

**Course Syllabus**  
**Biology 110**  
**Principles of the Human Body**

**Credits:** 3  
**Time:** Spring 2015  
**Place:** online  
**Faculty:** Cristina Roche  
Science Department  
Middlesex Community College  
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**Text:** Human Biology: Concepts and Current Issues 7<sup>th</sup> Edition

–Michael D. Johnson

**Course Description**

This is an introductory course dealing with the structure and function of the human organism and the issues facing the human in today's world. It is intended for students with limited science background. Reading exempt and grade of "C" or better in MAT\*075 or placement into MAT\*095 or higher.

**General Objectives of the Course**

Upon successful completion of this course the student will be able to:

- Briefly describe the unifying themes that characterize the biological sciences.
- Explain the basic chemistry concepts important to biology.
- Explain the basic structure and function of cells as the basic units of all living things and as the building blocks of multicellular organisms.
- Define homeostasis and explain why this concept is central to physiology.
- Distinguish between discovery science and hypothesis-based science. Explain why both types of exploration contribute to our understanding of nature.
- Explain the relation between form and function in biology, as expressed in molecular, cellular, and whole-organism physiology.
- Recognize the anatomical structures and explain the physiological functions of the body systems.
- Develop scientific terminology to describe the parts and processes of the human body.

**Scientific Knowledge & Understanding** (designated competency)

1. Communicate using appropriate scientific terminology.
2. Use representations and models to communicate scientific knowledge and solve scientific problems.
3. Plan and implement data collection strategies appropriate to a particular scientific question.
4. Articulate the reasons that scientific explanations and theories are refined or replaced.
5. Evaluate the quality of scientific information on the basis of its source and the methods used to generate it.

### **Learning Outcomes**

Students who fulfill the requirements of the course will have an increased understanding and appreciation for the workings of the human body. They will be familiar with the terminology and physiology of the major organ systems. They will be able to review relevant information and provide original feedback in an online setting.

### **Course Requirements**

A common misconception about on-line courses is that they are “self-paced” - that you can do the work any time during the semester. This course is designed in one-week units, with various deadlines approximately every week to keep everyone working on the same material and better able to participate in discussions.

This course will require at least as much time as the equivalent course taught in the classroom. In a “regular” 3-credit course, you would meet in the classroom for 3 hours per week. Instructors generally expect that you will study 1 to 2 hours for every hour in the classroom, for a total of 6 to 9 hours per week. The same holds true for an on-line course, except that the 3 hours of in-class time will now be time that you are putting in on-line.

Last minute glitches can occur with computer equipment, and the instructor will allow one extension per student with no late penalty upon request. However, ongoing computer problems will not be an acceptable excuse for incomplete work; you are expected to have a backup plan that allows you to complete work on time throughout the semester.

### **Reading Assignments**

As the course progresses students should become familiar with the topics in each chapter. Each topic includes important concepts and vocabulary with which the students will develop competencies. Readings from the text will provide the students with an introduction to these topics and a means for the student to continue their learning.

### **Weekly Assignments**

Every week there will be two homework assignments that will involve analysis of the chapters that we have read, and where relevant, and an anatomy quiz. Students will also be required to post to a weekly discussion forum.

Work may be submitted up to three days past posted deadlines with a 10% late penalty. If serious circumstances prevent you from completing work within this time frame, you must notify the instructor prior to the late deadline.

### **Communications**

From time to time, problems arise and need to be addressed directly with students. This e-mail address will be the primary means for the instructor to communicate

with individual students.

### Learning Disabilities

Learning disabilities and accommodations (for example, on timed quizzes) are handled through Disability Support Services. Individual instructors cannot grant accommodations without the approval of Disability Support Services, but if you qualify, you should notify the instructor at the start of the course.

### Problems

If you are struggling with any aspect of the course, or unexpected personal difficulties arise, you should always contact the instructor immediately. The instructor very much wants to see you succeed in the course and will make every effort to help you do so.

