

**Advances in Cardiovascular Medicine and Technology**

**Summer 2022**

**PRE-REQUISITE**: High School Biology

**COURSE DATES:** July 11 – 22, 2022

9:00 – 11:30

Anthropology 105

**FACULTY**: Brittany Butts, PhD

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**OFFICE HOURS:** After class Tuesdays and Thursdays and by appointment as needed

Heart disease is the #1 cause of death among adults in the United States, accounting for more than 600,000 deaths each year. This course will discuss the health implications of using innovative technologies in cardiovascular care. This course is designed for students interested in learning how science and technology intersect to improve human health.

**OBJECTIVES/OUTCOMES**:

1. Learn the history of cardiac technology and recent advances in the use of technology in cardiac care.
2. Understand the anatomy and physiology of the cardiovascular system and apply it to cardiac technologies.
3. Explain in depth at least one device or technology used in cardiac care and how this device affects cardiovascular function.

**COURSE REQUIREMENTS**:

Students are expected to:

* Prepare for class by completing the daily assigned readings.
* Participate actively in the discussion of the topic for each class session.
* Complete synchronous and asynchronous course activities.
* Create and present a group presentation on a cardiac condition and the technology used for treatment.

**BOOKS**:

Dunn, Rob. (2015) The Man Who Touched His Own Heart. Little, Brown, and Company, New York, NY. ISBN: 9780316225793

Online textbook (available on Canvas): Chapter 19 - The Cardiovascular System: The Heart, by OpenStax College, Rice University. (Download for free at <http://cnx.org/content/col11496/latest>/).

**COURSE SCHEDULE:**

*Week 1:*

July 11: Course introduction, introduction to CV system, history of cardiac care

July 12: Cardiac anatomy (heart dissection), coronary artery disease

July 13: Myocardial infarction, cardiac bypass

July 14: Field Trip – CDC Museum

July 15: Heart failure, ventricular assist devices

*Week 2:*

July 18: Heart transplantation

July 19: Congenital heart disease – advancements and surgeries

July 20: The heart and electricity, part 1

July 21: The heart and electricity, part 2

July 22: Student Presentations

### **COMPLETING THE COURSE:**

### It is expected that you will complete all course assignments. But sometimes life happens. Should there be any extenuating circumstances that prevent you from doing so, please contact me via email: [brittany.butts@emory.edu](mailto:brittany.butts@emory.edu)

**COURSE GOALS AND ASSIGNMENTS:**

* Students will complete assigned readings and engage in-class discussions and activities.
* On the last day of class students will participate in group presentations on a cardiovascular technology.

## **ACADEMIC HONESTY AND PLAGIARISM:**

Please review the [Emory College Honor Code](http://catalog.college.emory.edu/academic/policies-regulations/honor-code.html).

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## **ADA AND STUDENTS WITH DISABILITIES:**

In compliance with the Americans with Disabilities Act of 1990 (ADA), no otherwise qualified person with a disability be excluded from participation in, be denied the benefits of, or be subject to discrimination under any educational program or activity in the university. Please contact the Office for Disability Services using the link below to coordinate reasonable accommodations for students with documented disabilities.  
[Emory’s Office of Equity & Inclusion Website](http://equityandinclusion.emory.edu/index.html)

**STATEMENT ON RELIGIOUS HOLIDAYS**:

Students should notify their course faculty in writing during the first week of the semester of their desire to observe any religious holidays. Students will remain responsible for all assigned work/clinical days. Refer to the Religious Holiday Calendar <https://www.emory.edu/events/resources/guides/religious.html>

**WEEK 1**

**Class 1: Introduction to Cardiovascular Medicine**

**July 11, 2022**

**Topics and Activities:**

* Introductions of faculty and students
* Overview of the course, syllabus, and course requirements
* Introduction to Cardiovascular Medicine.
* Beginnings of cardiology
* Cardiovascular anatomy

**Homework Assignments:**

Readings:

* Textbook:
  + [Section 19.1](https://openstax.org/books/anatomy-and-physiology/pages/19-1-heart-anatomy): Coronary Artery Disease (page 804)
  + *Review* the anatomy of the heart if you need a refresher – [Section 19.1](https://openstax.org/books/anatomy-and-physiology/pages/19-1-heart-anatomy) Heart Anatomy (Links to an external site.) (pages 784 – 802 for PDF)
* Dunn:
  + Chapters 1 (The Bar Fight that Precipitated the Dawn of Heart Surgery)
  + Chapter 12 (The Perfect Diet)
  + Chapter 13 (The Beetle and the Cigarette)

Not an assignment, but just FYI...

