UNIVERSITY OF WASHINGTON

OFFICE OF THE PRESIDENT

Mark A. Emmert, President

March 20, 2008

Dean Matthew O'Donnell
College of Engineering
Box 352180

Dean Paul G. Ramsey
School of Medicine
Box 356350

Dear Matt and Paul:

Based on the recommendation of its Subcommittee on Admissions and Programs, the Faculty Council on Academic Standards has recommended approval of the revised requirements for a Bachelor of Science degree in Bioengineering. A copy of the changes is attached.

I am writing to inform you that the Department of Bioengineering is authorized to specify these requirements beginning spring quarter 2008.

The new requirements should be incorporated in printed statements and in individual department websites as soon as possible. The *General Catalog* website will be updated accordingly by the Registrar's Office.

Sincerely yours,

Mark A. Emmert
President

Enclosure

cc: Professor Paul Yager (with enclosure)
Laura Wright (with enclosure)
Mr. Robert Corbett (with enclosure)
Dr. Deborah H. Wiegand (with enclosure)
Todd Mildon, J.D. (with enclosure BIOEN-20080109)

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Creating & Changing Undergraduate Academic Programs*

After college/school review, send signed original and 8 copies to: University Registrar, 355850

College: Engineering / School of Medicine **Department or Unit:** Bioengineering **Date:** 1/9/2008

New Programs

- ☐ Leading to a Bachelor of _____ *in* _____ *degree*
- ☐ Leading to a Bachelor of _____ *degree with a major in* _____
- ☐ Leading to a _____ Option *within the existing major in* _____
- ☐ Leading to a Minor *in* _____

Changes to existing programs

- ☐ New Admission Requirements for the Major *in* _____ *within the Bachelor of* _____
- ☐ Revised Admission Requirements for the Major *in* _____ *within the Bachelor of* _____
- ☒ Revised Program Requirements for the Major *in* Bioengineering *within the Bachelor of* Science
- ☐ Revised Requirements for the Option *in* _____ *within the major in* _____
- ☐ Revised Requirements for the Minor *in* _____

Other Changes

- ☐ Change name of program *from* _____ *to* _____
- ☐ New or Revised Continuation Policy *for* _____
- ☐ Eliminate program *in* _____

Proposed Effective Date: *(quarter/year)* Spring 2008

Contact Person	Phone Number	Email
Laura Wright	206 543 8958	lew3@u.washington.edu

1. Explanation of and Rationale for Proposed Change: (*Please use additional pages if necessary. For new programs, please include any relevant supporting documentation such as student learning outcomes, projected enrollments, letters of support, and departmental handouts.)*

Our ABET evaluators found that we are short 1.5 credits of engineering. Our current curriculum requires 5 credits of electives outside of bioengineering, to be chosen from a departmentally approved list of math, science, and engineering courses. We propose to restrict 3 of these credits to a departmentally approved list of engineering courses.

This list will include specific courses in bioengineering and in other engineering departments.

We chose 3 credits because several of the engineering courses chosen by our students in the past carry 3 credits, as do a number of our Bioengineering senior electives. The 2 credits left over will become free electives.

** For information about when and how to use this form please go to http://www.washington.edu/faculty/facsenate/councils/teas/1503/.*

Creating & Changing Undergraduate Academic Programs

2. Catalog Copy

A. Catalog Copy as Currently Written *(Include only sections/paragraphs that would be changed if your request is approved. Please cross out or otherwise highlight any deletions.)*

~~4. *Approved Electives (5 credits):* Five additional credits chosen from an approved list of math, science, and engineering courses (see the department's Web page for further information), or from the Bioengineering senior elective list.~~

B. Proposed Catalog Copy, Reflecting Requested Changes *(Include exact wording as you wish it to be shown in the printed catalog. Please underline or otherwise highlight any additions. If needed, attach a separate, expanded version of the changes that might appear in department publications.)*

4. *Approved Electives:* Three credits of approved Engineering Electives chosen from a departmentally approved list OR from additional Bioengineering senior elective credit. See departmental webpage for further information and an approved list.

