Engineering Faculty Document No. 50-02
April, 2003

TO: Engineering Faculty

FROM: The Faculty of the Agricultural and Biological Engineering

RE: Course Change in title, description, and prerequisites

The faculty of the Department of Agricultural and Biological Engineering has approved the following course change. This action is now submitted to the Engineering Faculty with a recommendation for approval.

FROM:

ABE 556 Food Plant Design and Economics
Sem. 2, Class 3, lab 3 cr. 4.
Prerequisite: ABE 454 and ABE 555 or consent of instructor

Fundamental concepts for food-plant design, estimation of process costs and profitability, optimization of processing systems. Introduction to food-plant layout, utility design, sanitation requirements, and material selection.

TO:

ABE 556 Biological and Food Process Design
Sem.2, Class 3, lab 3 cr. 4.
Prerequisite: ABE 555 or consent of instructor

The course will focus on the synthesis, creation, evaluation and optimization of a process to convert basic biological materials into a finished product. Concepts of material and energy balances, thermodynamics, kinetics, transport phenomena of biological systems will be used to design processes to minimize energy and environmental impacts, and evaluate economic factors while maintaining product quality. Group projects, written and oral reports.

Rationale: The proposed course title and description better reflects the updated content of the course.

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Vincent F. Bralts
Head, Department of Agricultural & Biological Engineering

ABE 556

Biological and Food Process Design

Instructor: Martin Okos

Course Learning Objectives:

Successful completion of the course will enable the students to:

Overall Objectives

1. Incorporate engineering and scientific principles into the analysis and design of a process to convert biological materials into higher valued products given economic, environmental, labor and energy constraints.

Topics

2. Economic aspects of product costs
3. Develop experimental design to identify impact of process variables in product quality
4. Minimizing environmental, energy impact
5. Optimization

Emphasis

6. Communicate technical information
7. Improve computer skills to operate and schedule processes
8. Work in teams to design a biological/food process

Textbook:

Turton, R., R. C. Bailie, W. B. Whiting, and J. A. Shaewitz. 1998. Analysis, Synthesis, and Design of Chemical Processes. B. M. Goodwin (ed.), Prentice-Hall, Inc., Upper Saddle River, New Jersey.

References:

1. Ladisch, Michael, 2001 Bioseparations Engineering: Principles Practice, and Economics. John Wiley and Sons, Inc, New York
2. Holland, F. A., J. Siquiros, S. Santoyo, C. L. Heard, and E. R. Santoyo. 1999. Water Purification Using Heat Pumps. Routledge, New York, N.Y. 184 p.
3. Kessler, H. G. 1981. Food Engineering and Dairy Technology. Verlag A. Kessler, P.O. Box 1721, D-8050 Freising, F. R. Germany. 619 p.
4. Mann, J. G. and Liu, Y. A. 1999. Industrial Water Reuse and Wastewater Minimization. R. Esposito (ed.), McGraw-Hill, New York, N.Y. 523 p.
5. Perry, R. H. and Green, D. W. 1997. Perry's Chemical Engineers' Handbook, 7th Edition. R. H. Perry, D. W. Green, and J. O. Maloney (eds.), McGraw-Hill, New York, N.Y.
6. Rotstein, E., R. P. Singh, and K. Valentas. 1997. Handbook of Food Engineering Practice. K. J. Valentas, E. Rotstein, R. P. Singh (eds.), CRC Press, Boca Raton, NY.
7. Wales, S. M. 1988. Chemical Process Equipment, Selection and Design, Butterworths Series in Chemical Engineering. H. Brenner, A. Acrivos, J. E. Bailey, M. Morari, E. B. Nauman, and R. K. Prud'Homme (eds.), Butterworth Publishers, Stoneham, MA. 755 p.
8. Shuler, M. and F. Kargi. 1992 Bioprocess Engineering – Basic Concepts, Prentice Hall

Course Outline – Weekly Topics:

1 Process Design Considerations and Flowsheet Synthesis
2 Evaluation of Alternatives
3 Equipment Materials Selection
4 Material Handing Equipment Design
5 Heat Transfer Equipment Design
6 Bioreactor Design
7 Separation and Purification Design
8 Process Cost Estimation
9 Engineering Economics and Analysis
10 Profitability and Alternative Investment
11 Optimal Design and Performance
12 Quality Assurance, Safety and Validation
13 Water Purification, Treatment and Reuse
14 Byproduct Treatment and Use
15 Energy Integration