If you're interested, you can watch a 2015 interview with course book author and evolutionary biologist, Rob Dunn, from a NC PBS show.

[https://www.pbs.org/video/nc-bookwatch-rob-dunn-man-who-touched-his-own-heart/](https://www.pbs.org/video/nc-bookwatch-rob-dunn-man-who-touched-his-own-heart/%20) (Links to an external site.)

**Class 2: Heart Dissection and Coronary Artery Disease**

**July 12, 2022**

**Topics and Activities:**

* Anatomy of the Heart – heart dissection
* Atherosclerosis, coronary artery disease
* Video: Georgia – coronary artery disease, Diet and heart disease
* Discussion: CAD risk factors and role of behavior and environment in coronary artery disease

**Homework Assignment:**

Readings:

* Textbook: [Section 19.1](https://openstax.org/books/anatomy-and-physiology/pages/19-1-heart-anatomy): Myocardial Infarction (page 803)
* Dunn: Chapters 5 (Seeing the Thing That Eats the Heart), 9 (Lighter than a Feather), and 10 (Mending the Broken Heart)
* Healthy People 2020: Social Determinants of Health

**Class 3: Myocardial Infarction, CABG**

**July 13, 2022**

**Topics and Activities:**

* Vascular system – structure and function
* Vascular Disease
  + Hypertension
  + Acute Myocardial Infarction and Percutaneous Coronary Intervention
  + Stroke
* Coronary artery bypass graft (CABG)

**Homework Assignment:**

Readings:

* Dunn: Chapters 2 (The Prince of the Heart) and 3 (When Art Reinvented Science)
  + We will discuss these on Friday.
* CDC Museum: Check out any online exhibits that you are interested in: <https://www.cdc.gov/museum/online/online-exhibitions.html>

**Class 4: Field Trip: CDC Museum**

**July 14, 2022**

**Information for our Field Trip:**

* We will meet in front of the dorms at 9:00 am and walk over to the museum.
* Please bring a photo ID.
* I would bring a mask just in case. CDC states: *Wear a well-fitting mask while in CDC-owned and -leased facilities when the COVID-19 community level in the county where the facility is located is high*. While COVID cases in this county are currently marked as ‘low’, this could change at any time. I’d bring one just in case CDC wants us to wear them when we check in or if you prefer to wear a mask.

About the CDC. CDC is the nation’s leading science-based, data-driven, service organization that protects the public’s health. CDC works 24/7 to protect America from health, safety and security threats, both foreign and in the U.S. Whether diseases start at home or abroad, are chronic or acute, curable or preventable, human error or deliberate attack, CDC fights disease and supports communities and citizens to do the same.

CDC Museum. The CDC museum has permanent and changing exhibitions that focus on a variety of public health topics, as well as the history of CDC. During our visit, we will consider the public health aspect of acute and chronic diseases and how public health relates to cardiovascular disease.

Current exhibits include:

* Influenza: Complex Virus/Complex History. This exhibit traces the global impact of influenza viruses since the 1918 pandemic. Influenza viruses are biologically and historically unique. Small changes in their genes occur frequently. Abrupt major changes are less common but can have devastating impact. In modern times, recurring influenza outbreaks have prompted virologists, medical professionals, and public health workers to search for ways to prevent influenza transmission and reduce the effects of influenza infections.
* Typhoidland. This exhibit will take us through the past, present, and future of typhoid control. We will go on a journey through 200 years of thinking and managing infectious disease.

**Homework Assignment:**

Readings:

* Textbook: ***Review*** [Section 19.3](https://openstax.org/books/anatomy-and-physiology/pages/19-3-cardiac-cycle): The cardiac cycle (pages 818-821) and Section 19.4: Cardiovascular physiology (pages 822-832) [we will cover this information in class Thursday, so a quick review is fine]
* Dunn: Chapter 11 War and Fungus

**Class 5: Heart Failure and Ventricular Assist Devices**

**July 15, 2022**

**Topics and Activities:**

* Cardiac cycle and cardiovascular physiology
* Heart Failure
* Ventricular Assist Devices (VADs)
* Videos: Beth – Living with a VAD; Victor – LVAD as a bridge to recovery
* Discussion: Living with heart failure and VADs

**Homework Assignment:**

Readings:

* Dunn: Chapters 7 (Frankenstein’s Monsters) and 8 (Atomic Cows)
* Articles (PDFs posted in Canvas
  + Waiting for Ideal Candidates
  + Advances in the understanding and management of heart transplantation
    - Sections ‘Advances in donor organ preservation’, ‘The face of cardiac transplantation in the current era’, and ‘The use of higher risk donor profile’
* We will use these articles in class on Monday.

