



HLC Accreditation 2016-2017

Federal Compliance Form

College of Engineering

Biomedical Engineering

Appendix A: Supplement A2 Biomedical Engineering Syllabi

Additional information:



BME 335, Biomedical Computer Applications, Fall 2016

Instructor:	Gary Brooking, PhD
Department:	Biomedical Engineering
Office Location:	Engineering Building 204D
Telephone:	(316) 978-7637
Email:	gary.brooking@wichita.edu
Preferred Method of Contact:	Email
Office Hours:	Monday 3:30-5:00; Tuesday 1:30-2:30pm
Classroom; Days/Time:	Engineering Building 209, Mon-Wed: 1:30 – 2:45 PM
Prerequisites:	MATH 242
Teaching Assistant:	Rachael Jones; Jonathan Whitford
TA Contact Info:	rachel.jones.worthington@gmail.com ; whitfordja@gmail.com

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. Any changes will be posted onto Blackboard and will be discussed in class.

Course Description

This course introduces students to software packages and applications applicable to the biomedical engineering curriculum and discipline. Course content includes three-dimensional graphical computer aided design software (e.g., Solidworks), mathematical programming software and applications (e.g., MATLAB), and data acquisition and analysis software (e.g., LabVIEW).

Definition of Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Course Goals and Measurable Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Demonstrate competence in modern engineering tools for the engineering practice, with the following software:
 - a. MatLab numerical analysis tool
 - b. LabVIEW data acquisition and processing tool
 - c. Solid Works graphical design tool
2. Demonstrate an ability to solve engineering design problems
3. Demonstrate the skills to effectively communicate engineering data
4. Develop the skills to work effectively in teams

Assignments and Weighting

Section	Assignment	Weight	Objective Measured
MatLab:			
	Homework's (x3)	10%	1a,2
	Project	15%	1a,2,3,4
	Exam	7%	1a
LabVIEW:			
	Homework's (x3)	10%	1b
	Project	12%	1b,3,4
	Exam	8%	1b,2
SolidWorks:			
	Homework's (x3)	10%	1c
	Project	18%	1c,2,3,4
	Exam	10%	1c,2

ABET BME Student Learning Outcomes for this course:

At the end of the semester the students will be asked to fill out a survey as to how well this course has met the ABET student learning outcomes.

ABET-c:	Ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
ABET-d:	An ability to function on multidisciplinary teams
ABET-e:	Ability to identify, formulate, and solve engineering problems
ABET-k:	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Required Texts/Readings Textbook

There are no required textbooks for this course. Reading assignments will be given on Blackboard and in class.

Other Readings

William J Palm III (2011). Introduction to MATLAB for Engineers, McGraw Hill, ISBN 978-0-07-353487-9

Other Equipment/Materials

There are free limited time versions for MatLab, LabView and Solidworks. Students may consider making use of the these trial versions for use at home, or purchasing the full product if they believe it will useful for them in future studies.

Class Protocol

- When emailing me, please place "**BME335**" at the beginning of the subject line. This will aid me in responding to your email quicker.
- You must have use of your own calculator (scientific or financial) during every class, lab, quiz and exam.
- Cellular phones must be in "vibration" or "silent" mode during the class and labs. In quizzes and exams all cell phones must be turned off. You cannot use your cell phone as a calculator.
- You are responsible to check your school registered emails at least once a day. All material and assignments will be posted on Blackboard and in addition I may contact you about the homework,

quizzes, and exams through your email. Make sure you are able to receive emails and your mailbox is not full.

- Any grades posted on Blackboard are only a copy of the official grades which are kept on a private spreadsheet. There may occasionally be a difference which if brought to my attention, I am willing to explain and/or correct.
- Class attendance and participation are considered important parts of the learning process, and therefore it is expected. Note that because of the broad multidisciplinary nature of the course, material presented in class may not be covered in the readings. The student is responsible to know all the material presented, whether from the readings or from class. The student is expected to expend sufficient effort to learn the material, to respect the instructor, and to be attentive and participatory in the classroom and labs.
- Examination materials will be drawn from the textbooks, lectures, student presentations, and homework. Pop quizzes will be given as and when necessary.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Percentages	Letter grade	Grade Points	Interpretation
93% - 100%	A	4.00	<i>The A range denotes excellent performance.</i>
90% - 92%	A-	3.67	
87% - 89%	B+	3.33	
83% - 86%	B	3.00	<i>The B range denotes good performance.</i>
80% - 82%	B-	2.67	
77% - 79%	C+	2.33	
73% - 76%	C	2.00	<i>The C range denotes satisfactory performance.</i>
70% - 72%	C-	1.67	
67% - 69%	D+	1.33	
63% - 66%	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
60% - 62%	D-	0.67	
<60%	F	0.00	<i>F denotes failing performance.</i>

The evaluation of your work is my professional judgment and is not subject to negotiation. Incomplete "I" will not be given out, except under very special circumstances (e.g., illness, serious accident, death in family, natural disaster, etc.). You will be asked to produce evidence of these circumstances. An incomplete for a course must be removed by the end of the next semester or it will change to F.

Extra Credit

Extra Credit questions may be available on certain quizzes or homework.

Late Assignments

You will be allowed one late Homework submission for the class without requiring any explanation if it is submitted within one week of the due date. A penalty of up to 20% per day will be applied for late homework and project submissions. All assignments are due as indicated on Blackboard.

Missed Assignments and Exams

Anyone missing an exam, quiz, presentation without notifying the instructor in advance will **NOT** be allowed to make up the missed exam, quiz or presentation. Documentation of reason for missing may be required by instructor.

Important Academic Dates:

For Fall Semester 2016, classes begin August, 22nd 2016, and end December, 8th, 2016. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is November, 1st 2016. The final exam period is December, 12th 2016 from 3:00 – 4:50pm.

Tentative Schedule

A tentative schedule is posted to BlackBoard. This schedule may change during the semester and any changes will be posted to Blackboard and discussed in class.

Diversity and Inclusive Excellence

Wichita State University is committed to achieving “Inclusive Excellence” and institutional strength through curricula, co-curricula, and other practices, which promote and encourage the intermingling of its students, faculty, and staff from different backgrounds, in a challenging intellectual and multicultural climate that is marked by respect and appreciation for the spectrum of human diversity. The University is also committed to an “all-inclusive” diversity and does not discriminate on the basis of race, ethnicity, gender, gender identity/expression, sexual orientation, age, socioeconomic status, disability, religion, national origin, or military status.

Academic Integrity

Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm.

The first offense in violation of academic integrity will result in a ‘zero’ for the assignment; the second offense will result in an F for the course. Additionally, students will view the slide show on ‘Ethical Use of Engineering Information’ (http://library.wichita.edu/aveng/Ethics_vid/Ethics.htm).

Intellectual Property

Wichita State University students are subject to Board of Regents and University policies (see http://webs.wichita.edu/inaudit/ch9_10.htm) regarding intellectual property rights. Any questions regarding these rights and any disputes that arise under these policies will be resolved by the President of the University, or the President’s designee, and such decision will constitute the final decision.

Disabilities

If you have a physical, psychiatric/emotional, or learning disability that may impact on your ability to carry out assigned course work, I encourage you to contact the Office of Disability Services (DS). The office is located in Grace Wilkie Annex, room 150, (316) 978-3309 (voice/tty). DS will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for

you. All information and documentation of your disability is confidential and will not be released by DS without your written permission.

Counseling & Testing

The WSU Counseling & Testing Center provides professional counseling services to students, faculty and staff; administers tests and offers test preparation workshops; and presents programs on topics promoting personal and professional growth. Services are low cost and confidential. They are located in room 320 of Grace Wilkie Hall, and their phone number is (316) 978-3440. The Counseling & Testing Center is open on all days that the University is officially open. If you have a mental health emergency during the times that the Counseling & Testing Center is not open, please call COMCARE Crisis Services at (316) 660-7500.

Shocker Alert System

Get the emergency information you need instantly and effortlessly! With the Shocker Alert System, we will contact you by email the moment there is an emergency or weather alert that affects the campus. Sign up at www.wichita.edu/alert.

Student Health Services

WSU's Student Health clinic is located in Ahlberg Hall. Hours are 8:00am to 4:00pm (8:00pm on Fridays), though the clinic may be closed occasionally on Wednesdays from noon to 1:30pm. In addition to outpatient and preventive care (including immunizations, a prescription service, and testing/counseling for sexually transmitted infections), Student Health can handle minor injuries. All services are confidential. For more information see www.wichita.edu/studenthealth.

Title IX

Title IX of the Educational Amendments of 1972 prohibits discrimination based on sex in any educational institution that receives federal funding. Wichita State University does not tolerate sex discrimination of any kind including: sexual misconduct; sexual harassment; relationship/sexual violence and stalking. These incidents may interfere with or limit an individual's ability to benefit from or participate in the University's educational programs or activities. Students are asked to immediately report incidents to the University Police Department, (316) 978- 3450 or the Title IX Coordinator (316) 978-5177. Students may also report incidents to an instructor, faculty or staff member, who are required by law to notify the Title IX Coordinator. If a student wishes to keep the information confidential, the student may speak with staff members of the Counseling and Testing Center (316) 978-3440 or Student Health Services (316)978-3620. For more information about Title IX, go to:

<http://www.wichita.edu/thisis/home/?u=titleixf>

The Heskett Center and Campus Recreation

Whether you want to be active on campus, relieve the stress from classes or take care of your body, Wichita State Campus Recreation is the place for you. Campus Recreation, located inside the Heskett Center, contributes to the health, education, and development of Wichita State University students, faculty, staff, alumni, and community members by offering quality programs and services. With many programs and facilities which are free to all students and members, Campus Recreation offers its members limitless opportunities. For more information about our services see www.wichita.edu/heskett.

Copyright Notice

Course materials prepared by the instructor, together with the content of all lectures presented by the instructor, are the property of the instructor. Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

BME 335 Fall 2016 Tentative Topic Guide

Date	Topic	Prep/Due
22-Aug	Flow charts and Programming	
24	Labview Basics - Logic	Labview Video 1-3; Workbook 1-4
29	Data Flow, Case Structure	Labview Video 4-7; Workbook 5-10
31	Loops; While; For, Shift Registers	Labview WorkBook: 11 12 Homework 1 : Workbook 4,5 & 6
5-Sep	Labor Day	
7	Debugging	Labview WorkBook: 13 - 14 Homework 2 : Workbook 8,9 & 10
12	Design Front Panels; Sub Vis	Homework 3 : WorkBook: 12,13 & 14
14	Labview Exam	Labview Project Hand in
19	Intro to Matlab	Preview Videos Topic 2 -4
21	1 & 2 - Vectors and Graphs	Matlab Problems 5b,6,7,8
26	3 & 4 - Curve fitting and interpolation	Problems 9,10,12,13,14
28	5 - Programng: Input Statements	Problems 15,16,17 Homework 4 - #7,9,10,14,16
3-Oct	6 - Conditional Statements	Problems 18,19,20
5	7 & 8 - Loops; 9 - Debugging	Problems 21,22,23,24,25
10	10 - Arrays	Homework 5 - #19,21,22,26a,27
12		Homework 6
17	Fall Break	
19	Matlab Exam	MATLAB Project Hand in
24	SolidWorks - Basic Functions	Lesson 1 & 2
26	40min Running Start	Lesson 3
31	Assembly	Lesson 4
2-Nov	Toolbox Basics	Lesson 5 & 6 Homework 7 : Lesson 5-Bearing Block Assembly
7	Drawing Basics	Lesson 7 & 9 Homework 8 : Lesson 7-Exercise
9	eDrawings; Revolve and Sweep	Lesson 10
14	Loft Features	Lesson 11 & 12 Homework 9 : Lesson 11-Exercise Exploded View
16	Visualisation	Lesson 8
21	SimulationXpress	Project
23	Design Tables	Project
28		Project
30	Thanksgiving	
5-Dec		Solidworks Project Hand in
7-Dec	Solidworks Exam (3:00 - 4:50pm)	



BME 452 - Biomechanics, Fall 2016

Instructor:	Nils Hakansson
Office Location:	EB120G
Telephone:	(316) 978-5909
Email:	nils.hakansson@wichita.edu
Email (preferred):	Tues. 4:00-5:00pm; Thur. 1:15-2:30pm; by appointment
Classroom; Days/Time:	EB202; 9:30 - 10:45 MW
Prerequisites:	MATH 243 (Calculus II); AE 223 (Statics)

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves.

Course Description:

BME 452 (3 credit hours) – A foundation of mechanics in addressing biomedical engineering problems. Introduction to the basic concepts and methods of mechanics as applied to biological tissues. Introduces statics, dynamics and mechanics applied to the human body including the following: (1) vectors, moments, equilibrium, (2) kinetics and kinematics including displacement, rotation, acceleration and deformation, (3) stress and strain, (4) equations of motion, (5) impulse and momentum, and (6) mechanical properties of biological tissues.

Definition of a Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe human motion using precise mechanical and anatomical terminology (assessed in quizzes, exams, and lab reports).
2. Develop an understanding of and ability to quantify linear and angular characteristics of motion (assessed in quizzes and exams)
3. Ability to generate equations of motion for linear and angular motions using force, work, and energy methods (assessed in quizzes and exams).
4. Apply engineering mechanics force and deformation principles related to human movement and biological tissues (assessed in quizzes and exams).
5. Increase written and oral communication skills (assessed in lab reports, the term paper and verbal discussions).