5. Free electives: 2 credits

3. Signatures *(required)*

Chair/Program Director	Date 1/9/08	Dean Engineering: Medicine:	Date 1-22-08
College Committee Engineering: Medicine:	Date 1/15/08	Faculty Council on Academic Standards	Date 1/29/08 3/7/08

List of Engineering Electives – Approved by Curriculum Committee 1/9/2008

(NOTE: This list is for reference only. This is *not* part of the proposed catalog copy.)

Aeronautics and Astronautics

A A 419 Aerospace Heat Transfer (3)
Fundamentals of conductive, convective, and radiative heat transfer with emphasis on applications to atmospheric and space flight. Prerequisite: PHYS 123; MATH 307. Offered: W.

A A 430 Finite Element Structural Analysis (3)
Introduction to the finite element method and application. One-, two-, and three-dimensional problems including trusses, beams, box beams, plane stress and plane strain analysis, and heat transfer. Use of finite element software. Prerequisite: CEE 220. Offered: A.

Chemical Engineering

CHEM E 310 Material and Energy Balances (4)
Chemical and physical process calculations: steady- and unsteady-state material and energy balances with specific examples in vapor-liquid contact operations and multiphase extraction, and introductory thermochemistry. Prerequisite: either CHEM E 260 or ENGR 260 with either ENGR 142 or CSE 142. Offered: A.

CHEM E 326 Chemical Engineering Thermodynamics (4)
Phase equilibria and chemical equilibria in multicomponent systems; theories of solution; chemical reaction analysis. Prerequisite: CHEM E 310 with either CHEM E 260 or CHEM 456. Offered: W.

CHEM E 330 Transport Processes I (5)
Diffusive transport of momentum, heat and mass; general aspects of fluid flow; the Navier-Stokes equations; one-dimensional flow with engineering applications. Prerequisite: CHEM E 310; either MATH 136 or MATH 307. Offered: W.

CHEM E 340 Transport Processes II (4)
Heat transfer, basic principles, and applications. Conduction, convection, and radiation. Prerequisite: CHEM E 330. Offered: Sp.

CHEM E 345 Introduction to Fuel Cells (3)
Overview of fuel cells, fuel cell efficiency, types of fuel cells, applications of fuel cells, and fuels for fuel cells. Intended for students in science and engineering and fuel cell professionals desiring a technical knowledge of fuel cells. No credit available, if already given for CHEM E 445. Prerequisite: CHEM 162; PHYS 122; recommended CHEM E 260. Offered: A.

CHEM E 465 Reactor Design (4)
Application of chemical kinetics and transport phenomena to the design of chemical reactors; characterization of batch and continuous-flow reactors in homogeneous and heterogeneous systems. Prerequisite: CHEM E 326; CHEM E 340. Offered: A.

CHEM E 481 Process Optimization (3)
Concepts and techniques of optimizing chemical engineering processes and systems, including classical and direct methods of search, linear and nonlinear programming, dynamic programming, statistical experimental design, and evolutionary operation. Offered: Sp.

CHEM E 484 Electronic and Optoelectronic Polymers (3)
Covers the chemistry, physics, materials science, and engineering applications of semiconducting and metallic conjugated polymers. Examines the structural origins of the diverse electronic and optoelectronic properties of conjugated polymers. Exemplifies applications by light-emitting diodes, lasers, solar cells, thin film transistors, electrochromic devices, biosensors, and batteries. Prerequisite: either CHEM 237, CHEM 455, CHEM E 340, or MSE 310. Offered: A.

