Size:** The optimal class size for this class is between 18 and 25 students.