Required Texts/Readings

Textbook

Ozkaya N and Nordin M. Fundamentals of Biomechanics: Equilibrium, Motion, and Deformation, 3rd Edition, Springer, N.Y., 2012. [ISBN-13: 978-1461411499]

Other Readings

To be assigned

Class Protocol

Class attendance and participation are considered important parts of the learning process, and therefore it is expected and strongly encouraged. Note that because of the broad multidisciplinary nature of the course, material presented in class may not be covered in the readings. The student is responsible to know all the material presented, whether from the readings or from class. The student is expected to expend sufficient effort to learn the material and to be attentive and participatory in the classroom.

Do not arrive late for class

No cell phone or non-course related computer use in class during lecture

No cell phone use during exams

Academic Integrity

Students are responsible for knowing and following the Student Code of Conduct

http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy

http://webs.wichita.edu/inaudit/ch2_17.htm.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Undergraduate Grading Scale

Percentage	Letter grade	Grade Points	Interpretation
100% - 93%	A	4.00	<i>The A range denotes excellent performance.</i>
92% - 90%	A-	3.67	
89% - 87%	B+	3.33	
86% - 83%	B	3.00	<i>The B range denotes good performance.</i>
82% - 80%	B-	2.67	
79% - 77%	C+	2.33	
76% - 73%	C	2.00	<i>The C range denotes satisfactory performance.</i>
72% - 70%	C-	1.67	
69% - 67%	D+	1.33	
66% - 63%	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
62% - 60%	D-	0.67	
<60%	F	0.00	<i>F denotes failing performance.</i>

The evaluation of your work is my professional judgment and is not subject to negotiation. Incomplete "I" will not be given out, except under very special circumstances (e.g., illness, serious accident, death in family, natural disaster, etc.).

Assignments and Weighting

Exams (Mid-term, Final)	25%
Weekly Quizzes/Homework	40%
Labs/Reports	15%
Term paper/Presentations	15%
Class participation	5%

Extra Credit

Extra Credit is not available in this course

Missed Assignments and Exams

Anyone missing an exam, quiz, presentation without notifying the instructor at least 48 hours in advance will NOT be allowed to make up the missed exam, quiz or presentation.

Important Academic Dates

For fall semester 2016, classes begin August 22, 2016, and end December 8, 2016. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is September 19, 2016. There are no classes on December 9, 2016. The final exam period is December 10 - 16, 2016.

About this Syllabus

This syllabus is not a contract. The instructor reserves and retains the right to alter the course requirements and/or assignments based on new materials, class discussions, current events or other legitimate pedagogical objectives.

Disabilities

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Diversity and Inclusive

Wichita State University is committed to being an inclusive campus that reflects the evolving diversity of society. To further this goal, WSU does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, gender identity, gender expression, marital status, political affiliation, status as a veteran, genetic information or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Executive Director, Office of Equal Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0138; telephone (316) 978-3186.

Intellectual Property

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Shocker Alert System

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BME 452 - Biomechanics, Fall 2016, Tentative Schedule

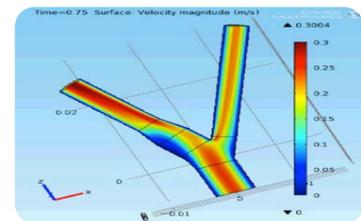
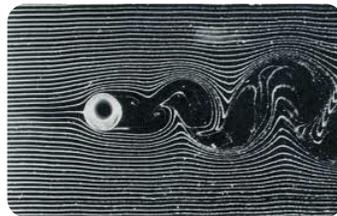
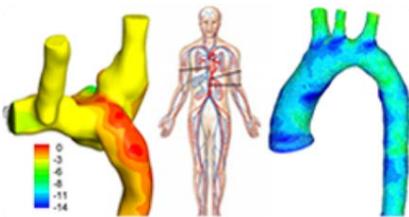
Date	Week	Topics	Source
August 22	1	Introduction Anatomical Terminology Standard Human	Notes, Chapter 1
August 29	2	Force Vector Moment and Torque	Chapter 2 Chapter 3
September 5	3	Static: Analyses of Systems in Equilibrium	Chapter 4
September 12	4	Application of Statics to Biomechanics	Chapter 5
September 19	5	Introduction to Dynamics Term Paper Topic due	Chapter 6
September 26	6	Linear Kinematics	Chapter 7
October 3	7	Linear Kinetics	Chapter 8
October 10	8	Angular Kinematics Angular Kinetics	Chapter 9 Chapter 10
Fall Break Oct. 17 October 19	9	Exam 1	
October 24	10	Term Paper reference summaries due	
October 31	11	Impulse Momentum	Chapter 11
November 7	12	Introduction to Deformable Body Mechanics Stress and Strain	Chapter 12 Chapter 13
November 14	13	Multi-axial Deformations and Stress Analyses	Chapter 14
November 21	14	Mechanical Properties of Biological Tissues Term paper due	Chapter 15
November 28	15	Mechanical Properties of Biological Tissues	Chapter 15
December 5	16	Term paper presentations Review	
December 12	Final Exam	Monday, December 12, 9:00 – 10:50am, 202 Engineering Building	

Note: Three laboratory activities will be conducted during the semester when scheduling permits.



BME 462, Introduction to Biofluids, Fall 2016

Instructor:	Kim Cluff, PhD
Department	Biomedical Engineering
Office Location:	Engineering Building rm#204a
Telephone:	(316) 978-5905
Email:	kim.cluff@wichita.edu
Preferred method of contact:	Email
Office Hours:	By appointment & Tuesdays 10:45am-11:30am
Classroom; Days/Time:	202 Engineering Building Tuesdays and Thursdays 9:30-10:45am
Prerequisites:	AE 223 (Statics), MATH 555 (Diff Equ.), and Co-req: Biol 223 (Human Anatomy), ME 398 (Thermodynamics)



How to use this syllabus

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Academic Honesty

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Each situation will be handled on a case by case basis, however, in general the first offense in violation of academic integrity will result in a 'zero' for the assignment, the second offense will result in an F for the course. Additionally, students must review the slide show on 'Ethical Use of Engineering Information' (http://library.wichita.edu/aveng/Ethics_vid/Ethics.htm).

Course Description

Biofluids is a course for undergraduates that provides a background and introduction to the conservation laws which form the foundation of fluid mechanics, and their application to bioengineering related problems including blood flow in the vascular system and other biological flows within the human body. Topics include dimensional analysis, definition of system, conservation of mass and energy, and conservation of momentum. This course elaborates on the application of fluid mechanics principles to major human organ systems.

Definition of a Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Go to:

http://webs.wichita.edu/?u=academicaffairs&p=/definitionandassignmentofcredithours/_for_the_policy_and_examples_for_different_types_of_courses_and_credit_hour_offerings.

A "credit hour" is a measure of graduate or undergraduate academic work represented in intended learning outcomes and verified by evidence of student achievement that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for each week of instructional time for approximately fifteen weeks for one semester, or an equivalent amount of work over a different amount of time.

Measurable Student Learning Objectives

After active participation in this course and an effort to learn the materials, students will have the knowledge and skills to be able to:

1. Develop and apply equations that govern pressure variation within a static fluid (Assessed in homework 2, quizzes, and exams))
2. Calculate shear stress and calculate buoyancy forces that act on objects immersed within a fluid (Assessed in homework 2, quizzes, and exams)
3. Formulate and apply equations of conservation laws and how they apply to biological and medical systems
 - a. Conservation of mass (Assessed in homework 3, quizzes, and exams)
 - b. Conservation of momentum (Assessed in homework 5, quizzes, and exams)
 - c. Conservation of energy ((Assessed in homework 7, quizzes, and exams)

Required Texts/Readings

Textbook

Biofluid Mechanics An Introduction to Fluid Mechanics, Microcirculation, and Microcirculation by David Rubenstein, Wei Yin, and Mary Frame
ISBN: 978-0-12-381383-

Class Protocol

Class attendance and participation are considered important parts of the learning process, and therefore it is expected and strongly encouraged. Note that because of the broad multidisciplinary nature of the course, material presented in class may not be covered in the readings. The student is responsible to know all the material presented, whether from the readings or from class. The student is expected to expend sufficient effort to learn the material, to respect the instructor, and to be attentive and participatory in the classroom and labs.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Quizzes	20%
Homework	30%
Mid-Term Exam	25%
Final Exam	25%

Percentages	Letter grade	Grade Points	Interpretation
100% - 93%	A	4.00	<i>The A range denotes excellent performance.</i>
92% - 90%	A-	3.67	
89% - 87%	B+	3.33	
86% - 83%	B	3.00	<i>The B range denotes good performance.</i>
82% - 80%	B-	2.67	
79% - 77%	C+	2.33	
76% - 73%	C	2.00	<i>The C range denotes satisfactory performance.</i>
72% - 70%	C-	1.67	
69% - 67%	D+	1.33	
66% - 63%	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
62% - 60%	D-	0.67	
<60%	F	0.00	<i>F denotes failing performance.</i>

Assignments

Exercise problems will be assign at the end of some lectures and the assignment due dates will be given to you for each assignment at that time. A list of assignments, value toward final grade, and tentative due dates are given below in the tentative schedule.

Late Assignments

As each of us have times in which we get sick, very busy, or have an emergency, one assignment may be turned in late without penalty if turned in within 2 calendar days of original due date AND you must notify the instructor by email. All other late assignments will not be accepted. In case of a family or medical emergency, the student must email the instructor within 2 calendar days **and** establish when the assignment will be turned in.

Important Academic Dates

The last date to drop a class and receive a W (withdrawn) instead of F (failed) is the end of the 10th week. Please refer to the academic catalog for further important dates.

For the Fall semester 2016, classes begin August 22nd, 2016, and end December 7th, 2016. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is the 10th week of class, Nov. 1st, 2016. The final exam is Dec 13th, 2016.

Exams

- Exam dates:
 - Midterm Exam: ~October
 - Final Exam: Tuesday, Dec. 13th, 9:00am – 10:50am
- Exams will include a mixture of multiple-choice, true-false, short answer, graphing, and number problems. Number problems will be similar to those done in lecture and examples in the text book.
- Exams are to be taken at the assigned time and date. No make-up exams will be given, except under medical/family emergency situations.

ABET student outcomes for this course

- a. An ability to apply knowledge of mathematics, science and engineering
- e. An ability to identify, formulate, and solve engineering problems

BSBME Program Outcomes

1. An understanding of biology and physiology
2. The capability to apply advanced mathematics to solve problems at the interface of engineering and biology

Disabilities

If you have a physical, psychiatric/emotional, or learning disability that may impact on your ability to carry out assigned course work, I encourage you to contact the Office of Disability Services (DS).

The office is located in Grace Wilkie Annex, room 150, (316) 978-3309 (voice/tty) (316-854-3032 videophone). DS will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for you. All information and documentation of your disability is confidential and will not be released by DS without your written permission.

Counseling & Testing

The WSU Counseling & Testing Center provides professional counseling services to students, faculty and staff; administers tests and offers test preparation workshops; and presents programs on topics promoting personal and professional growth. Services are low cost and confidential. They are located in room 320 of Grace Wilkie Hall, and their phone number is (316) 978-3440. The Counseling & Testing Center is open on all days that the University is officially open. If you have a mental health emergency during the times that the Counseling & Testing Center is not open, please call COMCARE Crisis Services at (316) 660-7500.

Diversity and Inclusive

Wichita State University is committed to being an inclusive campus that reflects the evolving diversity of society. To further this goal, WSU does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, gender identity, gender expression, marital status, political affiliation, status as a veteran, genetic information or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Executive Director, Office of Equal Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0138; telephone (316) 978-3186.

Intellectual Property

Wichita State University students are subject to Board of Regents and University policies (see http://webs.wichita.edu/inaudit/ch9_10.htm) regarding intellectual property rights. Any questions

regarding these rights and any disputes that arise under these policies will be resolved by the President of the University, or the President's designee, and such decision will constitute the final decision.

Shocker Alert System

Get the emergency information you need instantly and effortlessly! With the Shocker Alert System, we will contact you by email the moment there is an emergency or weather alert that affects the campus. Sign up at www.wichita.edu/alert.

Student Health Services (Suggested)

WSU's Student Health clinic is located in 209 Ahlberg Hall. Hours are 8:00am to 7:00pm (8:00 am to 5:00 pm on Fridays), though the clinic may be closed occasionally on Wednesdays from noon to 1:30pm. The telephone number is (316) 978-3620. In addition to outpatient and preventive care (including immunizations, a prescription service, and testing/counseling for sexually transmitted infections), Student Health can handle minor injuries. All services are confidential. For more information see www.wichita.edu/studenthealth.