Civil and Environmental Engineering

CEE 220 Introduction to Mechanics of Materials (4) NW
Introduction to the concepts of stress, deformation, and strain in solid materials. Development of basic relationships between loads, stresses, and deflections of structural and machine elements such as rods, shafts, and beams. Load-carrying capacity of these elements under tension, compression, torsion, bending, and shear forces. Prerequisite: A A 210. Offered: AWSpS.

CEE 342 Fluid Mechanics (4)
Elementary mechanics of incompressible fluids. Hydrostatics. Continuity, energy, and momentum equations. Introduction to potential flow. Resistance phenomena for laminar and turbulent flows. Dynamic similitude. Offered: A.

programmable logic devices, and the design and operation of digital computers, including ALU, memory, and I/O. Weekly laboratories. Prerequisite: CSE 142.

E E 361 Applied Electromagnetics (5)
Introductory electromagnetic field theory and Maxwell's equations in integral and differential forms; uniform plane waves in linear media; boundary conditions and reflection and transmission of waves; guided waves; transmission lines and Smith chart; electrostatics. Prerequisite: 1.0 in E E 233; MATH 324; PHYS 123.

E E 401 Engineering Design in Large Teams (4)
Engineering design process, including project management, team formation, working with technical literature, concept development (e.g., brainstorming, morphological analysis, biomimetics, theory of inventive problem solving), intellectual property, high-tech ventures. Prerequisite: E E 215.

E E 462 Principles of Mobile Robotics (4)
Design-oriented course in autonomous mobile robots. C programming, microprocessors, motors, gears, sensors, advanced sensing techniques, serial communications, PID control, algorithmic control, reactive control, multi-tasking. Laboratory exercises include design, construction, and testing of autonomous mobile robots, which compete at the end of the term.

E E 484 Sensors and Sensor Systems (4)
Introduction to optical and solid-state chemical and physical sensors. Topics include transduction mechanisms, design parameters, fabrication methods and applications.

Engineering

ENGR 360 Introductory Acoustics (3) NW
Introduction to propagation of acoustical waves; emphasis on propagation of sound waves in air, but material is applicable to propagation of sound waves in liquids, including underwater acoustics, and to propagation of stress waves in solids. Includes a historical development of acoustics, terminology, and units employed. Prerequisite: either MATH 136 or MATH 307; PHYS 123. Offered: Sp.

Industrial Engineering

IND E 250 Fundamentals of Engineering Economy (4) NW
Basics of industrial cost analysis and accounting. Application of interest computations to engineering decision making. Analysis of engineering alternatives based on use of interest computations, valuations, depreciation, and cost estimates. Offered: ASp.

IND E 337 Introduction to Manufacturing Systems (4)
Description of manufacturing systems. Includes discussion of current trends in manufacturing. Introduces process flow analysis, manufacturing organizations including job-shop, assembly lines, and group technology, manufacturing inventory philosophies (just-in-time, MRP, OPT), work environment, and work simplification. .

IND E 351 Human Factors in Design (4)
Engineering considerations of the abilities and limitations of the human aspect in the design of operational systems and components. Functional, psychological, physiological, and environmental considerations. Offered: Sp.

IND E 426 Reliability Engineering and System Safety (4)
Reliability and system safety measures. Life distributions and their applications in reliability. System reliability models. Design by reliability and probabilistic design. Reliability and safety analysis through FMECA and FTA. Reliability estimation and measurement by testing for binomial, exponential, and Weibull distributions. Prerequisite: IND E 315. Offered: Sp.

IND E 470 Systems Engineering (4)
Concepts of system approach, system hierarchies, functional analysis, requirements, trade studies, and other concepts used to define and integrate complex engineering systems. Introduction to risk analysis and reliability, failure modes and effects analysis, writing specifications, and lean manufacturing. Offered: jointly with A A 470.

Materials Science and Engineering

MSE 321 Thermodynamics and Phase Equilibrium (4)
Phase equilibria in materials systems of one, two and three components. Determination of phase diagrams. Quantitative applications of thermodynamics to systems of interest to materials scientists; detained review of thermodynamic laws and principles. Offered: A.

interaction between design, materials, and manufacture. Laboratories involve dissection and assembly of several common industrial and consumer products by student teams. Offered: jointly with IND E 295.

