The University Of Toledo

Existing Graduate Course Modification Form

* denotes required fields

Contact Person*: Patricia Relue Phone: 530-8098 (xxx - xxxx) Email: patricia.relue@utoledo.edu

Present

Supply all information asked for in this column.(Supply core, research intensive and transfer module info if applicable)

College*: College of Engineering

Dept/Academic Unit*: Bioengineering

Course Alpha/Numeric*: BIOE - 5730

Course Title: Comput Orthopedic Biomechanics

Credit hours: Fixed: 3 or Variable: to

CrossListings: BIOE 4730

Insert

To add a course, type in course ID and click the Insert button.

To remove a course, select the course on left and click the Remove button.

Remove

Prerequisite(s)(if longer than 50 characters, please place it in Catalog Description): BIOE 3110 for level UG with min. grade of D-

Corequisite(s)(if longer than 50 characters, please place it in Catalog Description):

Proposed

Fill in appropriate blanks only where entry differs from first column.

College: --Select a College--

Dept/Academic Unit: --Select a Department--

Course Alpha/Numeric: -

Course Title: Computational Bioengineering

Credit Hours: Fixed: or Variable: to

CrossListings:

Insert

To add a course, type in course ID and click the Insert button.

To remove a course, select the course on left and click the Remove button.

Remove

Prerequisite(s)(if longer than 50 characters, please place it in Catalog Description): permission of instructor

Corequisite(s)(if longer than 50 characters, please place it in Catalog Description):

Catalog Description (*only if changed*) 75 words max:

Introduction to and utilization of computation packages in orthopedic biomechanics. Computer aided design of implants, shape-optimization, finite element analysis of implant performance and failure of musculoskeletal organs, tissues and cells.

Catalog Description (*only if changed*) 75 words max:

Introduction to and utilization of computational packages for bioengineering applications. Introduction to finite element analysis and applications in biomechanics, biofluidics, bioheat transfer, optimization.

Has course content changed? (•) Yes ( ) No

If course content is changed, give a brief topical outline of the revised course below(less than 200 words)

Course content has been broadened from orthopedic biomechanics to a wider range of topics. Content includes applications of computer software such as COMSOL Multiphysics, AutoCAD, SolidWorks, and MATLAB to problems in heat transfer, mechanics, mass transfer and chemical kinetics.

Proposed effective term*: 201710 (e.g. 201140 for 2011 Fall)

File Type	View File
Syllabus	View

List any course or courses to be deleted. Effective Date:

Effective Date:

Comments/Notes:

This course was modified and approved at the UG level in Feb. 2014, but a graduate course modification was not submitted at that time.

Rationale:

Approval:

Department Curriculum Authority:	Patricia A. Relue	Date	2017/04/26
Department Chairperson:	Arunan Nadarajah	Date	2017/04/26
College Curriculum Authority or Chair:	Efstratios Nikolaidis	Date	2017/05/17
College Dean:	Mohamed Samir Hefzy	Date	2017/05/17
Graduate Council:	Andrea Kalinoski (GCEC for GC 08-11-	Date	2017/08/11
Dean of Graduate Studies:	Amanda C. Bryant-Friedrich	Date	2017/08/14
Office of the Provost :	margaret F. Traband	Date	2017/08/15

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Administrative Use Only

Effective Date: 2018/01/15 (YYYY/MM/DD)

CIP Code:

Subsidy Taxonomy:

Program Code:

Instructional Level:

Registrar's Office Use Only

Processed in Banner on:

Processed in Banner by:

Banner Subject Code:

Banner Course Number:

Banner Term Code:

Banner Course Title:

Computational Bioengineering

The University of Toledo
Department of Bioengineering / College of Engineering
BIOE 4730/5730: 001 (CRN: 19513/19514)

Instructor:	Dr. Halim Ayan	**Term**:	Spring 2017
Email:	halim.ayan@utoledo.edu	**Class Location**:	Palmer 2020
Office Hours:	M,W 1-2pm @ Nitschke 5027, also by appointment	**Class Day/Time**:	TR 11:00 am – 12:15 pm
		Lab Location:	Palmer 2020
Office Location:	Nitschke 5027	**Credit Hours**:	3
Office Phone:	419-530-8126		

COURSE/CATALOG DESCRIPTION

Introduction to and utilization of computational packages for bioengineering applications. Introduction to finite element analysis and applications in biomechanics, biofluidics, bioheat transfer, optimization.

COURSE OVERVIEW

Students will develop an understanding of the need for computational techniques and how to formulate mathematical solutions to a variety of problems in bioengineering. Students will apply the material learned in earlier courses (statics, dynamics, fluid mechanics, materials, computer applications for bioengineering, anatomy), as well as use computer techniques in biomechanics, biofluidics, and bioheat transfer problems.
Topics: Applications of computer software such as COMSOL, MATLAB, and SolidWorks, finite element method and finite difference method, biomechanics, biofluidics, bioheat transfer, optimization theory, analysis of stresses in femur model with complex loads.

STUDENT LEARNING OUTCOMES / EDUCATIONAL OBJECTIVES

Students should be able to: a) apply knowledge of mathematics, science, and engineering b) identify, formulate, and solve engineering problems c) use the techniques, skills, and modern engineering tools necessary for engineering practice

PREREQUISITES AND COREQUISITES

BIOE 3110 for level UG with min. grade of D - and BIOE 1200 for level UG with min. grade of D.

REQUIRED TEXTS AND ANCILLARY MATERIALS

No textbook required. Class handouts, notes, and journal articles will be used.