Title IX

Title IX of the Educational Amendments of 1972 prohibits discrimination based on sex in any educational institution that receives federal funding. Wichita State University does not tolerate sex discrimination of any kind including: sexual misconduct; sexual harassment; relationship/sexual violence and stalking. These incidents may interfere with or limit an individual's ability to benefit from or participate in the University's educational programs or activities. Students are asked to immediately report incidents to the University Police Department, (316) 978- 3450 or the Title IX Coordinator (316) 978-5177. Students may also report incidents to an instructor, faculty or staff member, who are required by law to notify the Title IX Coordinator. If a student wishes to keep the information confidential, the student may speak with staff members of the Counseling and Testing Center (316) 978-3440 or Student Health Services (316)978-3620. For more information about Title IX, go to: <http://www.wichita.edu/thisis/home/?u=titleixf>

The Heskett Center and Campus Recreation

Whether you are wanting to be active on campus, relieve the stress from classes or take care of your body, Wichita State Campus Recreation is the place for you. Campus Recreation, located inside the Heskett Center, contributes to the health, education, and development of Wichita State University students, faculty, staff, alumni, and community members by offering quality programs and services. With many programs and facilities which are free to all students and members, Campus Recreation offers its members limitless opportunities. For more information about our services see www.wichita.edu/heskett.

Video and Audio Recording

Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

**BME462: Introduction to Biofluids, Tentative Schedule
Fall 2016**

Week	Date	Topic	Assigned Reading	Homework
1	23-Aug	Course Policy		
	25-Aug	Ch. 1: Indroduction	Ch1	
2	30-Aug	Ch. 2: Fundamentals of Fluid Mechanics	Ch2.1 - 2.6	
	1-Sep	Ch. 2: Fundamentals of Fluid Mechanics	Ch2.7-2.8	
3	6-Sep	Ch. 2: Fundamentals of Fluid Mechanics		
	8-Sep	Ch. 3: Fluid Statics	Ch3.1	
4	13-Sep	Ch. 3: Fluid Statics		HMK1 (Vorticity, Shear stress, non-Newtonian fluids)
	15-Sep	Ch. 3: Buoyancy	Ch3.2	
5	20-Sep	Ch. 3: Buoyancy		
	22-Sep	Ch. 3: Conservation of Mass	Ch3.3	HMK2 (Fluid statics)
6	27-Sep	Ch. 3: Conservation of Mass		
	29-Sep	Ch. 3: Conservation of Mass		
7	4-Oct	Ch. 13: Computational Fluid Dynamics	Ch13.1	
	6-Oct	(no Class - BMES conference Oct. 5-8)		HMK3 (Conservation of Mass)
8	11-Oct	Review		
	13-Oct	EXAM (Ch1-Ch3.3)		
9	18-Oct	Fall Break (no class Oct. 15-18)		
	20-Oct	Ch. 13: Computational Fluid Dynamics		HMK4 (Computational Fluid Dynamics)
10	25-Oct	Ch. 3: Conservation of Momentum	Ch3.4	
	27-Oct	Ch. 3: Conservation of Momentum		
11	1-Nov	Ch. 3: Conservation of Momentum		
	3-Nov	Ch. 3: Navier-Stokes Equation	Ch3.7	HMK5 (Conservation of Momentum)
12	8-Nov	Ch. 3: Bernoullis Principle	Ch3.8	
	10-Nov	Ch. 4: Macrocirculation (The Heart)	Ch. 4	HMK6 (Bernoullies equation)
13	15-Nov	Ch. 4: Macrocirculation (The Heart)		
	17-Nov	Ch. 7: Heat transfer (Fouiers Law)		
14	22-Nov	Ch. 7: Heat transfer (Fouiers Law)		
	24-Nov	Thanks Giving Day (no class Nov. 23-27)		
15	29-	Ch. 7: Mass Transfer (Ficks Law)		HMK7 (Heat & Mass Transfer)

	Nov			
	1-Dec	Ch. 7 Mass Transfer (Ficks Law)		
16	6-Dec	Ch. 7: Mass Transfer (Ficks Law)		
	8-Dec	Last day of class (Review)		
17	13-Dec	Final Exam: 9:00am - 10:50am (EB rm#202)		
	15-Dec	no class		



BME 477, Introduction to Biomaterials, Fall 2016

Instructor:	Anil Mahapatro, PhD
Department:	Biomedical Engineering
Office Location:	Engineering Building, 204G
Telephone:	(316) 978-5912
Email:	anil.mahapatro@wichita.edu
Preferred Method of Contact	Email
Office Hours:	Tues. & Thurs.: 1.45pm-2.45 pm & 4.00 pm-5.00pm & or by appt.
Classroom; Days/Time:	Engineering Building 202, Tues. and Thurs., 12:30 am - 1:45 pm;
Prerequisites:	Undergraduate level CHEM 211 Minimum Grade of C and PHYS 213 Minimum Grade of C or PHYS 313 Minimum Grade of C.

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. If any changes are made it will be communicated in class.

Academic Honesty

Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm.

When cases of academic dishonesty are discovered the following academic sanctions will be pursued:
First offence: re-do assignment or fail assignment (at discretion of instructor)
Second offence: Fail course and/or begin proceedings against a student under the Code of Conduct.]

Course Description

Major classes of materials used in medical devices including polymers, metals, ceramics, composites, and natural materials will be discussed. Biocompatibility of biomaterials, host reactions to biomaterials, immune response, wound healing, biomaterial implantation and acute inflammation, thrombosis, infection, tumorigenesis and calcification of biomaterials, testing and degradation of biomaterials in vivo are covered. Specific biomaterials applications such as cardiovascular devices, drug delivery and tissue engineering are covered. Additionally, biomedical device design and regulatory issues are also discussed.

Definition of a Credit Hour

3 Credit hour class: Success in this 3 hour credit course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per week with 1 of the hours used for lecture) for instruction and preparation/ studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- Differentiate different class of materials used in medicine (assessed in exam 1)

- Identify and articulate the structure, property and applications of different metals, polymers, natural materials and ceramics used in medicine (assessed in exam 1, 2, 3 and final exam)
- Define the principle of biocompatibility and describe the biological cell interactions with biomaterials (assessed in exam 3)
- Explain the degradation of biomaterials in the biological environment (assessed in exam1, 2 and 3)
- Assess the basic design and regulatory issues during product development of biomaterials (assessed in exam 3, final exam and case study 2)
- Recognize materials design and selection criterion for representative clinical applications (assessed in final exam and case study 2)

ABET student outcomes for this course

- b. Ability to design and conduct experiments, as well as to analyze and interpret data (assessed in case study 1)
- f. An understanding of professional and ethical responsibility (assessed in final exam)

BSBE Program Outcomes

- 1. An understanding of biology and physiology (assessed in exam 3)
- 4. Address problems associated with the interaction between living and non-living materials and systems (assessed in exam 3)

Required Texts/Readings

Textbook: Biomaterials Science: An Introduction to Materials in Medicine, Author(s): Ratner & Hoffman & Schoen & Lemons, 3rd Edition, Academic Press, ISBN: 9780123746269

Other Readings

Supplemental materials and handouts related to the course will be provided

Class Protocol

All students are expected to attend all sessions of the class. Regular participation in the class is mandatory. Examination materials will be drawn from the textbooks, lectures, student presentations, and homework. Pop quiz will be given as and when necessary. No makeups for quizzes.

- Please do not arrive late for class; students consistently arriving late (over 10min after start of class) will receive a penalty (at discretion of instructor) towards the class participation grade.
- No cell phone, mobile devices (tablets etc.) and computer use in class during lecture.
- No cell phone use during exams
- **Disruptive behavior:** Disruptive behavior in class room will be dealt with policies associated with student conduct. Disruptive behavior in the classroom is defined as “behavior a reasonable person would view as being likely to substantially or repeatedly interfere with the conduct of a class. Examples include repeated, unauthorized use of cell phones in the classroom; persistent speaking without being recognized; or making physical threats”

[<http://webs.wichita.edu/?u=studentconduct&p=/facultyfaqs/>]

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Percentages	Letter grade	Grade Points	Interpretation
undergraduates			
90-100	A	4.00	<i>The A range denotes excellent performance.</i>
87-89	A-	3.70	
84-86	B+	3.30	
80-83	B	3.00	<i>The B range denotes good performance.</i>
77-79	B-	2.70	
74-76	C+	2.30	
70-73	C	2.00	<i>The C range denotes satisfactory performance.</i>
67-69	C-	1.70	
64-66	D+	1.30	
60-63	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
57-59	D-	0.70	
<57	F	0.00	<i>F denotes failing performance.</i>

Assignments

Final course grades will be based on total weighted points using the percentages below:

Quizzes, Homework and Class Participation*	5%
Case Study 1(Labs)	10%
Case Study 2	25%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	15%

*unexcused absence of more than 10% of lectures will result in '0' in this category. It is mandatory for students to attend 1) days where details of case study 2 will be discussed and 2) all days for the final case study 2 presentations; unexcused absence on any of the above days will result in '0' in this category.

Incomplete Grade:

This grade may be given at the discretion of the course instructor to a student who has been making satisfactory progress in a course except for work which could not be completed due to circumstances beyond your control (such as, illness, serious accident, death in family, natural disaster, etc.). You will be asked to produce evidence of these circumstances. If incomplete works due to these extraordinary events take place before the last date to withdraw, then you should withdraw from the course. An incomplete for a course must be removed by the end of the next semester or it will change to F.

Extra Credit

No extra credit available

Late Assignments

Late assignments will not be accepted. Under very special circumstances (eg; illness, serious accident, death in family, natural disaster etc) late assignments may be accepted at the sole discretion of the instructor with a significant late penalty.

Missed Assignments and Exams

Anyone missing an exam / quiz without notifying the instructor in advance will NOT be allowed to have a make-up exam / quiz. Missed exam / quiz will be allowed to be made up only with documented medical certificate.

Important Academic Dates

For Fall semester 2016, classes begin August 22nd, 2016 and ends December 8th, 2016. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is November 1st, 2016. There are no classes on September 5th (labor day), October 15-18th (Fall break) and November 23-27th (Thanksgiving Recess). The final exam period is December 10th-15th, 2016.

UNIVERSITY POLICIES

About this Syllabus

This syllabus is not a contract. The instructor reserves and retains the right to alter the course requirements and/or assignments based on new materials, class discussions, current events or other legitimate pedagogical objectives.

Disabilities

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diversity of society. To further this goal, WSU does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, gender identity, gender expression, marital status, political affiliation, status as a veteran, genetic information or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Executive Director, Office of Equal Employment Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0138; telephone (316) 978-3186.

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Title IX

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The Heskett Center and Campus Recreation

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Video and Audio Recording

Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

Tentative Schedule**:

Week	Topics, Readings, Assignments, Deadlines
1	Introduction to course and syllabus, Metallic Biomaterials
2	Metallic Biomaterials, Metallic corrosion
3	Introduction to polymers
4	Test 1, Biodegradable polymers
5	Biodegradable polymers, Natural polymers
6	Hydrogels, Ceramics
7	Ceramics, Characterization of materials
8	Characterization of materials, Test 2
9	Case study 2: Background information and details of case study,
10	Cell interactions with biomaterials, Wound healing and host response to biomaterials,
11	Case Study 1: Lab experiments
12	Case Study 1: Lab experiments, Test 3
13	Cardiovascular Devices, Orthopedic devices
14	Tissue engineering, Dental Applications
15	Ethical Issues, Drug delivery, Biosensors and other applications
16	Case Study 2 Presentations
Final	

***The schedule is subject to change at the discretion of the instructor or depending upon the progress of the class*



BME 480, Bioinstrumentation, Spring 2017

Instructor:	Gary Brooking, PhD
Department:	Biomedical Engineering
Office Location:	Engineering Building 204D
Telephone:	(316) 978-7637
Email:	gary.brooking@wichita.edu
Preferred Method of Contact:	Email
Office Hours:	Tue 2:00 – 3:30pm and Wed 11:00-12:30 pm
Classroom; Days/Time:	EB202; Tuesday and Thursday 9:30 – 10:45 am
Prerequisites:	BME 335; EE 282; IME 254
Teaching Assistant:	TBA
TA Contact Info:	TBA

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. Any changes will be posted onto Blackboard and will be discussed in class.

Definition of Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Course Description

Introduction to engineering aspects of the detection, acquisition, processing, and display of signals from living systems; biomedical sensors for measurements of biopotentials, force, displacement, blood pressure, blood flow, heart sounds, respiration, and temperature; biomedical devices; medical imaging instrumentation.

Course Goals and Measurable Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Demonstrate skills in instrumentation and basic electronic components required for signal detection.
2. Demonstrate understanding of bio-signals and how they are measured
3. Demonstrate knowledge of the required regulations for human subject testing
4. Demonstrate skills for acquiring and analyze bio-signals using appropriate statistic and software like MatLab, Labview, and Excel.
5. Develop and execute an experiment to validate a hypothesis
6. Convey experimental data and conclusions in clear and concise format.
7. Develop team work skills

Assignments and Weighting

Assignment	Weight	Outcome Measured
Quizzes (3)	10%	1,2
Homework	10%	1,2,3
Lab Reports (4)	25%	1,2,4,6
Mid-Term Exam	10%	1,2
CITI Training and IRB Application	10%	3
Group Project (Written)	15%	3,4,5,6,7
Poster & Oral Presentation	10%	4,5,6,7
Final Exam	10%	2,4,7

ABET BME Student Learning Outcomes for this course:

At the end of the semester the students will be asked to fill out a survey as to how well this course has met the ABET student learning outcomes.

