Welcome

Welcome to So You Want to Become a Biomedical Engineer!

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In this course guide, you will find:

1. Course Instructor Biography
2. Course Syllabus
3. Grading Policy and Course Information
4. Discussion Guidelines

Throughout your course adventure, the course staff is here to help and to guide. For help with the course, click the Discussion tab at the top of the course page and post a question. For help with a technical problem, click “Help Center” at the bottom of any edX webpage.

Again, thank you for joining us. Best wishes for an informative and fun experience.

Course Instructor Biography

Bruce C. Wheeler is an Adjunct Professor in the Department of Bioengineering at the University of California, San Diego. He is also Past President (2013/2014) of the IEEE Engineering in Medicine and Biology Society (EMBS).

Before joining UC San Diego, Wheeler was a professor and Acting Department Chair at the University of Florida, co- authoring Florida's new BME BS degree program proposal. Previously he had been on faculty at the University of Illinois where he was the Founding Head of the Bioengineering Department, authored the proposals and shepherded to completion the programs for the BS, MS and PhD. He also served as ECE Associate Head for Undergraduate Education and Chair of the Neuroscience Program. He earned his Ph.D. and master's from Cornell and his bachelor's from MIT.

Course Syllabus

LESSON 1: Introduction

- Overview
- Course Structure

LESSON 2: Biomedical Engineering Defined

- What is a BME
- A Very Broad Field
- How BMEs Differ from Other Engineers
- Is BME Right for You?
- Helping You Get There

LESSON 3: The Big Picture

- A Multidisciplinary Field
- A Simple History of Science
- What Biomedical Engineering Provides

Course Syllabus, continued

LESSON 4: Practical Applications

- Introduction
- Clinical Engineering
    - Working in the Clinical Setting
- Rehabilitation Engineering
    - Neural Prostheses
    - Working with Patients
    - Exoskeletons
- Performance Enhancement
    - Monitoring Pilot Fatigue
- How They Got Here

LESSON 5: Starting from Physiology

- Introduction
- Cardiac Engineering
    - Reanimating Human Hearts
    - Lessons from Hibernating Bears
- Physiological Systems Modeling
    - Modeling Neural Circuits for Parkinson's and Epilepsy Control
- How They Got Here

LESSON 6: Neural Engineering

- Introduction
    - Multi-Scale Engineering
- Brain-Machine Interfaces
    - Addressing Pilot-Induced Oscillations
    - Sensory Feedback with Neural Implants
    - Non-Invasive Signaling
- Conclusion
- How They Got Here

Course Syllabus, continued

LESSON 7: Biomedical Imaging

- Introduction
- Functional Brain Imaging
- Cardiac Imaging
- How They Got Here

LESSON 8: Biomedical Image Processing

- Introduction
- Image Analysis
- How They Got Here

LESSON 9: Electronics & Instrumentation

- Instrumentation, Sensors & Measurement
    - Sleep Monitoring
    - Home Robot for Fall Detection
- Biosignal Processing
    - Cardio Seismography
    - Monitoring the Brain Under Anesthesia
    - Seizure Control
- Wearable Biomedical Sensors
- How They Got Here

LESSON 10: Biomedicine Meets Computers

- Introduction
- Bioinformatics
    - YOU on a Chip
    - Systems Medicine
    - Tracking Bacteria Propagation
- Biomedical and Health Informatics
    - Monitoring Premature Infants
    - Mining Data from Wearables
    - Telemedicine
- How They Got Here

Course Syllabus, continued

LESSON 11: Mechanics Meets Biology & Medicine

- Introduction
- Biomechanics
- Biorobotics
- Surgical Robotics
- How They Got Here

LESSON 12: Materials Go Very Small

- Introduction
- BioMEMS
- Micro & Nanotechnology
- How They Got Here

LESSON 13: BME Intersects Cells & Tissues

- Introduction
- Drug Design & Delivery
    - The Langer Lab
    - Tales of Two Startups
- Biomaterials
- Tissue Engineering
- How They Got Here

LESSON 14: Additional Areas

- Genetic Engineering & Synthetic Biology
- Cellular & Molecular Biomechanics
- Agricultural & Environmental Engineering

LESSON 15: Where the Rubber Meets the Road

- Introduction
- Let the Need Drive the Research
- Getting to Market

Course Syllabus, continued

LESSON 16: Designing Your Career

- What You Can Do with a BME Degree
- Selecting a Career Path
- Working in Industry
- Entrepreneurship
- Career Advice