TECHNOLOGY REQUIREMENTS

Access to Blackboard is required. Course syllabus, lecture material, reading assignments, and lab material will be posted on Blackboard. Additionally access to lab computers requires engineering account login (ECC account credentials).

UNIVERSITY POLICIES

Policy Statement on Non-Discrimination on the basis of Disability (ADA)

The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

Academic Accommodations

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding

Prepared: 08/24/2016. Revised: *None*

academic accommodations/adjustments in this course please contact the Student Disability Services Office. (Rocket Hall 1820; officeofaccessibility@utoledo.edu ; 419.530.4981)

ACADEMIC POLICIES

Absence Policy: Class attendance will be monitored. Although it is optional, students are expected to be prompt and regular in class attendance as it will be beneficial for them. Students are responsible for all materials, announcements, schedule changes etc. discussed in the class. If you must miss a class for a university approved reason, (documented sickness, required military training, religious holiday, etc.), then you must contact me at halim.ayan@utoledo.edu or leave a written note with the BIOE secretary for me beforehand.

Academic dishonesty: Please refer to student handbook for additional information concerning academic dishonesty. The College and University policies on academic dishonesty may be found in the appendices of the MIME Undergraduate Handbook on the web at: http://www-mime.eng.utoledo.edu/programs/u_graduate/handbook/ugradhandbook.html

GRADING

I. There will be minimum four (4) homework (HW) assignments. Extra assignment(s) may be offered at instructor's discretion. No late homework will be accepted.

II. There will be one mid-term project assignment (chicken femur) given.

III. There will be one semester long term project. Each term project will be done as a group of two (2). Each group will deliver a written report and oral presentation at the end of the semester. Group members will receive the same grade for their term projects.

IV. The final grade will be based on a weighted average. The weights assigned to graded elements are: HW assignments 40% (total), Midterm project 20%, and Term (Final) project 40% (report and presentation).

V. Final letter grades will be assigned on a 100 point scale as shown below:

A	95% or higher	A-	90-94.9%	B+	87-89.9%
B	83-86.9%	B-	80-82.9%	C+	77-79.9%
C	73-76.9%	C-	70-72.9%	D+	67-69.9%
D	63-66.9%	D-	55-62.9%	F	Below 55.0%

VI. If an assignment due date is missed, the instructor is to be notified beforehand, by email or phone if necessary. In an emergency situation, the instructor is to be notified as soon as possible. Do not simply wait until the next class period.

Midterm Grading Midterm grades will be given after Week-8, and grade will be calculated based on points possible (total worth of points assigned) until then. Midterm grades are important for students to assess their performance before the end of semester.

Final Grading Final grading will be based on 100% points possible during the entire semester. Letter grade will be assigned according to the scale given above.

COMMUNICATION GUIDELINES

Students are required to check their UT email accounts regularly for communications from the instructor (mostly via Blackboard). Students are required to their UT email accounts to send email to the instructor.

STUDENT SUPPORT SERVICES

BIOE Student services: Ms. Robin Van Hoy, Asst Director of Department Student Services, Department of Bioengineering, Nitschke Hall Room 5051-B, Robin.VanHoy@utoledo.edu, Phone: 419-530-8078, Fax: 419-530-8076

COURSE SCHEDULE

See Blackboard page for the detailed class schedule (under "Syllabus and Class schedule" content area). Course schedule is subject to change, as needed. Tentative schedule is provided below:

Date	Tentative class schedule
1/10/2017	Introduction, syllabus
1/12/2017	Introduction to Comp. Bioe. & Finite element method (FEM)
1/17/2017	FEM, example
1/19/2017	FEM, example
1/24/2017	Introduction to Finite difference method (FDM), example
1/26/2017	FDM, heat transfer background
1/31/2017	*No lecture*
2/2/2017	FDM, example and **HW1** assignment
2/7/2017	COMSOL lab session-1 (intro and simple model) @ PL2020
2/9/2017	COMSOL lab session-2 (intro cont'd & reporting in COMSOL) @ PL2020
2/14/2017	COMSOL lab session-3 (introduction to convergence analysis, **HW2** assignment) @ **PL2020**
2/16/2017	COMSOL lab session-4 (Convergence analysis cont'd, importing 3D model to COMSOL) @ **PL2020**
2/21/2017	COMSOL lab session-5 (Solidworks, 3D from 2D, **Midterm project** & **Final project** assignments) @ PL202
2/23/2017	Dr. Goel's lecture
2/28/2017	Individual discussions on final project
3/2/2017	3-minute presentations on final project topics
3/7/2017	**spring break**
3/9/2017	**spring break**
3/14/2017	3-minute presentations on final project topics (cont'd)
3/16/2017	COMSOL **multiphysics** examples @ PL2020 (Blood flow) (Midterm project deadline 11:00 am)
3/21/2017	COMSOL **multiphysics** examples @ PL2020 (Chemical kinetics)
3/23/2017	COMSOL **multiphysics** examples @ PL2020 (Geometry manipulation, creating multiple domains)
3/28/2017	Intro to Monte Carlo Simulation
3/30/2017	Monte Carlo Simulation
4/4/2017	Guest talk : Dr. Dan Gehling
4/6/2017	Intro to Optimization
4/11/2017	Optimization with MATLAB and MS Excel
4/13/2017	Optimization with SolidWorks
4/18/2017	Final project presentations
4/20/2017	Final project presentations
4/25/2017	Final project presentations
4/27/2017	*last day of the class* **Final Project Report deadline (9:30 am)**
5/6/2017	HW3 deadline (12-noon)