***Note****: we will cover congenital heart disease next week. If anyone has access to HBO, you can stream a movie that relates to one of Monday’s homework readings. The movie is ‘Like Something the Lord Made’. It is available to stream via HBO max. This 2004 movie stars Yasiin Bey, Alan Rickman, and Mary Stuart Masterson. This movie is not an assignment – there is a reading assignment that covers this story. Just an FYI if you can and want to watch it.*

**WEEK 2**

**Class 6: Heart Transplantation**

**July 18, 2022**

**Topics and Activities:**

* Heart transplantation
* Group project – we will have time to meet in your groups

**Homework Assignment:**

Readings:

* Textbook: [Section 19.1](https://openstax.org/books/anatomy-and-physiology/pages/19-1-heart-anatomy): Congenital Heart Defects (page 793) and Figure 19.10;
* Website: [Congenital Heart Defects, NIH](https://www.nhlbi.nih.gov/health-topics/congenital-heart-defects)
* Handout: ‘Like Something the Lord Made’ (*alternative option – if you have HBO you can stream the movie of the same name. This 2004 movie stars Yasiin Bey, Alan Rickman, and Mary Stuart Masterson.*)
* Dunn: Chapter 14 (The Book of Broken Hearts)

**Class 7: Congenital Heart Defects, Infectious Disease and the Cardiovascular System**

**July 19, 2022**

**Topics and Activities:**

* Congenital heart defects
* Infectious disease and the cardiovascular system
  + Ebola
  + Chagas disease
  + COVID-19

**Homework Assignment:**

Readings:

* Textbook: ***Review*** [Section 19.2](https://openstax.org/books/anatomy-and-physiology/pages/19-2-cardiac-muscle-and-electrical-activity): Cardiac Muscle and Electrical Activity (pages 805-818)
* Handout: What Broke My Father’s Heart
* Dunn – Chapters 5 (Seeing the Thing That Eats the Heart) and 6 (The Rhythm Method)

**Class 8: The Heart and Electricity, Part I**

**July 20, 20212**

**Topics and Activities:**

* Electricity in the Heart
* EKGs
* Pacemakers and Defibrillators

**Homework Assignment:**

Readings:

* Textbook: page 789 (cardiac tamponade), page 824 (abnormal heart rate), page 786 (CPR)
* Website: [Atrial Fibrillation, NIH](https://www.nhlbi.nih.gov/health-topics/atrial-fibrillation)
* Article: CPR (See Canvas)

**Class 9: The Heart and Electricity, Part II**

**July 21, 2022**

**Topics and Activities:**

* Atrial fibrillation
* Cardiac ablation
* Cardiac Emergencies and CPR – rhythms, electricity, and drugs
* Heart Sounds

**Homework Assignment:** Complete presentations for Friday

**Class 10: Student Presentations**

**July 22, 2022**

* Student group presentations
* Class synthesis and discussion

**Group Presentation Assignment**

1. You will choose a group by the third day of class. There should be 2-4 students per group.

2. Each group is to prepare a 15-minute presentation on a single technology or treatment used in cardiovascular medicine. (Please do not take more than 20 minutes so that each group has adequate time.)

3. Each group should present a different technology. You can choose any technology or treatment in this course, such as LVAD, transplant, pacemaker, defibrillator, Fontan procedure, heart catheterization, etc. If there is a cardiovascular technology or treatment you would like to cover that we are not covering in this class, please email or ask the instructor first.

4. Presentation format is completely up to your group, but you must cover the mandatory content listed below.

You can do a PowerPoint presentation in which everyone takes a turn presenting a piece. You can make a video. You can record a skit of some sort (such as a hospital drama with doctors and patients acting out a scene using the technology and explaining it to someone). You can present a sales pitch for a newly invented technology. Or any idea you have. Feel free to be creative!

Every member of the group must participate in the presentation.

5. The following content must be included in your presentation:

* + The medical condition requiring the technology or treatment
  + A description of the medical condition (pathophysiology)
  + Details on how the technology or treatment works
  + An explanation of how this technology or treatment would affect a patient and his/her family. How will this change a patient’s life? What sort of instructions would someone receiving this technology and taking care of someone with this technology require?
  + Identify the expected outcomes for the patient with this technology or treatment