ABET-a:	An ability to apply knowledge of mathematics, science and engineering
ABET-b:	An ability to design and conduct experiments, as well as to analyze and interpret data
ABET-i:	Recognition of the need for, and an ability to engage in life-long learning
BE-1:	An understanding of biology and physiology
BE-2:	The capability to apply advanced mathematics to solve problems at the interface of engineering and biology
BE-3:	The ability to make measurements on and interpret data from living systems
BE-4:	Address problems associated with the interaction between living and non-living materials and systems

Required Texts/Readings Textbook

There are no required textbooks for this course. Reading assignments will be given on Blackboard and in class.

Other Readings

Webster JG. Medical Instrumentation: Application and Design, 4th Edition, 2009. [ISBN 978-0-471-67600-3]

National Instruments, LabVIEW: Getting Started with LabVIEW, June 2010. [373427G-01]

William J Palm III (2011). Introduction to MATLAB for Engineers, McGraw Hill, ISBN 978-0-07-353487-9

Other Equipment/Materials

You will be utilizing Arduino's for the development of basic instruments and will be required to purchase one. I recommend the following two kits:

- 16Hertz UNO R3 Beginner Starter Kit
- 16 Hertz UNO R3 Ultimate Stater Kit

However any Arduino UNO R3 or compatible kit with a breadboard would be sufficient.

There are also free limited time version of MatLab, LabView and Solidworks. Students may consider making use of the these trial versions for use at home, or purchasing the full product if they believe it will useful for them in future studies.

Class Protocol

- When emailing me, please place “**BME480**” at the beginning of the subject line. This will aid me in responding to your email quicker.
- You must have use of your own calculator (scientific or financial) during every class, lab, quiz and exam.
- Cellular phones must be in “vibration” or “silent” mode during the class and labs. In quizzes and exams all cell phones must be turned off. You cannot use your cell phone as a calculator.
- You are responsible to check your school registered emails at least once a day. All material and assignments will be posted on Blackboard and in addition I may contact you about the homework, quizzes, and exams through your email. Make sure you are able to receive emails and your mailbox is not full.
- Any grades posted on Blackboard are only a copy of the official grades which are kept on a private spreadsheet. There may occasionally be a difference which if brought to my attention, I am willing to explain and/or correct.
- Class attendance and participation are considered important parts of the learning process, and therefore it is expected. Note that because of the broad multidisciplinary nature of the course, material presented in class may not be covered in the readings. The student is responsible to know all the material presented, whether from the readings or from class. The student is expected to expend sufficient effort to learn the material, to respect the instructor, and to be attentive and participatory in the classroom and labs.
- Examination materials will be drawn from the textbooks, lectures, student presentations, and homework. Pop quizzes will be given as and when necessary.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Percentages	Letter grade	Grade Points	Interpretation
93% - 100%	A	4.00	<i>The A range denotes excellent performance.</i>
90% - 92%	A-	3.67	
87% - 89%	B+	3.33	
83% - 86%	B	3.00	<i>The B range denotes good performance.</i>
80% - 82%	B-	2.67	
77% - 79%	C+	2.33	
73% - 76%	C	2.00	<i>The C range denotes satisfactory performance.</i>
70% - 72%	C-	1.67	
67% - 69%	D+	1.33	
63% - 66%	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
60% - 62%	D-	0.67	
<60%	F	0.00	<i>F denotes failing performance.</i>

The evaluation of your work is my professional judgment and is not subject to negotiation. Incomplete “I” will not be given out, except under very special circumstances (e.g., illness, serious accident, death in family, natural disaster, etc.). You will be asked to produce evidence of these circumstances. An incomplete for a course must be removed by the end of the next semester or it will change to F.

Extra Credit

Extra Credit questions may be available on certain quizzes or homework.

Late Assignments

You will be allowed one late Homework submission for the class without requiring any explanation if it is submitted within one week of the due date. A penalty of up to 20% per day will be applied for late homework and project submissions. All assignments are due as indicated on Blackboard.

Missed Assignments and Exams

Anyone missing an exam, quiz, presentation without notifying the instructor in advance will **NOT** be allowed to make up the missed exam, quiz or presentation. Documentation of reason for missing may be required by instructor.

Important Academic Dates:

For Spring Semester 2017, classes begin January, 17th 2017, and end May, 4th, 2017. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is March, 31st 2017. The final exam period is May, ___ 2016 from _____ pm.

Tentative Schedule

A tentative schedule is posted to Blackboard. This schedule may change during the semester and any changes will be posted to Blackboard and discussed in class.

Diversity and Inclusive Excellence

Wichita State University is committed to achieving “Inclusive Excellence” and institutional strength through curricula, co-curricula, and other practices, which promote and encourage the intermingling of its students, faculty, and staff from different backgrounds, in a challenging intellectual and multicultural climate that is marked by respect and appreciation for the spectrum of human diversity. The University is also committed to an “all-inclusive” diversity and does not discriminate on the basis of race, ethnicity, gender, gender identity/expression, sexual orientation, age, socioeconomic status, disability, religion, national origin, or military status.

Academic Integrity

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Counseling & Testing

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BME480 Bio-Instrumentation, Spring 2016, Tentative Schedule

Week	Date	Topics, Readings, Assignments, Deadlines	Grp	Homework / Lab Reports
1	1-17-16 1-19-16	1. Introduction; Measurement Principles 2. Arduino		
2	1-24-16 1-26-16	3. Bio Instrument Constraints Lab 1: Intro to Arduino	Indv	
3	1-31-16 2-2-16	4. Basic Sensors and Electrical Principles Lab 2: Introduction to LabVIEW, Multisim and Biomedical Tool Box	A	HW1 – Lab2 (2/9) Arduino Tut 4 Pg55 Challenge 4f (2%)
4	2-7-16 2-9-16	5. Analog signals and conditioning Quiz 1 (3.3%) Lab 3: Start Wearable sensors	Indv	HW2 – Lab2 (2/9) (2%)
5	2-14-16 2-16-16	Lab 4: Filters Lab 3: Wearable sensors (Cont)	A Indv	HW3 – Lab4 (2%)
6	2-21-16 2-23-16	6. Digital Signals and Conditioning Lab 5: R2R DA Converters	A	Lab3 Report Due (Indv) (5%)
7	2-28-16 3-2-16	7. Biopotentials (Quiz 2) (3.3%) Lab 6: Op-Amps and active filters – part 1	A	HW4 – Lab6 (3/4) (2%)
8	3-7-16 3-9-16	8. EMG Measurements and Amplifiers Lab 7: Op-Amps and active filters – part2	B	HW5 – Lab7 (3/11) (2%)
9	3-14-16 3-16-16	Mid-term Review Lab 8: EMG		
10	3-21-16 3-23-16	Spring Break Spring Break	B	
11	3-28-16 3-30-16	Mid-term Exam (10%) Lab 9: ECG Measurement of ECG	B	Lab 8 Report Due (10%)
12	4-4-16 4-6-16	IRB - Group project proposal presentations Lab 10: Blood Pressure Measurement (Sound; Flow; Volume)	C B	Choose a Project CITI Training (Ind) (5%)
13	4-11-16 4-13-16	9. Biostatistic review Biostatistics for Group project		Lab 9 or 10 Report Due (10%)
14	4-18-16 4-20-16	10. <i>Intro to Ultrasound</i> Quiz 3 (3.3%) - Group project Updates	C	IRB Submission (5%)
15	4-25-16 4-27-16	Group project Updates	C	
16	5-2-16 5-4-16	Group project Updates Poster Presentations (10%)	C	Project Report (15%)
Final Exam	5-9-16	Tuesday, May 10 th 9:30 – 10:50pm. (10%)		



BME 482, Design of Biodevices, Fall 2016

Instructor:	Gary Brooking, PhD
Department:	Biomedical Engineering
Office Location:	Engineering Building 204D
Telephone:	(316) 978-7637
Email:	gary.brooking@wichita.edu
Preferred Method of Contact:	Email
Office Hours:	Monday 3:30-5:00; Tuesday 1:30-2:30pm
Classroom; Days/Time:	EB210, Tuesday & Thursday, 2:45 pm – 4:00 pm;
Prerequisites:	BME 355 and program consent

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. Any changes will be posted onto Blackboard and will be discussed in class.

Course Description

This course discusses the overview of device definitions, selection and use of materials in medical devices, product development and documentation, regulation and testing of medical devices, reliability and liability, licensing and patents, manufacturing and quality control, biocompatibility, FDA and ISO 10993 biological evaluations. It provides an overview of the multiple issues in designing a marketable medical device, including the design process from clinical problem definition through prototype and clinical testing to market readiness. Case studies will be discussed. Students must be within three semesters of graduation in order to take this course.

Definition of Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Course Goals and Measurable Student Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Define the key principles in designing a marketable medical device
2. Demonstrate the methods to implement product design criterion
3. Demonstrate skills to utilize product design tools
4. Demonstrate understanding of current federal regulatory process in bring a medical device to market
5. Demonstrate the ability to identify relevant standards for product development and testing
6. Define the process involved with protecting intellectual property

Grading Assignments

Grading: Final course grades will be based on total weighted points using the percentages below:

Assignment	Weight	Outcome Measured
Homework (3)	15%	1,2
Quizzes (3)	15%	3,4,5
Product Design Specification Presentation	10%	2
Product Design Specification Report	10%	2,3
Concept Generation Presentation	10%	3,4,5,6
Concept Generation Report	15%	1,3,4,5,6
Business Canvass 1	5%	1,3
Business Canvass 2	5%	1,3
E-Team Grant	15%	1,2,3,4,6

ABET BME Student Learning Outcomes for this course:

At the end of the semester the students will be asked to fill out a survey as to how well this course has met the ABET student learning outcomes.

ABET-c:	Ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
ABET-g:	Ability to communicate effectively
ABET-i:	Recognition of the need for, and ability to engage in life-long learning
ABET-k:	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Required Texts/Readings

Engineering Design, Author(s): George Dieter and Linda C. Schmidt, 5th Edition, McGraw Hill, ISBN: 9780073398143

Other Readings

- Design of Biomedical Devices, Paul H. King and Richard C. Fries, 2009, ISBN: 9781420061796
- “Biodesign”, Zenios, Makower and Yock, Cambridge University Press, 2015
- Supplemental materials and handouts related to the course will be provided

Class Protocol

- When emailing me, please place “**BME482**” at the beginning of the subject line. This will aid me in responding to your email quicker.
- You must have use of your own calculator (scientific or financial) during every class, lab, quiz and exam.

- Cellular phones must be in “vibration” or “silent” mode during the class and labs. In quizzes and exams all cell phones must be turned off. You cannot use your cell phone as a calculator.
- You are responsible to check your school registered emails at least once a day. All material and assignments will be posted on Blackboard and in addition I may contact you about the homework, quizzes, and exams through your email. Make sure you are able to receive emails and your mailbox is not full.
- Any grades posted on Blackboard are only a copy of the official grades which are kept on a private spreadsheet. There may occasionally be a difference which if brought to my attention, I am willing to explain and/or correct.
- Class attendance and participation are considered important parts of the learning process, and therefore it is expected. Note that because of the broad multidisciplinary nature of the course, material presented in class may not be covered in the readings. The student is responsible to know all the material presented, whether from the readings or from class. The student is expected to expend sufficient effort to learn the material, to respect the instructor, and to be attentive and participatory in the classroom and labs.
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Grading Scale

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77% - 79%	C+	2.33	
73% - 76%	C	2.00	<i>The C range denotes satisfactory performance.</i>
70% - 72%	C-	1.67	
67% - 69%	D+	1.33	
63% - 66%	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
60% - 62%	D-	0.67	
<60%	F	0.00	<i>F denotes failing performance.</i>

The evaluation of your work is my professional judgment and is not subject to negotiation. Incomplete “I” will not be given out, except under very special circumstances (e.g., illness, serious accident, death

in family, natural disaster, etc.). You will be asked to produce evidence of these circumstances. An incomplete for a course must be removed by the end of the next semester or it will change to F.

Extra Credit

Extra Credit questions may be available on certain quizzes or homework.