| Unit # | Instructional Unit              | Specific Objectives of Unit  |
|--------|---------------------------------|--|
| 1.     | Exploring Life and Science      | <ol style="list-style-type: none"><li>1. Explain the characteristics of life.</li><li>2. Diagram the hierarchy of structural levels in biological organization.</li><li>3. Distinguish between discovery science and hypothesis-based science.</li><li>4. Distinguish between quantitative and qualitative data.</li><li>5. Distinguish between inductive and deductive reasoning.</li><li>6. Explain what is meant by hypothesis, fact, law, and theory in science.</li><li>7. Distinguish between science and technology. Explain how science and technology are interdependent.</li><li>8. Define homeostasis and explain why this concept is central to physiology.</li><li>9. Define negative feedback and give an example of it.</li><li>10. Define positive feedback and give an example of it.</li></ol> |
| 2.     | The chemistry of living things  | <ol style="list-style-type: none"><li>1. Sketch and explain the structure of an atom.</li><li>2. Explain electronegativity and predict the behavior of individual atoms.</li><li>3. Identify the types of chemical bonds that would occur between various atoms important to cellular biology.</li><li>4. Discuss the biologically important properties of water.</li><li>5. Describe the structure of the four main classes of biological molecules: proteins, nucleic acids, lipids, and carbohydrates.</li><li>6. Define acid and base and interpret the pH scale.</li><li>7. Describe the purpose and effects of a buffer.</li></ol>   |
| 3.     | Structure and function of Cells | <ol style="list-style-type: none"><li>1. Distinguish between prokaryotic and eukaryotic cells.</li><li>2. Explain why there are both upper and lower limits to cell size.</li><li>3. Discuss the development and modern tenants of cell theory.</li><li>4. Explain the advantages of compartmentalization in eukaryotic cells.</li><li>5. Describe membrane structure and function and the mechanism for movement of materials across the cell membrane.</li><li>6. Identify parts of a cell and describe the structure and function of each organelle.</li></ol>  |

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|    |   | <ol style="list-style-type: none"> <li>7. Describe the effects of hypotonic, isotonic, and hypertonic environments on cells.</li> <li>8. Define osmosis and predict the direction of water movement based on differences in solute concentrations.</li> <li>9. Define energy. Distinguish potential energy from kinetic energy.</li> <li>10. Describe the structure of ATP, production, and function of ATP.</li> <li>11. Define metabolism, catabolism, and anabolism.</li> <li>12. Explain the role of catabolic and anabolic pathways in cellular metabolism.</li> <li>13. Distinguish between kinetic and potential energy.</li> <li>14. Briefly describe the energy conversions carried out by mitochondria.</li> </ol>   |
| 4. | Organization and Regulation of Body Systems | <ol style="list-style-type: none"> <li>1. Define the term histology and contrast the general features of the four major classes of tissues.</li> <li>2. Identify the organ systems, their functions, and the major organs in each system.</li> <li>3. Demonstrate and describe the anatomical planes of section.</li> <li>4. Apply directional terms to descriptions of anatomical parts.</li> <li>5. Identify structures of the integumentary system.</li> <li>6. Describe the general functions of skin and the subcutaneous layer.</li> <li>7. Compare the structure and function of the epidermis and dermis.</li> <li>8. Describe the three most common types of skin cancer.</li> </ol>  |
| 5. | The Skeletal System                         | <ol style="list-style-type: none"> <li>1. Describe the general functions of the skeletal system.</li> <li>2. Identify the internal structural components of compact and spongy bone.</li> <li>3. Identify parts of a long bone.</li> <li>4. Describe two bone disorders.</li> <li>5. Define the two major divisions of the skeletal system (axial and appendicular) and the general bones contained in each.</li> <li>6. Explain the different types of movements permitted at synovial joints.</li> </ol>   |
| 6. | Cardiovascular System                       | <ol style="list-style-type: none"> <li>1. Describe the functions and major components of the cardiovascular system.</li> <li>2. Identify the parts of the heart.</li> <li>3. Define and distinguish between the pulmonary and systemic circuits.</li> <li>4. Define systole and diastole.</li> <li>5. Explain what keeps the heartbeat regular.</li> <li>6. Compare and contrast the various types of blood vessels and their functions.</li> <li>7. Describe the components and physical properties of blood and blood plasma.</li> <li>8. Distinguish between the terms hemostasis and homeostasis.</li> <li>9. Explain the structure and function of the various formed elements: RBCs, WBCs, and platelets.</li> <li>10. Name and describe three disorders associated with RBCs.</li> <li>11. Name and describe three disorders associated with WBCs.</li> <li>12. Explain what determines a person's ABO and Rh blood types and how this relates to transfusion compatibility.</li> </ol> |

