This course is available for student registration only after the approval process has been completed.

COURSE NO. 4050  CREDIT HOURS 3  TERM TO BE ADDED TO THE FILE Fall 2015

CLASS HOURS 45/semester  LECTURE HOURS 45/semester  LAB HOURS CONTACT HOURS (CEU ONLY)

DEPARTMENT Biomedical Engineering  SCHEDULE TYPE Special Projects/Topics

☐ COLLEGE OF AERONAUTICS – 23  ☐ COLLEGE OF PSYCHOLOGY AND LIBERAL ARTS – 25
☐ NATHAN M. BISK COLLEGE OF BUSINESS – 24  ☐ COLLEGE OF SCIENCE – 26
☐ COLLEGE OF ENGINEERING – 1  ☐ EXTENDED STUDIES / NATHAN M. BISK COLLEGE OF BUSINESS – 90

COMPUTER TITLE Restricted to 25 characters, including spaces Special Topics in BME

CATALOG TITLE Special Topics in Biomedical Engineering

CATALOG DESCRIPTION OF COURSE Restricted to 350 characters, including spaces

Covers special topics in biomedical engineering. May be repeated for a maximum of six credits, provided the topics change.

(REQUIREMENT: Junior standing and department approval.)

This description has been approved by the catalog office.

In addition, please attach a course syllabus and/or more detailed description.

RESTRICTIONS ☐ Prerequisite _____________________________ ☐ Corequisite _____________________________

☐ Course Number and ○ or ☐ Course Number and ○ or

☐ Prerequisite _____________________________ ☐ Corequisite _____________________________

☐ Course Number and ○ or ☐ Course Number and ○ or

☐ Prerequisite _____________________________ ☐ Corequisite _____________________________

☐ Course Number and ○ or ☐ Course Number and ○ or

ADDITIONAL RESTRICTION Restricted to junior- or senior-level standing.

If this course replaces a course currently offered in BANNER, please indicate old course information and the date/term the course may be removed from the system.

GRADE TO BE ISSUED

☐ A, B, C, D, F  ☐ A, B, C, D, F, CEU/Audit

☐ CEU  ☐ S, U

☐ P, F  ☐ Other

TERM TO INACTIVATE

Yes ☐ No Will this course be used to measure program-level student learning outcomes? If yes, review and signature required.

Yes ☐ No Will this course be used to satisfy the scholarly inquiry requirement? If yes, attach "Q" materials for review.

APPROVALS: On completion of description and course number verification, affix appropriate signatures as indicated, and submit completed form to Chair, Graduate Council or Chair, Undergraduate Curriculum Committee for approval.

Originator 9/14/14

Department Head/Program Chair 9/14/14

Dean or Associate Dean 9/14/14

Vice President for Institutional Effectiveness

Date

CATALOG DIRECTOR

These changes/additions have been made for the University Catalog and entered into the BANNER term named above.

Catalog Director  Date

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SCARRES  Operator Init  Date

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R00-90-214
BME 4050: SPECIAL TOPICS - ADVANCED BIOMECHANICS
Department of Biomedical Engineering
Spring 2014

2014-15 Catalog Data: Continues study of biomechanics concepts. Stress, strain and transformation; mechanical properties of biomaterials; combined loading - axial, torsion, bending and transverse loading; viscoelastic modeling of bio-tissues; experimental deformation analysis; failure criteria for bio-tissues; pressurized vascular tissue analysis; bone stability analysis. Prerequisites: BME 3081.

Credits & Contact Hours: 3 Credits, 45 Lectures (50 minutes/lecture)

Required or Selected Elective: Restricted Elective

Prerequisites: BME 3081

Instructor:
Dr. Ted Conway; Office: Link 304; Phone: 674-8491, email: tconway@fit.edu

Office Hours:

Objectives:
1. Understand scope and development of advanced topics in biomechanics
2. Understand the concepts of continuum mechanics
3. Learn the equilibrium equations and constitutive relations in biomechanics
4. Learn the applications of biomechanics to hard tissues
5. Learn the applications of biomechanics to soft tissues

Textbooks:


Course Outcomes:

1. Apply basic laws of physics to formulate, solve, and communicate biomechanics load-deformation analysis problems.
2. Develop a continued understanding of structure and physiology of biological tissues and apply engineering principles to relate tissue structure to its mechanical function.
3. Apply advanced mechanics of materials principles to biomechanics and perform stress, strain and deformation calculations due to combined loading regimes.
4. Understand basic concepts of failure criteria and analysis.
5. Understand current challenges in biomechanical engineering.
**Topics Covered:**