Late Assignments

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BME 482, Design of Biodevices, Fall 2016, Tentative Course Schedule

Week	Date	Topic	Assignments
1	Aug 23 Aug 25	Introduction to biomedical engineering design Product development process	
2	Aug 30 Sept 1	Problem Presentation Problem definition and need identification	HW1: Need/Project Presentation
3	Sept 6 Sept 8	Problem Definition Team behavior and tools	
4	Sept 13 Sept 15	Gathering information & IP Concept Generation	CITI Reports
5	Sept 20 Sept 22	Regulatory Basics and Reimbursement Decision making and concept selection	
6	Sept 27 Sept 29	Interim Report 1 - PDS	Interim Report 1 - PDS
7	Oct 4 Oct 6	Quiz 1	Quiz 1
8	Oct 11 Oct 13	Prototype design and development (Config Design) Materials evaluation and selection	
9	Oct 18 Oct 20	Fall Break Marketing & Business Plans	
10	Oct 25 Oct 27	FDA, regulatory standards and policies, product documentation Safety engineering, reliability and quality optimization	Business Canvass 1
11	Nov 1 Nov 3	Quiz 2 Human Factors and Life Long Learning	Quiz 2
12	Nov 8 Nov 10	Medical devices sterilization, post market considerations Materials consideration	
13	Nov 15 Nov 17	Standards Embodiment Design Presentations	Interim Report 2 - Concepts
14	Nov 22 Nov 24	Quiz 3 Thanksgiving	Quiz 3
15	Nov 29 Dec 1	Teams progress presentations	
16	Dec 6 Dec 8	Conceptual Presentations	Business Canvass 2 E-Team Grant

BME 585, Biomedical Engineering Capstone Design I, Fall 2016

Instructor:	Gary Brooking, PhD
Department:	Biomedical Engineering
Office Location:	Engineering Building 204D
Telephone:	(316) 978-7637
Email:	gary.brooking@wichita.edu
Preferred Method of Contact:	Email
Office Hours:	Monday 3:30-5:00; Tuesday 1:30-2:30pm
Classroom; Days/Time:	Engineering Building 209, Mon-Wed: 11:00 – 12:15 PM
Prerequisites:	BME 335 and program consent

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Course Description

This course focuses on the process of strategic clinical problem solving and innovation through evaluation of real world diagnostic processes, current therapeutic approaches and clinical outcomes. Students work in teams to identify and critically evaluate unmet medical or clinical needs through the use of a biodesign and innovation process, including clinical needs finding through on-site observations, stakeholder assessments, needs statement development and concept generation. For undergraduate students only. Students must be within three semesters of graduation in order to take this course.

Course Goals and Measurable Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Identify multiple clinical needs through meaningful observations at clinical sites and customer interviews
2. Develop appropriate needs statements from the needs finding process
3. Demonstrate selection of appropriate need
4. Generate multiple concepts through the ideation and brainstorming process
5. Identify critical components for successful business opportunities
6. Identify and implement key requirements for effective teams
7. Demonstrate professional skills working with sponsor

Assignments and Weighting

Assignment	Weight	Outcome Measured
Homework	6%	1,2,6
Quizzes	9%	1,2,3,4
Individual Site Visit Reports (x2)	10%	1,2,7
Midterm Needs Presentation	10%	1,2,3
Preliminary Project Report	5%	1,2,3
Business Canvass	5%	5
Sponsor Presentation	10%	3,5,7
Project Notebook	5%	1,7
Final Project Presentation	15%	2,3,4,5
Final Project Paper	15%	2,3,4,5,6
Team Blog	5%	6
Team Reviews	5%	6

Recommended Textbook

BIODESIGN: The Process of Innovating Medical Technologies, Paul Yock, Stefanos Zenios, Josh Makower, Cambridge University Press, 2015. ISBN 978-1-107-08735-4.

Other Readings

Business Model Generation, Alexander Osterwalder, John Wiley & Son, ISBN:978-0470-87641-1

ABET BME Student Learning Outcomes for this course:

At the end of the semester the students will be asked to fill out a survey as to how well this course has met the following ABET student learning outcomes.

ABET-d	An ability to function on multidisciplinary teams
ABET-f	Understanding of professional and ethical responsibility
ABET-g	Ability to communicate effectively
ABET-h	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
ABET-i	Recognition for the need for, and ability to engage in life-long learning
ABET-j	Knowledge of contemporary issues
ABET-k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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Extra Credit

Extra Credit is not available in this course.

Late Assignments

You will be allowed one late Homework submission for the class without requiring any explanation if it is submitted within one week of the due date. A penalty of up to 20% per day will be applied for late homework and project submissions. All assignments are due as indicated on Blackboard.

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Get the emergency information you need instantly and effortlessly! With the Shocker Alert System, we will contact you by email the moment there is an emergency or weather alert that affects the campus. Sign up at www.wichita.edu/alert.

Student Health Services

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Title IX

Title IX of the Educational Amendments of 1972 prohibits discrimination based on sex in any educational institution that receives federal funding. Wichita State University does not tolerate sex discrimination of any kind including: sexual misconduct; sexual harassment; relationship/sexual violence and stalking. These incidents may interfere with or limit an individual's ability to benefit from or participate in the University's educational programs or activities. Students are asked to immediately report incidents to the University Police Department, (316) 978- 3450 or the Title IX Coordinator (316) 978-5177. Students may also report incidents to an instructor, faculty or staff member, who are required by law to notify the Title IX Coordinator. If a student wishes to keep the information confidential, the student may speak with staff members of the Counseling and Testing Center (316) 978-3440 or Student Health Services (316)978-3620. For more information about Title IX, go to: <http://www.wichita.edu/thisis/home/?u=titleixf>

The Heskett Center and Campus Recreation

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members limitless opportunities. For more information about our services see www.wichita.edu/heskett.

Copyright Notice

Course materials prepared by the instructor, together with the content of all lectures presented by the instructor, are the property of the instructor. Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

BIOE 585 Capstone Design I, Fall 2016, Tentative Schedule

Wk	Date	Topic	Topic/Video Prep	Assignments Due
1	Aug 22	Introduction and Course Description: Strategic Focus 1.1 Needs Finding: Strategic focus Notebooks/Journals	1. Strategic Focus - DesJardins 2. Greg_Lambrecht_Needs Finding_Lessons Learnt b. Defining Need c. Need Scoping	First and Second Site Selection (prior to class)
1	Aug 24	Needs Exploration 1.2	3. Todd_Brinton_Needs Finding & Validation 4. Needs Statement – Dimeo b. Needs Statement Develop c. Example Needs Statements	Homework 1: Observation Paper Review
2	Aug 29	HIPPA Needs Statement 1.3	5. Todd_Brinton_Needs Screening_Disease states 6. Awair_ Questioning Existing Solution Paradigms 7. Stefanos_Zenios Stakeholder	Homework 2: Campus Needs Statement
2	Aug 31	Disease State Fundamentals 2.1 Existing Solutions 2.2 Stakeholder Analysis 2.3	8. Market Analysis – DesJardins 9. Needs Filtering - Dimeo	Quiz 1
3-5	Sept 5 Sept 23	First Clinical Site Observation	Josh Makower-The Perfect Storm in MedTech	Sept 26 - First site visits report
6-8	Sept 26 Oct 14	Second Clinical Site Observation		Oct 17 –Second site visit report
9	Oct 17	Fall Break		
9	Oct 19	Team Presentations Site Visits (5min)		Team Reports site visits Project Team selection
10	Oct 24	Needs Selection 2.5 Team Work	10. Bill Tobin – 5 Videos on Team Development	Quiz 2
10	Oct 26	Guest Lecturer (Mr Damiano)	11. Using the Need Specification to Guide Brainstorming b. Prompts for Structure 12. George_Kembel Brainstorming	Homework 3 – Team survey
11	Oct 31	Market Analysis 2.4; Dr. Jim Wolff, CFE - Market Analysis	13. Brainstorming - DesJardins 14. Ross_Jaffe_Marketing Strategy	
11	Nov 2	Market Analysis 2.4 Dr. Jim Wolff, CFE - Business Plan Development, Funding;	15. Josh Makower – What is a Business Model 16. Josh Makower Choosing a Business Model	Initial Business Model Canvas
12	Nov 7	Guest Lecturer (Mr Watson)	17. IDEO Creativity (9 videos)	Quiz 3
12	Nov 9	Ideation 3.1 Initial Concept Selection 3.2		
13	Nov 14	Team Status Reports	18. How has US reimbursement landscape changed in the last 3-5 years	Team Status Reports
13	Nov 16	Team Status Reports		Team Status Reports
14	Nov 21	Practice Presentations		Practice Team Presentations
14	Nov 23	Practice Presentations		
15	Nov 28	On Site Team Presentations		
15	Nov 30	On Site Team Presentations		
16	Dec 5	On Site Team Presentations		
16	Dec 7	Final Presentations and Project Hand in		



BME 585 Capstone Design II Spring 2017 Tentative Schedule

Wk	Date	Activity	Task Due
1	Jan 17	Introduction Lecture	
2	Jan 24	Lecture; Design Concepts	
3	Jan 31	Jeremy Hill (CEDBR) – Data Sources	Final Project Design Decided Status Reports 1
4	Feb 7	John Gendron – Network Kansas	Product Pitch (7min max) Biodesign Business Canvas (1st – 1%)
5	Feb 14		WSU New Ventures “Intent to Compete” Biodesign Business Canvas (2nd – 2%)
6	Feb 21	Guest Lecturer – Dr Kit Vaughan	New Ventures Business Summary (5%)
7	Feb 28	Guest Lecturer – Dr Waston Medical Device Entrepreneur	Status Report 2
8	Mar 7	Preliminary Design Presentation	Interview reports (5%) Preliminary Design Report (5%)
10	Mar 14	Status Report 3	EOH Registration due March 24
9	Mar 21	Spring Break	
11	Mar 28	Final Design Presentation (10%)	2nd Competition (BME Start/RESNA/..)
12	Apr 4	Status Report 4	Final Design Report (individual 10%)
13	Apr 11	Status Report 5	Biodesign Business Canvas (Final -2%)
14	Apr 18	Prototype Presentation	Prototype Presentation (10%) <i>There will be an opportunity to refine/correct Prototype</i>
15	Apr 25	BIOE Exit Exam – Required (10%)	Consultation Report (5%)
16	May 2	Engineering Open House (EOH)	Poster/Oral Presentation (10%) Project Notebook (individual 5%)
17	May 9 10:00	Final	Final Project Presentations (10%) Final Project Report (10%)

Note: The above schedule is tentative. Every effort will be made to follow the above schedule. However, if unforeseen circumstances arise, the schedule may change. Every effort will be made to give you as much advance warning as possible.



BME 590, Independent Study and Research, Fall 2016

Instructor:	Michael J. Jorgensen, PhD
Department:	Biomedical Engineering
Office Location:	204E Engineering Building
Telephone:	316-978-5904
Email:	michael.jorgensen@wichita.edu
Preferred Method of Contact:	email
Office Hours:	Appointment only
Classroom; Days/Time:	N/A
Prerequisites:	Instructor consent

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. Changes to this syllabus will be communicated verbally as well as by email.

Academic Honesty

Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm.

Course Description

Independent study or research directed by a faculty member affiliated with Biomedical Engineering. May be repeated for credit. A maximum of 3 credit hours may be applied toward graduation. For undergraduate students only.

Definition of a Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Go to: <http://webs.wichita.edu/?u=academicaffairs&p=/definitionandassignmentofcredithours/> for the policy and examples for different types of courses and credit hour offerings.

Measurable Student Learning Outcomes

Upon successful completion of this course, students will have:

1. Identified a topic for study in consultation with the instructor
2. Evaluated the topic in terms of its relevance to the discipline
3. Reviewed appropriate resources, e.g., readings, appropriate to the topic
4. Engaged in assessment covering the topic to assure competency in topic area

Required Texts/Readings Textbook

The readings will be determined based on the topic of the independent study/research to be performed by the students.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Points/percentages, as instructor chooses	Letter grade	Grade Points	Interpretation
93 – 100	A	4.00	<i>The A range denotes excellent performance.</i>
90 – 92	A-	3.70	
87 – 89	B+	3.30	
83 – 86	B	3.00	<i>The B range denotes good performance.</i>
80 – 82	B-	2.70	
77 – 79	C+	2.30	
73 – 76	C	2.00	<i>The C range denotes satisfactory performance.</i>
70 – 72	C-	1.70	
67 – 69	D+	1.30	
63 – 66	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
60 – 62	D-	0.70	
<60	F	0.00	<i>F denotes failing performance.</i>

Assignments

Please see tentative schedule for assignments and due dates

Extra Credit

Extra credit is not available for this course

Late Assignments

Credit will not be given for late assignments

Important Academic Dates

For Fall semester 2016, classes begin August 22, 2016, and end December 8, 2016. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is November 1, 2016. The final exam period is December 10-15, 2016.

Disabilities

If you have a physical, psychiatric/emotional, or learning disability that may impact on your ability to carry out assigned course work, I encourage you to contact the Office of Disability Services (DS). The office is located in Grace Wilkie Annex, room 150, (316) 978-3309 (voice/tty) (316-854-3032 videophone). DS will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for you. All information and documentation of your disability is confidential and will not be released by DS without your written permission.

Counseling & Testing

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Diversity and Inclusive

Wichita State University is committed to being an inclusive campus that reflects the evolving diversity of society. To further this goal, WSU does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, gender identity, gender expression, marital status, political affiliation, status as a veteran, genetic information or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Executive Director, Office of Equal Employment Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0138; telephone (316) 978-3186.

Intellectual Property

Wichita State University students are subject to Board of Regents and University policies (see http://webs.wichita.edu/inaudit/ch9_10.htm) regarding intellectual property rights. Any questions regarding these rights and any disputes that arise under these policies will be resolved by the President of the University, or the President's designee, and such decision will constitute the final decision.