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|     |                                   | 13. Explain what is meant by blood pressure and heart rate.  |
| 7.  | The Lymphatic system and Immunity | <ol style="list-style-type: none"> <li>1. Explain how lymph is formed and returned to the bloodstream.</li> <li>2. Describe the major functions of the lymphatic system.</li> <li>3. Compare and contrast the major concepts regarding humoral immunity and cellular immunity.</li> <li>4. List the cardinal signs of inflammation and state the causes of each.</li> <li>5. Summarize the benefits of fever and the limits of these benefits.</li> </ol>  |
| 8.  | The Muscular System               | <ol style="list-style-type: none"> <li>1. List the functions of muscles.</li> <li>2. Describe the connective tissues associated with muscle.</li> <li>3. Describe the microscopic levels of structure in skeletal muscle.</li> <li>4. Explain how a nerve fiber stimulates a skeletal muscle fiber.</li> <li>5. Explain what is meant by origin, insertion, belly, action, and insertion.</li> <li>6. Distinguish between isotonic and isometric contraction.</li> </ol>   |
| 9.  | The Nervous System                | <ol style="list-style-type: none"> <li>1. Describe the function of the nervous system.</li> <li>2. Describe the major anatomical and functional subdivisions of the nervous system.</li> <li>3. Explain the difference between a sensory neuron, motor neuron, and an interneuron.</li> <li>4. Explain how messages are transmitted from one neuron to another.</li> <li>5. Describe the function of the spinal cord.</li> <li>6. Describe the gross anatomy of the spinal cord.</li> <li>7. Define reflex and describe the general components of a typical reflex arc.</li> <li>8. Describe the gross anatomy of the brain.</li> <li>9. Name the three meninges from superficial to deep.</li> <li>10. Describe the function of the cerebrospinal fluid.</li> <li>11. Identify the structures of the eye and explain their function.</li> <li>12. Explain the sense of vision.</li> <li>13. Identify the structures of the ear and explain their function.</li> <li>14. Explain the sense of hearing and balance.</li> <li>15. Explain the sense of taste and smell.</li> </ol> |
| 10. | The Endocrine System              | <ol style="list-style-type: none"> <li>1. Define hormone and the endocrine system.</li> <li>2. List the major organs of the endocrine system.</li> <li>3. Compare and contrast the nervous and the endocrine systems.</li> <li>4. Describe how an endocrine gland differs from an exocrine gland.</li> <li>5. Explain some general causes and examples of hormone hyposecretion and hypersecretion.</li> <li>6. Explain the pathophysiology of and treatment for Diabetes.</li> </ol>  |
| 11. | The Respiratory System            | <ol style="list-style-type: none"> <li>1. Identify the main structures of the respiratory system and state their functions.</li> <li>2. Trace the flow of air from the nose to the pulmonary alveoli.</li> <li>3. Describe the mechanisms of transporting O<sub>2</sub> and CO<sub>2</sub>.</li> <li>4. Describe the factors that govern gas exchange in the lungs and systemic capillaries.</li> <li>5. Discuss two common pulmonary disorders.</li> </ol>  |

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| 12. | The Digestion and Nutrition      | <ol style="list-style-type: none"> <li>1. Identify the main structures of the digestive system and state their functions.</li> <li>2. Describe the basic processes underlying digestion.</li> <li>3. Describe some factors that regulate hunger and satiety.</li> <li>4. Define nutrient and list the major classes of nutrients.</li> <li>5. Name the major vitamins and mineral required by the body and the general functions they serve.</li> <li>6. Discuss the recommended dietary guidelines outlined by the USDA.</li> </ol>   |
| 13. | The Urinary System               | <ol style="list-style-type: none"> <li>1. Name and locate the main structures of the urinary system and state their functions.</li> <li>2. Describe the major functions of the urinary system.</li> <li>3. Explain the significance of urine formation.</li> <li>4. Describe the composition and properties of urine</li> <li>5. Define glycosuria and its relationship to diabetes mellitus.</li> </ol>   |
| 14. | The Reproduction and Development | <ol style="list-style-type: none"> <li>1. Identify the fundamental biological distinction between male and female.</li> <li>2. Define primary sex organs, secondary sex organs, and secondary sex characteristics.</li> <li>3. Explain the role of sex chromosomes in determining sex.</li> <li>4. Define gonad and gamete and describe the relationship between the terms.</li> <li>5. Trace the male and female reproductive tracts and describe the gross anatomy and function of the organs.</li> <li>6. Compare and contrast male and female sex response.</li> <li>7. Compare oogenesis with spermatogenesis.</li> <li>8. Explain the fundamental concepts processes involved in ovulation and menstruation.</li> <li>9. Describe the process of fertilization, implantation and pregnancy.</li> </ol> |

### Evaluations

This course will be evaluated by ongoing assessment and there will be a final paper to be written at the end of the course.