Theories of Stress and Strain (8 Lectures)  
Linear and Non-Linear Stress-Strain Relationships (6 Lectures)  
Axial, Torsional, Bending and Transverse Loading (8 Lectures)  
Combined Loading Analysis (3 Lectures)  
Viscoelastic Modeling of Biomaterials (6 Lectures)  
Thin and Thick Walled Pressure Vessels – Vascular Tissues (3 Lectures)  
General Failure Analysis (7 Lectures)  
Buckling and Bone Stability Analysis (4 Lectures)

**Class Schedule:** MWF 9:00 – 9:50am

**Grading Policy:**  
Homework (20%)  
Exam 1 (25%)  
Exam 2 (25%)  
Final Exam (30%)

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### Outcomes Assessment Matrix for BME 4050

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Relationship of Course Outcomes to Student Outcomes</th>
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**Key**  
- **a** An ability to apply knowledge of mathematics, science, and engineering  
- **b** An ability to design and conduct experiments, as well as analyze and interpret data  
- **c** An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability  
- **d** An ability to function on multi-disciplinary teams  
- **e** An ability to identify, formulate, and solve engineering problems  
- **f** An understanding of professional and ethical responsibility  
- **g** An ability to communicate effectively  
- **h** The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context  
- **i** A recognition of the need for, and an ability to engage in life-long learning  
- **j** A knowledge of contemporary issues  
- **k** An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

◇ = The Course Outcome *lightly* addresses the Student Outcome  
◆ = The Course Outcome *strongly* addresses the Student Outcome

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Course Outcomes Assessment Matrix completed by: T. A. Conway, Ph.D., Professor of Biomedical Engineering.

Date: 9/17/2014
Florida Institute of Technology

ADDING A NEW COURSE TO THE CURRICULUM

This course is available for student registration only after the approval process has been completed.

SUBJECT   B M E  COURSE NO.*  4 0 0 0  CREDIT HOURS  3  TERM TO BE ADDED TO THE FILE  Spring 2015

*Justify level if 1000-level and no co- or prerequisites. A minimum of junior standing and department head approval.

CLASS HOURS  4  LECTURE HOURS  4  LAB HOURS  135/582  CONTACT HOURS (CEU ONLY)  

DEPARTMENT  Biomedical Engineering  SCHEDULE TYPE  Special Projects/Topics (S)

☐ COLLEGE OF AERONAUTICS – 23  ☐ COLLEGE OF PSYCHOLOGY AND LIBERAL ARTS – 25
☐ NATHAN M. BISK COLLEGE OF BUSINESS – 24  ☐ COLLEGE OF SCIENCE – 26
☐ COLLEGE OF ENGINEERING – 1  ☐ EXTENDED STUDIES / NATHAN M. BISK COLLEGE OF BUSINESS – 90

COMPUTER TITLE  Restricted to 25 characters, including spaces  Independent Study in BME  Dual-Prefix, Bl-Level, Full-Load?  □ Yes  ■ No

CATALOG TITLE  Independent Study in Biomedical Engineering

CATALOG DESCRIPTION OF COURSE  Restricted to 350 characters, including spaces
Includes student/faculty research on subjects topical to biomedical engineering at a level commensurate with advanced undergraduate standing. (Requirement: Department head approval and junior standing.)

This description has been approved by the catalog office  7/1/14

In addition, please attach a course syllabus and/or more detailed description.

REstrictions  ☐ Prerequisite  ☐ Corequisite  ☐ and or

☐ Prerequisite  ☐ Corequisite  ☐ and or

☐ Prerequisite  ☐ Corequisite  ☐ and or

☐ Other

GRADES TO BE ISSUED  ☐ A, B, C, D, F  ☐ A, B, C, D, F, CEU/Audit
☐ CEU  ☐ S, U  ☐ P, F

ADDITIONAL RESTRICTION  □ DEPT. HEAD APPRO + JR. STANDING

If this course replaces a course currently offered in BANNER, please indicate old course information and the date/term the course may be removed from the system.

SUBJECT Alpha Prefix (e.g., CSE)  COURSE NO. (e.g., 1301)  TERM TO INACTIVATE

☐ Yes  ■ No  Will this course be used to measure program-level student learning outcomes? If yes, review and signature required.*

☐ Yes  ■ No  Will this course be used to satisfy the scholarly inquiry requirement? If yes, attach "Q" materials for review.

APPROVALS: On completion of description and course number verification, affix appropriate signatures as indicated, and submit completed form to Chair, Graduate Council, or Chair, Undergraduate Curriculum Committee for approval.