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Video and Audio Recording

Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

Tentative Schedule for 15 week class – adjust to your style and different term lengths

Week	Date	Topics, Readings, Assignments, Deadlines
1	TBD	Review course expectations with instructor
2		
3	TBD	Present topic of study to instructor for approval
4		
5		
6		
7		
8	TBD	Review appropriate resources, e.g., readings, appropriate to the topic
9		
10		
11		
12	TBD	Evaluate the topic in terms of its relevance to the discipline in the form of a presentation to the instructor
13		
14		
15		
16		
Final	TBD	Complete a paper on the topic in terms of its relevance to the discipline



BME 595, Bioengineering Senior Capstone II, Spring 2017

Instructor:	Gary Brooking
Department:	Biomedical Engineering
Office Location:	Engineering Building 204D
Telephone:	(316) 978-7637
Email:	gary.brooking@wichita.edu
Preferred Method of Contact:	Email
Office Hours:	Tuesdays 2:00 – 3:30pm; Wednesday 11:00 – 12:30pm
Classroom; Days/Time:	TBA; Tuesday 7:05-9:45pm
Prerequisites:	BME 482, BME 585

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. Any changes will be posted onto Blackboard and will be discussed in class.

Definition of Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Course Description

This course focusses on engineering practice involving a team-based bioengineering analysis and project design, including discovering customer requirements; design requirements; design; biocompatibility, regulatory, ethical, societal, and environmental considerations; creativity; alternative approaches for solution; specific system analysis; project management; prototype construction and testing; and final report and presentation. For undergraduate students only.

Course Goals and Measurable Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Select and apply appropriate knowledge and tools learned in your undergraduate engineering curriculum.
2. Apply problem solving systematic engineering design techniques to new problems.
3. Demonstrate life-long learning skills by conducting research on an unknown engineering project.
4. Demonstrate communication skills, including interpersonal, written and oral.
5. Apply project management skills, including task and schedule development, production and market assessment.
6. Collaborate on a group project by completing designated tasks and offering feedback to team members on their performance
7. Demonstrate innovation and entrepreneurship skills.

Assignments and Weighting

Assignment	Weight	Outcome Measured
Biodesign Business Canvas (two parts)	5%	1,5,7
Shocker New Venture Business Summary	5%	4,5,6,7
Concept Design Report	5%	1,2,3
Final Design Presentation	10%	1,2,4
Individual Final Design Report (FDR)	10%	1,2
Physical Prototype	10%	1,2,3
Multidiscipline Consultations	5%	3,4,6,7
Customer Interviews	5%	4,7
Individual Project Notebook	5%	3,4
Project Poster	10%	1,4
Final Project Presentation	10%	1,2,4,6
Final Project Report	10%	1,2,3,4,5,6

ABET BME Student Learning Outcomes for this course:

At the end of the semester the students will be asked to fill out a survey as to how well this course has met the following ABET student learning outcomes:

ABET-b	Ability to design and conduct experiments, as well as to analyze and interpret data
ABET-c	Ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
ABET-d	Ability to function on multidisciplinary teams
ABET-e	Ability to identify, formulate and solve engineering problems
ABET-f	Understanding of professional and ethical responsibility
ABET-g	Ability to communicate effectively
ABET-h	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
ABET-i	Recognition of the need for, and ability to engage in life-long learning
ABET-j	Knowledge of contemporary issues
ABET-k	Ability to use the techniques, skills, and modern engineering tools for engineering practice
BE4	Address problems of interaction between living and nonliving materials and systems

Concluding Package for ABET:

1. Two CD's with all of all your reports, calculations, drawings, all engineering analysis and research along with your Power Point final presentation and a well printed and bound hard copy of your Final Project Report to **Dr. Brooking** is due on final presentation day.
2. One soft and one hard copy of your Final Project Report **to your sponsor** is due on final presentation day.

Resources

The following resources will be used:

- Your final oral presentation will require a PowerPoint presentation. It is your responsibility to be sure your presentation is loaded on your laptop and interface with the projection system and will run smoothly on it prior to the start of class.
- If necessary, Dr. Brooking has access to a digital camera and projector equipment that may be checked out for use in giving presentations in class or at off-campus locations.
- You might also need a 3D printer, laboratory equipment and facilities or use of the student machine shop. Please consult with Dr. Brooking to arrange this. Whether or not these facilities are free of charge will depend on what you are planning to do.
- Blackboard will be used for class instruction, and will contain relevant course materials. Changes in class schedule will be posted on Blackboard, and class communication tools are available for team members to use.

Other Equipment/Materials

Students are expected to purchase some supplies to organize and present their designs:

1. Notebooks are required to accumulate project information.
 - a. Each student must have a project notebook to record work hours, write project notes, record design ideals and sketches, brainstorming results, customer interviews and calculations. Recorded work hours will be used for project costing and peer review grade disputes. This may take the form of an electronic journal.
 - b. Each group will need a master notebook for accumulating common group information and for constructing the draft final report.
2. A working prototype of your design is required. This should be a well-fabricated physical prototype with supporting analysis and detail drawings.
3. You will have a budget of \$200 to cover the costs of materials for prototype development. Students will need to cover costs in excess of the budgeted expenses. Students can equally share costs and in some cases alternative funding sources may be possible. Please advise your team members of costs before making purchases.

Recommended Texts/Readings Textbook

Engineering Design: A Systematic Approach

Gerhard Pahl, Ken Wallace, Lucienne Blessing - Technology & Engineering - 2007 - 617 pages

Business Model Generation

Alexander Osterwalder, Yves Pigneur – John Wiley & Sons - 2010 - 281 pages

Class Protocol

- When emailing me, please place “**BME595**” at the beginning of the subject line. This will aid me in responding to your email quicker.
- A continuous effort is required in this course to be successful as the design process is difficult and time intensive. Your team members also require your presence to be successful. As a result of this, **CLASS ATTENDANCE IS MANDATORY** as you will be working with your team members during class and outside of class time, who depend on your time for a good grade. Some special guest lecturers may also be given

- Successful completion of your design project will require careful planning of your time and strong team dynamics with good communication among your group members.
- Please keep in mind when interfacing with industry and outside organizations you are representing WSU.
- WSU faculty members are available for consultations on your project in their particular area of expertise. Dr. Brooking will serve as your general technical advisor on your design projects. These roles are to guide you, not instruct you on engineering training you have been given previously.
- Industry and academic experts may be invited by the department will give lectures on topics of relevant interest to Biomedical Engineering and general engineering design and innovation practices. If so, attendance will be required and will be graded as a pop quiz.
- You are responsible to check your school registered emails at least once a day. All material and assignments will be posted on Blackboard and in addition I may contact you about the homework, quizzes, and exams through your email. Make sure you are able to receive emails and your mailbox is not full.
- Any grades posted on Blackboard are only a copy of the official grades which are kept on a private spreadsheet. There may occasionally be a difference which if brought to my attention, I am willing to explain and/or correct.
- Examination materials will be drawn from the textbooks, lectures, student presentations, and homework. Pop quiz will be given as and when necessary.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Percentages	Letter grade	Grade Points	Interpretation
93% - 100%	A	4.00	<i>The A range denotes excellent performance.</i>
90% - 92%	A-	3.67	
87% - 89%	B+	3.33	
83% - 86%	B	3.00	<i>The B range denotes good performance.</i>
80% - 82%	B-	2.67	
77% - 79%	C+	2.33	
73% - 76%	C	2.00	<i>The C range denotes satisfactory performance.</i>
70% - 72%	C-	1.67	
67% - 69%	D+	1.33	
63% - 66%	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
60% - 62%	D-	0.67	
<60%	F	0.00	<i>F denotes failing performance.</i>

The evaluation of your work is my professional judgment and is not subject to negotiation. Incomplete "I" will not be given out, except under very special circumstances (e.g., illness, serious accident, death in family, natural disaster, etc.). You will be asked to produce evidence of these circumstances. An incomplete for a course must be removed by the end of the next semester or it will change to F.

Extra Credit

No Extra Credit will be available in this class.

Late Assignments

You will be allowed one late Homework submission for the class without requiring any explanation if it is submitted within one week of the due date. A penalty of up to 20% per day will be applied for late homework and project submissions. All assignments are due as indicated on Blackboard.

Missed Assignments and Exams

Anyone missing an exam, quiz, presentation without notifying the instructor in advance will **NOT** be allowed to make up the missed exam, quiz or presentation. Documentation of reason for missing may be required by instructor.

Important Academic Dates:

For Spring Semester 2017, classes begin January, 17th 2017, and end May, 4th, 2017. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is March, 31st 2017. The final exam period is May, ___ 2016 from _____ pm.

Tentative Schedule

A tentative schedule is posted to Blackboard. This schedule may change during the semester and any changes will be posted to Blackboard and discussed in class.

Diversity and Inclusive Excellence

Wichita State University is committed to achieving "Inclusive Excellence" and institutional strength through curricula, co-curricula, and other practices, which promote and encourage the intermingling of its students, faculty, and staff from different backgrounds, in a challenging intellectual and multicultural climate that is marked by respect and appreciation for the spectrum of human diversity. The University is also committed to an "all-inclusive" diversity and does not discriminate on the basis of race, ethnicity, gender, gender identity/expression, sexual orientation, age, socioeconomic status, disability, religion, national origin, or military status.

Academic Integrity

Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm.

The first offense in violation of academic integrity will result in a 'zero' for the assignment; the second offense will result in an F for the course. Additionally, students will view the slide show on 'Ethical Use of Engineering Information' (http://library.wichita.edu/aveng/Ethics_vid/Ethics.htm).

Intellectual Property

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the University Police Department, (316) 978- 3450 or the Title IX Coordinator (316) 978-5177. Students may also report incidents to an instructor, faculty or staff member, who are required by law to notify the Title IX Coordinator. If a student wishes to keep the information confidential, the student may speak with staff members of the Counseling and Testing Center (316) 978-3440 or Student Health Services (316)978-3620. For more information about Title IX, go to:

<http://www.wichita.edu/thisis/home/?u=titleixf>

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Definition of a Credit Hour

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Go to:

<http://webs.wichita.edu/?u=academicaffairs&p=/definitionandassignmentofcredithours/> for the policy and examples for different types of courses and credit hour offerings.

A "credit hour" is a measure of graduate or undergraduate academic work represented in intended learning outcomes and verified by evidence of student achievement that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for each week of instructional time for approximately fifteen weeks for one semester, or an equivalent amount of work over a different amount of time.

Measurable Student Learning Outcomes

The overall objectives of this course are to provide students with experience in computer-aided engineering applications in biomedical processes. After active participation in this course and an effort to learn the material, students will have the knowledge and skills to be able to:

- Select a biomedical problem and determine the various parameters required for modeling (assessed in course project)
- Construct 3D geometries in CAD software (assessed in course project and quizzes)
- Implement a problem into COMSOL including determining the governing equations, define their geometry or creating the geometry, set boundary conditions, specify the physics, set material properties, mesh, simulate, and then visualize their results (assessed in homework 1, 2, 3, 4, 5)
- Identify and describe the limitations of computer-aided modeling in terms of accuracy, and reliability (assessed in course project)
- Function and interact cooperatively and efficiently as a team member in completing a group project. (assessed in course project)
- Present data in written format. (assessed in course project)
- Describe the requirements and limitations of biocomputational modeling in the clinical environment. (assessed in course project)

Class Protocol

Class attendance and participation are considered important parts of the learning process, and therefore it is expected and strongly encouraged. Note that because of the broad multidisciplinary nature of the course, material presented in class may not be covered in the readings. The student is responsible to know all the material presented, whether from the readings or from class. The student is expected to expend sufficient effort to learn the material, to respect the instructor, and to be attentive and participatory in the classroom.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Quizzes	20%
Homework	45%
Final Project (Written)	20%
Oral Presentation	15%

Percentages	Letter grade	Grade Points	Interpretation
100% - 93%	A	4.00	<i>The A range denotes excellent performance.</i>
92% - 90%	A-	3.67	
89% - 87%	B+	3.33	
86% - 83%	B	3.00	<i>The B range denotes good performance.</i>
82% - 80%	B-	2.67	
79% - 77%	C+	2.33	
76% - 73%	C	2.00	<i>The C range denotes satisfactory performance.</i>
72% - 70%	C-	1.67	
69% - 67%	D+	1.33	
66% - 63%	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
62% - 60%	D-	0.67	
<60%	F	0.00	<i>F denotes failing performance.</i>

Assignments

Exercise problems will be assign at the end of some lectures and the assignment due dates will be given to you for each assignment at that time. A list of assignments, value toward final grade, and tentative due dates are given below in the tentative schedule.

Course Project:

Projects will be defined by each group, but must involve careful and deep understanding of some aspect of multi-physics computational modeling. The final product will be an oral presentation, and a written report. More information on the project will be presented in lecture.

Graduate Student Project:

Graduate students will be expected to perform an additional project. The graduate student project can entail a separate project that is related to his/her thesis or dissertation. Alternatively, graduate students can provide an additional report that provides a review from the literature of a novel application of biocomputational modeling.

Undergraduate vs. Graduate Credit (for 700 level courses)

Undergraduate students enrolled in 700 level courses will receive undergraduate credit (not graduate credit) unless they have a previously approved senior rule application or dual/accelerated enrollment form on file in the Graduate School. Undergraduate credit earned in 700 level courses cannot later be counted toward a graduate degree.

Late Assignments

As each of us have times in which we get sick, very busy, or have an emergency, one assignment may be turned in late without penalty if turned in within 2 calendar days of original due date **and** the instructor is notified via email. All other late assignments will not be accepted. In case of a family or medical emergency, the student must email the instructor within 2 calendar days **and** establish when the assignment will be turned in.