### Grading Rubric

| Categories                            | Weight by % | Total Points |
|---------------------------------------|-------------|--------------|
| 14 Assignments 1<br>20 points each    | 28%         | 280          |
| 14 Assignments 2<br>20 points each    | 28%         | 280          |
| 14 Discussion posts<br>20 points each | 28%         | 280          |
| 1 Final Paper                         | 16%         | 160          |
|                                       |             |              |

## Syllabus

| Week: date    | Assignments deadline date | Chapter of Book            | Topic  |
|---------------|---------------------------|----------------------------|--|
| Week 1: 1/21  | 1/30                      | Chapter 1                  | Exploring Life and Science                       |
| Week 2: 1/28  | 2/6                       | Chapter 2                  | Chemistry of Living Things                       |
| Week 3: 2/4   | 2/13                      | Chapter 3                  | Structure and Function of Cells                  |
| Week 4: 2/11  | 2/20                      | Chapter 4                  | From Cells to Organ Systems                      |
| Week 5: 2/18  | 2/27                      | Chapter 5                  | The Skeletal System                              |
| Week 6: 2/25  | 3/6                       | Chapter 6                  | The Muscular System                              |
| Week 7: 3/4   | 3/13                      | Chapter 8                  | Heart and Blood vessels                          |
| Week 8: 3/11  | 3/27                      | Chapter 9                  | The Immune System and Mechanisms of Defense      |
| Week 9: 3/25  | 4/3                       | Chapter 10                 | The Respiratory System: Exchange of Gases        |
| Week 10: 4/1  | 4/10                      | Chapter 11                 | The Nervous System: Integration and Control      |
| Week 11: 4/8  | 4/17                      | Chapter 12 and 13 overview | Sensory Mechanisms and Endocrine System Overview |
| Week 12: 4/15 | 4/24                      | Chapter 14                 | Digestive System and Nutrition                   |
| Week 13: 4/22 | 5/1                       | Chapter 15                 | The Urinary System                               |
| Week: 14 4/29 | 5/8                       | Chapter 16                 | Reproductive Systems                             |
| Week 15: 5/6  | 5/15                      |                            | Final Paper                                      |

### Plagiarism and Academic Honesty Statement

“At Middlesex Community College we expect the highest standards of academic honesty. Academic dishonesty is prohibited in accordance with the Board of Trustees’ Proscribed Conduct Policy in Section 5.2.1 of the Board of Trustees’ Policy Manual. This policy prohibits cheating on examinations, unauthorized collaboration on assignments, unauthorized access to examinations or course materials, plagiarism, and other proscribed activities. Plagiarism is defined as the use of another’s idea(s) or phrase(s) and representing that/those idea(s) as your own, either intentionally or unintentionally.” (Board of Trustees’ Policy 5.2.1) ***Students caught cheating or plagiarizing can be failed for the assignment, failed for the class, or asked to leave school for the semester.***

### Religious Observances Statement.

If your religious obligations conflict with the course calendar requirements and you wish to request accommodation, you must make your request in writing prior to the date of the assessment or activity you will miss and preferably at the beginning of the semester. When requesting a make-up, assignment, or activity, state the reason for

your request and the date(s) on which your religious obligation(s) will conflict with the course calendar requirements. Also, if your religious obligation/holiday is unfamiliar to your instructor, you may be asked to provide a calendar that shows the published date(s) of your religious observance(s) or holiday(s).

**In order to provide a fair and consistent learning experience to all students, the instructor will adhere to all policies outlined in the syllabus throughout the course. As questions arise about the course, students are encouraged to refer back the syllabus.**

### **IMPORTANT COLLEGE POLICIES!! PLEASE READ CAREFULLY!**

For information about the college's policies and procedures regarding academic honesty, accessibility/disability services, attendance, audio-recording in the classroom, grade appeals, plagiarism, religious accommodations, weather and emergency closings, and more, please go to the following website: [www.mxcc.edu/catalog/syllabus-policies/](http://www.mxcc.edu/catalog/syllabus-policies/) or scan the QR code with your smart phone. Also, please become familiar with the policies regarding nondiscrimination, sexual misconduct, and general student conduct at the following website: [www.mxcc.edu/nondiscrimination/](http://www.mxcc.edu/nondiscrimination/).



### **NON-DISCRIMINATION STATEMENT**

*Middlesex Community College does not discriminate on the basis of race, color, religious creed, age, sex, national origin, marital status, ancestry, present or past history of mental disorder, learning disability or physical disability, sexual orientation, gender identity and expression or genetic information in its programs and activities. In addition, the College does not discriminate in employment on the additional basis of veteran status or criminal record.*

*The following people have been designated to handle inquiries or complaints regarding non-discrimination policies and practices:*

- Primary Title IX Coordinator  
Dr. Adrienne Maslin  
Dean of Students/Title IX and Section 504/ADA Coordinator  
amaslin@mxcc.edu; 860-343-5759; Founders Hall Room 123J
- Secondary Title IX Coordinator  
Ms. Mary Lou Phillips  
Director of Human Resources, Middlesex Community College  
mphillips@mxcc.edu; 860-343-5751; Founders Hall Room 115

- Secondary Title IX Coordinator  
Ms. Queen Fordham  
Coordinator of the Meriden Center Welcome Desk  
qfordham@mxcc.edu; 203-608-3011