Origination Date  7/1/14

Department Head/Program Chair  2/1/14

Dean or Associate Dean

Date

Chair, Graduate Council
Date

OR

Chair, Undergraduate Curriculum Committee
Date

**Associate Vice President for Institutional Effectiveness

Date

CATALOG DIRECTOR

These changes/additions have been made for the University Catalog and entered into the BANNER term named above.

Date

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RE182-1010
BME 4300 INDEPENDENT STUDY IN BIOMEDICAL ENGINEERING  
Fall 2014

2014-15 Catalog Data: This class will provide undergraduate students with experience working with faculty on biomedical engineering research projects. While specific research projects will vary, the general goals of this class are to gain a more detailed understanding of a specific research area and develop skills important for a future scientific research career. The subject topics will be commensurate with advanced undergraduate standing. No pre-requisite classes are required, but department head approval and junior standing are required.

Credits & Contact Hours: 3 Credits, 45 contact hours.

Required or Elective or Selected Elective: Restricted Elective.

Prerequisites by Topic: Scientific writing, Physics, Chemistry, Statics, Mathematics, Material Science, Basic introductory computer skills.

Co-requisites by Topic: None

Grading Policy: 
Grades will be determined based on the student’s performance in the research, and written and/or oral presentation on the research at the end of the semester. The specific assignments and tasks will be decided by the individual instructor.

Textbook: 
Journal articles and text book determined by the instructor

Course Outcomes: Students completing the course should be able to:
1. Develop a more detailed, hands on understanding of a specific Biomedical Engineering research area.
2. Apply the basic engineering and science principles learned in previous classes to a current Biomedical Problem.
3. Gain experience with skills necessary for a researcher, including performing a literature search, experimental design, mathematical model development, and communicating the results from the work.

Topics Covered and Associated Time:
The specific topics, meetings, and deadlines will be determined on an individual basis by the instructor. The contact hours will be 45 h at a minimum.

Class Schedule: To be determined by the instructor

Contribution of Course to Meeting the Requirements of Curriculum: This course meets the requirements of one and one-half years of engineering science topics.
Relationship of Course to Program Outcomes: See assessment matrix.

Prepared By: Chris Bashur, Ph.D., Assistant Professor of Biomedical Engineering
Outcomes Assessment Matrix for BME 4300

<table>
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Key

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♦ = The course outcome lightly addresses the Student Outcome
◆ = The course outcome strongly addresses the Student Outcome

Course outcomes assessment matrix completed by: Chris Bashur, Ph.D., Biomedical Engineering
Date: 8/4/2014
This is a specific example for the Undergraduate Curriculum Committee to supplement the primary syllabus

BME 4300 INDEPENDENT STUDY IN BIOMEDICAL ENGINEERING
Fall 2014

2014-15 Catalog Data: This class will provide undergraduate students with experience working on cardiovascular tissue engineering research. This class involves understanding the current clinical need and research approaches for generating small-diameter vascular grafts, performing research on a specific approach to generate these grafts through electrospinning, and gaining experience with communicating the results through an end of the semester presentation and written summary of the results. The student will gain experience with biodegradable scaffold fabrication and characterization (e.g., mechanical testing), cell culture, and assays to analyze the cellular response to the biomaterial. No pre-requisite classes are required, but department head approval and junior standing are required.

Credits & Contact Hours: 3 Credits, at least 180 hours.

Required or Elective or Selected Elective: Restricted Elective.

Prerequisites by Topic: Scientific writing, Physics, Chemistry, Statics, Mathematics, Material Science, Basic introductory computer skills.

Co-requisites by Topic: None

Grading Policy:

Research Performance: 50%
Written plans for experimental design: 10%
Final oral presentation: 20%
Final written summary of work: 20%

Textbook:
Relevant journal articles in the material science and tissue engineering fields

Course Outcomes: Students completing the course should be able to:
1. Develop a more detailed, hands on understanding of cardiovascular tissue engineering.
2. Apply the basic engineering and science principles learned in previous classes to cardiovascular tissue engineering.
3. Gain experience with skills necessary for a researcher, including performing a literature search, experimental design, mathematical model development, and communicating the results from the work.

Topics Covered and Associated Time:
Weekly research will be performed. The student will also perform literature searches to become familiar with the field. The student will meet weekly with the faculty member individually and with the laboratory group for the group meeting. The final group meeting will involve the student’s presentation.

**Class Schedule:** To be determined by the instructor

**Contribution of Course to Meeting the Requirements of Curriculum:** This course meets the requirements of one and one-half years of engineering science topics.

**Relationship of Course to Program Outcomes:** See assessment matrix.

**Prepared By:** Chris Bashur, Ph.D., Assistant Professor of Biomedical Engineering