Important Academic Dates

The last date to drop a class and receive a W (withdrawn) instead of F (failed) is the end of the 10th week. Please refer to the academic catalog for further important dates.

For the Spring semester 2016, classes begin January 19th, 2016, and end May 13th, 2016. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is the 10th week of class. The final exam is May 10th, 2016.

Disabilities

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am to 5:00 pm on Fridays), though the clinic may be closed occasionally on Wednesdays from noon to 1:30pm. The telephone number is (316) 978-3620. In addition to outpatient and preventive care (including immunizations, a prescription service, and testing/counseling for sexually transmitted infections), Student Health can handle minor injuries. All services are confidential. For more information see www.wichita.edu/studenthealth.

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The Heskett Center and Campus Recreation

Whether you are wanting to be active on campus, relieve the stress from classes or take care of your body, Wichita State Campus Recreation is the place for you. Campus Recreation, located inside the Heskett Center, contributes to the health, education, and development of Wichita State University students, faculty, staff, alumni, and community members by offering quality programs and services. With many programs and facilities which are free to all students and members, Campus Recreation offers its members limitless opportunities. For more information about our services see www.wichita.edu/heskett.

Video and Audio Recording

Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

BME 735, Bio-Computational Modeling, Spring 2016, Tentative Schedule

Week	Date	Topics	Homework
1	1-19-16 1-21-16	Syllabus/Modeling/Introduction to SolidWorks: Review SolidWorks: Review Basic Techniques	
2	1-26-16 1-28-16	SolidWorks Quiz: (Extrude, Extrude cut, Fillet, Revolve, Sweeps, Lofts, Sketch picture Reference geometry) Comsol: Structural Mechanics (Wrench) - Intro to Comsol Multiphysics GUI:	
3	2-2-16 2-4-16	Comsol: Structural Mechanics: Cantilever – Livelink to Solidworks, parametric sweeps, plotting data Comsol: Structural Mechanics: Loaded Spring	Hmk1: Structural mechanics (loading on a bone)
4	2-9-16 2-11-16	Comsol: Structural Mechanics: Compression of elastoplastic pipe	
5	2-16-16 2-18-16	Hmk 2: Comsol Structural Mechanics	Hmk 2: Comsol: Structural Mechanics: Stent
6	2-23-16 2-25-16	Comsol: Heat transfer: Steady State Introduction Comsol: Heat transfer: Steady State (Conduction: Fouierys Law)	
7	3-1-16 3-3-16	Comsol: Predicting time of Death (transient heat transfer analysis)	Hmk 3: Comsol: Heat transfer- Predicting time of death
8	3-8-16 3-9-16	Comsol: Heat transfer: Multiphysics: Heat Transfer + Fluid flow (Heat sink w. convection)	
9	3-15-16 3-17-16	Spring Break Spring Break	
10	3-22-16 3-24-16	Comsol: Fluid Dynamics: (Simple Steady state non-compressible bifurcated artery) Comsol: Fluid Dynamics - Bifurcated Artery – Transient state Navier Stokes equ. blood flow simulation	Hmk4: Comsol: Fluid dynamics
11	3-29-16 3-31-16	Comsol: Aortic Arch – Fluid structure interaction Comsol: 2D – Fluid structure interaction	Hmk5: Bifurcated Artery blood flow
12	4-4-16 4-7-16	Comsol: Multi-body Dynamics Comsol: Multiphysics modeling	Hmk6: Course Project Proposal Due
13	4-12-16 4-14-16	Comsol: Meshing; Virtual Operations:	Hmk7: Virtual Operations Meshing
14	4-19-16 4-21-16	Comsol: Course Projects Comsol: Course Projects	Hmk8: Multi-body Dynamics
15	4-26-16 4-28-16	Comsol: Course Projects Comsol: Course Projects	
16	5-3-16 5-5-16	Oral Presentations Oral Presentations	
Final Project	5-10-16	Tuesday, May 10 th 10:00am	Course Project Written Report



BME 752 – Applied Human Biomechanics, Spring 2017

Instructor:	Nils Hakansson
Office Location:	EB120G
Telephone:	(316) 978-5909
Email (preferred):	nils.hakansson@wichita.edu
Office Hours:	Tues. 4:00-5:00pm; Thur. 1:15-2:30pm; or by appointment
Classroom; Days/Time:	EB210; 2:45 – 4:00 pm MW
Prerequisites:	BIOL 223, BME 452 or equivalent, or instructor consent

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves.

Course Description:

BME 752 (3 credit hours) – Examines the biology, physiology, and structure of skeletal muscle, the mechanisms of skeletal muscle force generation, and the adaptations to muscle that arise from changes in muscle usage. Students learn to create biomechanical models and generate simulations of human movement based on data collected in a human biomechanics lab. Experimental design and data analysis and interpretation are emphasized.

Definition of a Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe human motion using precise mechanical and anatomical terminology (assessed in assignment 1, quizzes, exams, and lab report 1).
2. Describe the biology, physiology, and structure of skeletal muscle, and the adaptations to muscle that arise from changes in muscle usage (assessed in assignment 2, quizzes and exams).
3. Describe the mechanisms of skeletal muscle force generation from a physiological and mathematical perspective (assessed in assignment 3-5, quizzes, exams, and lab report 2).
4. Integrate and synthesize human movement data from multiple modalities (assessed in term project).
5. Interpret the basic concepts of biomechanics to understand the use and implications of these concepts as presented in medical and technical publications (assessed in lab report 3, oral presentations, and the term project).
6. Assemble data and compose written and oral reports (assessed in oral presentations and the term project).
7. Develop and implement a research project (assessed in the term project).

Optional Texts/Readings

Textbook

Skeletal Muscle Structure, Function, and Plasticity, R.L. Lieber, 3rd Edition, Lippincott Williams & Wilkins, 2009 [ISBN-13: 978-0781775939].

Other Readings

To be assigned

Class Protocol

Class attendance and participation are considered important parts of the learning process, and therefore it is expected and strongly encouraged. Note that because of the broad multidisciplinary nature of the course, material presented in class may not be covered in the readings. The student is responsible to know all the material presented, whether from the readings or from class. The student is expected to expend sufficient effort to learn the material and to be attentive and participatory in the classroom.

Academic Integrity

Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Grading Scale

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90 – 100	A	4.00	<i>The A range denotes excellent performance.</i>
87 – 89	A-	3.67	
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70 – 73	C	2.00	<i>The C range denotes satisfactory performance.</i>
67 – 69	C-	1.67	
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60 – 63	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
57 – 59	D-	0.67	
<57	F	0.00	<i>F denotes failing performance.</i>

The evaluation of your work is my professional judgment and is not subject to negotiation. Incomplete “I” will not be given out, except under very special circumstances (e.g., illness, serious accident, death in family, natural disaster, etc.).

Assignments and Weighting

Exams/Quizzes	30%
Course Project	30%
Class Labs/Reports	20%
Class Presentations	15%
Class Participation	5%

Undergraduate vs. Graduate Credit (for 700 level courses)

Undergraduate students enrolled in 700 level courses will receive undergraduate credit (not graduate credit) unless they have a previously approved senior rule application or dual/accelerated enrollment form on file in the Graduate School. Undergraduate credit earned in 700 level courses cannot later be counted toward a graduate degree.

Extra Credit

Extra Credit is not allowed in this course

Missed Assignments and Exams

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Important Academic Dates

For spring semester 2017, classes begin January 17, 2017, and end May 4, 2017. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is February 13, 2017. There are no classes on May 5, 2017. The final exam period is May 6 - 12, 2017.

About this Syllabus

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Disabilities

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Copyright Notice

Course materials prepared by the instructor, together with the content of all lectures presented by the instructor, are the property of the instructor. Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

BME 752 Applied Human Biomechanics, Spring 2017, Tentative Schedule

Week	Topics	Source
1	Introduction - Historical perspective of musculoskeletal research	Assigned readings
2	Skeletal Muscle Anatomy - Muscle development; skeletal muscle cell microstructure; whole skeletal muscle structure Assignment 1: OpenSim tutorial 1	Lieber chapter 1, Assigned readings
3	Skeletal Muscle Physiology - Muscle fiber activation; skeletal muscle mechanics; muscle fiber types and motor units; the motor unit Assignment 2: OpenSim tutorial 2	Lieber chapter 2, Assigned readings
4	The Production of Movement - Basic muscle mechanics; muscle-tendon interaction; joint moments; physiological range of motion. Lab 1: Muscle force-length: active and passive insufficiency	Lieber chapter 3, Assigned readings
5	Skeletal Muscle Adaptation to Increased and Decreased Use - Adaption to chronic electrical stimulation; adaption to chronic stretch; adaption to compensatory hypertrophy, immobilization, remobilization, and aging Assignment 3: OpenSim tutorial 3	Lieber chapter 4 - 5, Assigned readings
6	Exam – (In class)	
7 - 8	Muscle-Tendon Modeling - Muscle-tendon modeling concepts; viscoelastic properties of muscle; force-length and force-velocity characteristics of skeletal muscle Lab 2: Muscle force-length curve	Assigned readings
9 - 10	Three Dimensional Kinematics and Kinetics - Axes systems; global and local reference systems; rotation of axes; determination of segment angular velocities and accelerations; kinetic analysis of reaction forces and moments Lab 3: Muscle force-velocity curve	Assigned readings
11	Exam – (In class)	
12 - 13	Biomechanical Models of Human Movement - Link-segment model development (inverse dynamics); forces acting on the link-segment model; review of forward solution models Assignment 4: OpenSim maximum height jumping	Assigned readings
14	Biomechanics Applications - Biomechanics literature review; identification and selection of important research literature on a specific biomechanics topic Assignment 5: OpenSim muscle tug-of-war	Lieber chapter 6, Assigned readings
15	Course Project Reports due Course Project Presentations	
Final Exam		



BME 757 – Clinical Biomechanics Instrumentation, Fall 2016

Instructor:	Nils Hakansson
Office Location:	EB120G
Telephone:	(316) 978-5909
Email (preferred):	nils.hakansson@wichita.edu
Office Hours:	Tues. 1:30-3:00pm; Thur. 11:00-12:00pm; or by appointment
Classroom; Days/Time:	EB202; 2:45 – 4:00 pm MW
Prerequisites:	BME 452, or instructor consent

How to use this syllabus

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Course Description

BME 757 (3 credit hours) – Students learn to collect, process, analyze and interpret motion of the human body (e.g., running, walking, jumping, lifting, etc.), muscle force, muscle activity and acceleration data using various equipment in a human biomechanics lab. The equipment and techniques used are common to multiple fields and disciplines, including physical medicine and rehabilitation, orthopedics, physical therapy, prosthetics and orthotics, wearable biosensors, sports performance and medical/sport/safety equipment design.

Definition of a Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Describe human motion using precise mechanical and anatomical terminology (assessed in quizzes, exams, and lab reports).
2. Utilize and operate biomechanics measurement equipment to collect multi-modal kinematic and kinetic human movement data (assessed in lab reports and term project).
3. Quantify and analyze linear and angular characteristics of human motion (assessed in quizzes, exams, and lab reports).
4. Interpret the basic concepts of biomechanics to understand the use and implications of these concepts as presented in medical and technical publications (assessed in oral presentations and term project).
5. Assemble data and compose written and oral reports (assessed in oral presentations, lab reports, and term project).
6. Develop and implement a research project (assessed in the term project).

Optional Texts/Readings

Textbook

Biomechanics and Motor Control of Human Movement, 4th Edition, by David A. Winter (Oct 12, 2009) [ISBN-10: 0470398183]

Other Readings

To be assigned

Class Protocol

Class attendance and participation are considered important parts of the learning process, and therefore it is expected and strongly encouraged. Note that because of the broad multidisciplinary nature of the course, material presented in class may not be covered in the readings. The student is responsible to know all the material presented, whether from the readings or from class. The student is expected to expend sufficient effort to learn the material and to be attentive and participatory in the classroom.

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Copyright Notice

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BME 757/Clin Biomech Instr, Fall 2016, Tentative Schedule

Week	Topics	Source
1	Introduction Research Ethics and Responsible Conduct of Research	Lecture notes, assigned reading
2	Measurement Techniques & Data Acquisition	Lecture notes, assigned reading
3	Anthropometry, Determination of Body Segment Parameters	Winter, chapter 4
4	Signal Processing	Lecture notes, Winter, chapter 2
5	Filtering, Data Smoothing, and Numerical Methods	Lecture notes, assigned reading
6	2d Video & Kinematic Analysis	Winter, chapter 3
7	3-D Kinematic Analysis	Winter, chapter 3, assigned reading
8	Force Plate and Pressure Distribution	Winter, chapter 5
9	Exam – (In class)	
10	Electromyography	Winter, chapter 10, assigned reading
11	General Mechanics Principles – Work, Energy, and Power	Winter, chapter 6
12	Muscle Mechanics	Winter, chapter 9, assigned reading
13	Synthesis of Human Movement – Inverse and Forward Dynamics	Winter, chapter, assigned reading 8
14	Course Project Reports due	Lecture notes
15	Course Project Presentations	Lecture notes
Final Exam	Wednesday, December 14, 1:00 – 2:50pm, 202 Engineering Building	



BME 777, Biodegradable Materials, Spring, 2016

Instructor:	Anil Mahapatro, PhD
Department:	Biomedical Engineering
Office Location:	Engineering Building, 204G
Telephone:	(316) 978-5912
Email:	anil.mahapatro@wichita.edu
Preferred Method of Contact	Email
Office Hours:	Tues. & Thurs.: 10.30am -11.00 am & 1.00pm-2.30 pm or by appt.
Classroom; Days/Time:	Engineering Building 210, Tues. and Thurs., 2:45 pm - 4:00 pm.
Prerequisites:	BME 477 or ME 651 or instructor consent

How to use this syllabus

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Academic Honesty

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Second offence: Fail course and/or begin proceedings against a student under the Code of Conduct.