LESSON 17: Planning Your Education

- Selecting Your Major
- How Much Education You'll Need
- What Courses To Take
- Academic Advice
    - Which Classes to Take
    - Degree Programs
    - Which Degree is Right for You
    - For Those Going to Med School
    - How Far You Should Go
    - Try Things On
    - Your Attitude Towards Learning
- Gaining Real-World Experience
    - Why Work in a Lab
    - Getting into a Lab
    - The Lab Environment
    - Poster Halls

LESSON 18: Advice and Inspiration

- What Inspires Me
- Where to Learn More
- Advantages of Society Membership
- My Personal Goal
- Conclusion

Grading Policy and Course Information

About This Course

Want to become a biomedical engineer but not sure where to focus or how to get there? This engineering course will give you an overview of this wildly popular and vast field, as you learn about more than two dozen areas of focus and get a peek at some of the cool and exciting advances going on at top institutions. Along the way, you'll meet more than three dozen biomedical engineers—from top names in the field to those just starting their careers.

Through exercises, you'll get to think like a BME and experience the various areas to see which fits your interests and talents.

Finally, once you have a better sense of where you'd like to focus, our educational and career advice will help show you how to get there.

While targeted to students exploring a career in biomedical engineering, anyone curious about this fascinating field will find something of interest: from the thinking processes of pilots and baseball batters to an inside view of a beating heart to developments in bionics, exoskeletons, and nanotechnology.

Join us on a journey through the world of biomedical engineering.
Verified students are eligible to earn Continuing Education Units (CEUs) and Professional Development Hours (PDHs), valid toward continuing education requirements for many professional certifications.

Prerequisites

Secondary school (high school) math, science and reasoning

Time Commitment

Approximately eight hours total.

Deadlines

All course requirements must be completed by 29 June 2016.

Grading Policy and Course Information, continued

The deadline to upgrade to a verified certificate is 27 June 2016.

What You Will Learn

- The breadth of the field of biomedical engineering
- Advances going on in each of the areas of focus
- How to select an area and degree program
- How other biomedical engineers got where they are
- How to chart your own career

Grading Policy

Assignment	# of Assignments	# of Attempts Allowed	Type	Droppable
Quiz	19	3	2	

Letter Grade	Overall Percentage to Earn
Pass	70 - 100
Fail	0 - 69

Discussion Guidelines

We ask you to build community and share, in your own words, your thoughts about the course content and any about news or research related to the class.
We ask that you use the discussion space as:

- A forum for discussing topics raised in the course and demonstrate your understanding or application of the course material
- A medium to discuss questions about assignments, readings, and course content with peers and course staff
- A medium for collaboration and the exchange of ideas.
- An online meeting place for social interaction among peers.

Discussion boards are moderated by the course instructional team.

For more information on discussion boards, please see below and refer to the discussion board details https://www.edx.org/blog/getting-most-out-edx-discussion-forums.

In order for the discussion board to run smoothly, please refer to the guidelines below for basic discussion board etiquette. How you phrase your posts is important. Please remember that the participants in the course come from all over the world, representing a variety of cultures and speaking many different languages. Be respectful of others and be aware of the tone of your posts. Think through and re-read your posts before posting!

A few guidelines for the discussion board are outlined below.

- Please limit your posts/responses to 200 words or less (by request of edX). In other words, be concise in your posts/responses.
- Reflect on and respond to Discussion Board questions and post your contribution, in your own words.

Discussion Guidelines, continued

- To build community, we ask that you review 1-2 items posted by your classmates and respond to at least one of those postings.

- Before posting, read what others have previously posted to avoid repeating comments. You can always upvote good posts. Click on the green “plus” button so that good posts and/or responses can be found more easily. You can search by votes to find the most interesting posts.

- Never use derogatory language or make insensitive comments. (You should flag inappropriate posts.)
- Do not personally attack people. It’s fine to disagree, but use facts and reasons to back up an argument, not personal attacks.

- Stick to the topic of the discussion board.

- Remember that humor is often difficult to convey in text – avoid it if people might not understand what you are trying to say.

- Avoid slang and use appropriate spelling – given the diversity in the class, what might mean something to you will not mean the same thing to someone else. Correct spelling and grammar will help others to understand you and provide useful responses. Avoid using ALL CAPS, abbrv of wrds (abbreviation of words), and excessive punctuation!!!!!!!!!

- Use correct grammar.

- If you reference something, provide everyone with the link or reference.

- Notify the course staff of bugs. Include [STAFF] at the beginning of your post’ title – this will help us identify your question or problem and respond to it.