M E 333 Introduction to Fluid Mechanics (5)
Introduction to the basic fluid laws and their application. Conservation equations, dynamic similarity, potential flow, boundary-layer concepts, effects of friction, compressible flow, fluid machinery, measurement techniques. Prerequisite: M E 323; either MATH 307 or AMATH 351.

M E 354 Mechanics of Materials Laboratory (5)
Properties and behavior of engineering materials including stress-strain relations, strength, deformation mechanisms, strength, deformation, fracture, creep, and cyclic fatigue. Introduces experimental techniques common to structural engineering, interpretation of experimental data, comparison of measurements to numerical/analytical predictions, and formal, engineering report writing. Lecture and laboratory. Prerequisite: MSE 170, CEE 220.

M E 373 Introduction to System Dynamics (5)
Mathematical modeling, analysis, and design of physical dynamic systems involving energy storage and transfer by lumped-parameter linear elements. Time-domain response by analytical methods and numeric simulation. Laboratory experiments. Prerequisite: either AMATH 351 or MATH 307; either AMATH 352 or MATH 308; E E 215; M E 230.

M E 392 Concurrent Engineering (3)
Focus on the need for and the tools of concurrent engineering in all engineering disciplines. Functional and cross-function organizations, new product development, market-need identification and design for manufacturing are explored. Offered: jointly with IND E 392.

M E 406 Corrosion and Surface Treatment of Materials (3)
Corrosion fundamentals and forms (galvanic, crevice, pitting, stress corrosion, erosion, hydrogen and leaching). Principles of design, materials selection, cathodic protection and surface treatments (coatings, carburizing, nitriding and plating) applied to reduce corrosion. Failure analysis applied to case studies.

M E 415 Sustainability and Design for Environment (3)
Analysis and design of technology systems within the context of the environment, economy, and society. Applies the concepts of resource conservation, pollution prevention, life cycle assessment, and extended product responsibility. Examines the practice, opportunities, and role of engineering, management, and public policy. Offered: jointly with ENVIR 415/CEE 495.

M E 431 Advanced Fluid Mechanics (4)
Advanced topics in fluid mechanics, including kinematics, potential theory and vortex dynamics, viscous flow, turbulence, experimental and numerical methods, and design. Prerequisite: M E 333.

M E 436 Friction and Wear of Materials (3)
Study of principles of friction and wear behavior of materials and of those material properties that affect such behavior. Principles of lubrication. Applications to design of surfaces for wear resistance. Prerequisite: M E 333; M E 356.

M E 440 Advanced Mechanics of Materials and Solids (3) *Labossiere*
Study of mechanics of deformable bodies, including three-dimensional stress and strain tensors and their transformations. Equations of compatibility, continuity and equilibrium. Elastic constants. Failure criteria including fracture, yield and instability. Deflection relations for complex loading and shapes. Indeterminate problems. Design applications and numerical methods. Prerequisite: M E 354.

M E 471 Automatic Control (4)
Dynamic system modeling; control system stability and performance analysis; compensator design by Bode and root-locus methods. Prerequisite: M E 374.

M E 473 Instrumentation (4)
Principles and practice of industrial and laboratory measurement. Dynamics of instrument response; generalized performance analysis of sensor systems; theory of transducers for motion, force, pressure, flow, and other measurements. Lecture and laboratory. Prerequisite: M E 374.

M E 477 Embedded Computing in Mechanical Systems (4)
Analysis of electromechanical systems employing microcomputers for control or data acquisition. Microcomputer architecture, memory organization, assembly language programming, interfaces, and communications. Particular emphasis on design of hardware and software interfaces for real-time interaction with mechanical systems. Weekly laboratory. Prerequisite: M E 374.