Course Description

This course will provide students with a comprehensive overview of biodegradable materials as it relates to their applications in the biomedical and health care fields. The course will cover in details the different classes of biodegradable materials including biodegradable polymers, ceramics and metals. Synthesis, characterization and degradation of these materials in the biological environment will be covered. Biodegradation / biocorrosion mechanisms of these materials, the complexity of the response of the biological environment and the experimental methods for monitoring the degradation process will be discussed. Strategies for surface modification to control the degradation will be touched upon. Finally specific applications of these materials in drug delivery, cancer therapy, regenerative therapies, cardiovascular and orthopedic will be covered.

Definition of a Credit Hour

3 Credit hour class: Success in this 3 hour credit course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per week with 1 of the hours used for lecture) for instruction and preparation/ studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- Differentiate different classes of biodegradable materials used in biomedical and health care fields (assessed in exam 1 and 2).

- Identify and articulate the structure, formation, characterization and properties of biodegradable polymers, metals and ceramics (assessed in exam1, 2, 3 and final exam).
- Explain the biodegradation and bio corrosion mechanisms of biodegradable materials under in-vitro and in-vivo conditions (assessed in exam1, 2 and 3).
- Differentiate and explain the response of biological environment to the biodegradable materials (assessed in exam 3).
- Describe strategies of surface modification to control the biodegradation rates (assessed in exam 3 and final exam).
- Recognize materials design and selection criterion for representative clinical applications such as drug delivery systems, regenerative therapies, cardiovascular and orthopedic fields (assessed in final exam and case study 2).

Required Texts/Readings:

Textbook: No official text book has been assigned for the course. Materials will be drawn from various books and research journal papers.

Other Readings

Supplemental materials and handouts related to the course will be provided

Class Protocol

All students are expected to attend all sessions of the class. Regular participation in the class is mandatory. Examination materials will be drawn from the textbooks, lectures, student presentations, and homework. Pop quiz will be given as and when necessary. No makeups for quizzes.

- Please do not arrive late for class; students consistently arriving late (over 10min after start of class) will receive a penalty (at discretion of instructor) towards the class participation grade.
- No cell phone, mobile devices (tablets etc.) and computer use in class during lecture.
- No cell phone use during exams
- **Disruptive behavior:** Disruptive behavior in class room will be dealt with policies associated with student conduct. Disruptive behavior in the classroom is defined as “behavior a reasonable person would view as being likely to substantially or repeatedly interfere with the conduct of a class. Examples include repeated, unauthorized use of cell phones in the classroom; persistent speaking without being recognized; or making physical threats”

[<http://webs.wichita.edu/?u=studentconduct&p=/facultyfaqs/>]

Assignments

Grading: Final course grades will be based on total weighted points using the percentages below:

Quizzes, Homework and Class Participation*	5%
Case Study 1	15%
Case Study 2	15%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	20%

*unexcused absence of more than 10% of lectures will result in '0' in this category. It is mandatory for students to attend all case study 1 presentations; unexcused absence on any day for the case study presentations will result in '0' in this category.

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Note, other classes might assign grades differently: Be sure to understand the different grading scales in all of your classes.)

Percentages	Letter grade	Grade Points	Interpretation
93-100	A	4.00	<i>The A range denotes excellent performance.</i>
90-92	A-	3.70	
87-89	B+	3.30	
83-86	B	3.00	<i>The B range denotes good performance.</i>
80-82	B-	2.70	
77-79	C+	2.30	
73-76	C	2.00	<i>The C range denotes satisfactory performance.</i>
70-72	C-	1.70	
67-69	D+	1.30	
63-66	D	1.00	<i>The D range denotes unsatisfactory performance.</i>
60-62	D-	0.70	
<60	F	0.00	<i>F denotes failing performance.</i>

Incomplete Grade:

This grade may be given at the discretion of the course instructor to a student who has been making satisfactory progress in a course except for work which could not be completed due to circumstances beyond your control (such as, illness, serious accident, death in family, natural disaster, etc.). You will be asked to produce evidence of these circumstances. If incomplete work due to these extraordinary events takes place before the last date to withdraw, then you should withdraw from the course. An incomplete for a course must be removed by the end of the next semester or it will change to F.

Extra Credit

No extra credit available

Late Assignments

Late assignments will not be accepted. Under very special circumstances (eg; illness, serious accident, death in family, natural disaster etc) late assignments may be accepted at the sole discretion of the instructor with a significant late penalty.

Missed Assignments and Exams

Anyone missing an exam / quiz without notifying the instructor in advance will NOT be allowed to have a make-up exam / quiz. Missed exam / quiz will be allowed to be made up only with documented medical certificate

Important Academic Dates

For spring semester 2016, classes begin January 19th, 2016 and end May 5th, 2016. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is April 1st, 2016. The final exam period is May 7th-May 12th, 2016.

UNIVERSITY POLICIES

About this Syllabus

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Disabilities

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Counseling & Testing

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Diversity and Inclusive

Wichita State University is committed to being an inclusive campus that reflects the evolving diversity of society. To further this goal, WSU does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, gender identity, gender expression, marital status, political affiliation, status as a veteran, genetic information or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Executive Director, Office of Equal Employment Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0138; telephone (316) 978-3186.

Intellectual Property

Wichita State University students are subject to Board of Regents and University policies (see http://webs.wichita.edu/inaudit/ch9_10.htm) regarding intellectual property rights. Any questions regarding these rights and any disputes that arise under these policies will be resolved by the President of the University, or the President's designee, and such decision will constitute the final decision.

Shocker Alert System

Get the emergency information you need instantly and effortlessly! With the Shocker Alert System, we will contact you by email the moment there is an emergency or weather alert that affects the campus. Sign up at www.wichita.edu/alert.

Student Health Services

WSU's Student Health clinic is located in 209 Ahlberg Hall. Hours are 8:00am to 7:00pm (8:00 am to 5:00 pm on Fridays), though the clinic may be closed occasionally on Wednesdays from noon to 1:30pm. The telephone number is (316) 978-3620. In addition to outpatient and preventive care (including immunizations, a prescription service, and testing/counseling for sexually transmitted infections), Student Health can handle minor injuries. All services are confidential. For more information see www.wichita.edu/studenthealth.

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The Heskett Center and Campus Recreation

Whether you are wanting to be active on campus, relieve the stress from classes or take care of your body, Wichita State Campus Recreation is the place for you. Campus Recreation, located inside the Heskett Center, contributes to the health, education, and development of Wichita State University students, faculty, staff, alumni, and community members by offering quality programs and services. With many programs and facilities which are free to all students and members, Campus Recreation offers its members limitless opportunities. For more information about our services see www.wichita.edu/heskett

Video and Audio Recording

Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

Tentative Schedule:**

Week	Topics, Readings, Assignments, Deadlines
1	Introduction to course and syllabus, Metals overview-1
2	Metals overview-2
3	Introduction to Biodegradable Metals, Magnesium based Materials
4	Test 1, Metals corrosion and biodegradation
5	Surface coatings on Magnesium,
6	Corrosion / biodegradation and testing of magnesium
7	Biological Testing
8	Test 2, Iron based materials
9	Iron based materials and Case study 2: details of case study,
10	Introduction to biodegradable polymers
11	Case Study 1: Lab experiments, Test 3
12	Additive Manufacturing, Drug Delivery-1
13	Drug delivery-2
14	Hydrogels
15	Scaffolds for tissue engineering
16	Case Study 2 Presentations
Finals	

***The schedule is subject to change at the discretion of the instructor or depending upon the progress of the class*



BME 779, Tissue Engineering, Fall 2016

Instructor:	Anil Mahapatro, PhD
Department:	Biomedical Engineering
Office Location:	Engineering Building, 204G
Telephone:	(316) 978-5912
Email:	anil.mahapatro@wichita.edu
Preferred Method of Contact	Email
Office Hours:	Tues. & Thurs.: 1.45pm-2.45 pm & 4.00 pm-5.00pm & or by appt.
Classroom; Days/Time:	Engineering Building 122, Tues. and Thurs., 2:45 pm - 4:00 pm.
Prerequisites:	BME 477 or instructor consent

How to use this syllabus

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Academic Honesty

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Second offence: Fail course and/or begin proceedings against a student under the Code of Conduct.]

Course Description

This course will provide an introduction to the strategies and fundamental bioengineering design criteria behind the development of tissue substitutes. Principles of engineering and the life sciences toward the development of biological substitutes that restore, maintain, or improve tissue function will be discussed. Topics to be covered include stem cells, cell growth and differentiation, cell signaling, materials for scaffolding, scaffold degradation and modification, cell culture environment, cell nutrition, cryopreservation, bioreactor design, clinical applications, regulatory and ethics.

Definition of a Credit Hour

3 Credit hour class: Success in this 3 hour credit course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per week with 1 of the hours used for lecture) for instruction and preparation/ studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- Demonstrate basic principles related to tissue engineering (assessed in exam 1,2, 3, final exam and case study 2)

- Describe and differentiate different human tissue and cells based upon their structure and function (assessed in exam 1)
- Explain, comprehend, compare and contrast the processes of tissue repair and regeneration (assessed in exam 1 and final exam)
- Differentiate the different materials used for scaffolding for tissue engineering and understand the degradation of these materials, the cell material interaction and material modification strategies for these materials (assessed in exam 2 and exam 3)
- Explain basic design principles for bioreactor design (assessed in exam 3)
- Develop tissue engineering and design strategies for representative clinical applications (assessed in final exam and case study 2)

Required Texts/Readings

Textbook: Tissue Engineering, 2nd Edition, Edited by Clemens van Blitterswijk, ISBN 978-0-12-420145-3

Other Readings

- Biomaterials Science: An Introduction to Materials in Medicine, Author(s): Ratner & Hoffman & Schoen & Lemons, 3rd Edition, Academic Press, ISBN: 9780123746269
- Supplemental materials and handouts related to the course will be provided

Class Protocol

All students are expected to attend all sessions of the class. Regular participation in the class is mandatory. Examination materials will be drawn from the textbooks, lectures, student presentations, and homework. Pop quiz will be given as and when necessary. No makeups for quizzes.

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Assignments

Grading: Final course grades will be based on total weighted points using the percentages below:

Quizzes, Homework and Class Presentations and Participation*	5%
Case Study 1	15%
Case Study 2	15%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final Exam	20%

*unexcused absence of more than 10% of lectures will result in '0' in this category. It is mandatory for students to attend all case study 2 presentations; unexcused absence on any day for the case study presentations will result in '0' in this category.

Grading Scale

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Undergraduate vs. Graduate Credit (for 700 level courses)

Undergraduate students enrolled in 700 level courses will receive undergraduate credit (not graduate credit) unless they have a previously approved senior rule application or dual/accelerated enrollment form on file in the Graduate School. Undergraduate credit earned in 700 level courses cannot later be counted toward a graduate degree.

Incomplete Grade:

This grade may be given at the discretion of the course instructor to a student who has been making satisfactory progress in a course except for work which could not be completed due to circumstances beyond your control (such as, illness, serious accident, death in family, natural disaster, etc.). You will be asked to produce evidence of these circumstances. If incomplete works due to these extraordinary events take place before the last date to withdraw, then you should withdraw from the course. An incomplete for a course must be removed by the end of the next semester or it will change to F.

Extra Credit

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Important Academic Dates

For Fall semester 2016, classes begin August 22nd, 2016 and ends December 8th, 2016. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is November 1st, 2016. There are no classes on September 5th (labor day), October 15-18th (Fall break) and November 23-27th (Thanksgiving Recess). The final exam period is December 10th-15th, 2016.

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Video and Audio Recording

Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

Tentative Schedule:**

Week	Topics, Readings, Assignments, Deadlines
1	Introduction to course and syllabus, Introduction to Tissue Engineering
2	Introduction to cellular biology
3	Stem Cells, Cell Visualization
4	Test 1, Histology and Tissue Types
5	Scaffold Design
6	Scaffold Materials: Polymers, Ceramics and Metals
7	Surface Modification
8	Test 2, Scaffold Fabrication
9	Cell Nutrition, Bioreactors
10	Bioreactors, Aseptic cell culture techniques
11	Test 3, Case Study 1: Lab experiments
12	Case Study 1: Lab experiments
13	Case Study 1: Lab experiments
14	Cryobiology, Tissue Engineering of Skin
15	Bone Tissue Engineering
16	Case Study 2 Presentations
Finals	

***The schedule is subject to change at the discretion of the instructor or depending upon the progress of the class*