Course Number: GMS 6400C

Credit Hours: 6 credit hours

Course Format: This online course is tailored for asynchronous distance learners.

COURSE DESCRIPTION
Principles of Medical Physiology (GMS6400C) teaches the functions of the human body at a level required for clinical medicine. The course covers normal physiology, as well as selected diseases. Concepts are organized by systems: Endocrine, Cardiovascular, Respiratory, Renal and Gastrointestinal. Additional content includes a Foundational Basics introductory section on the cell, body fluids and autonomic nervous system and a final Integration section which applies the physiological principles learned to special situations (Pregnancy, Aging, Exercise, Stress). The ultimate goal is for students to develop an understanding of the integrated functions of the normal body and “problem solving” and “critical thinking” skills in evaluating clinical situations. Each recorded lecture lasts ~20 – 30 min.

TARGET AUDIENCE
This course is designed to meet the needs of individuals wanting to pursue a career in medicine or biomedical research. This course will provide a foundation for students who have not met the entry requirements for medical school and for those wishing to enhance their applications into Masters and PhD programs in the medical sciences.

PREREQUISITES
This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to Biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

CONTACTS
Bruce R. Stevens PhD, Professor of Physiology and Functional Genomics, stevensb@ufl.edu; Tel: 352-392-4480. Peter Sayeski PhD, Professor of Physiology and Functional Genomics, psayeski@ufl.edu; Tel 352 392-1816.

SCHEDULE
This is a 15 week course that is offered in the spring, fall and summer.

COURSE GOALS
Physiology is the science of how the body functions, and is the basis for understanding modern clinical medicine and the biomedical sciences. This course will provide: 1) a foundation understanding of the basic functions of the human body; 2) knowledge of the physiology of the major systems: endocrine, cardiovascular, muscle, respiratory, renal, and gastrointestinal, as well as selected diseases that affect these systems; 3) integration of these individual facts in order to understand how organ systems work independently and interdependently in the body. One example of this integration is in the control of acid base balance. Other examples covered in this course are in the integrated responses to pregnancy and exercise as well as pathophysiologic responses to aging.

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

1. Understand the normal functions of the individual body systems at a level required for an understanding of clinical medicine.
2. Understand how these systems act in an integrated manner to regulate overall body functions.
3. Understand how failure of these normal physiologic functions and integrations are associated with some diseases.
4. Demonstrate the ability to apply physiological principles of clinical relevancy by multiple choice examinations and Quiz exercises.

LEARNING RESOURCES
1. Recorded video lectures with PowerPoint presentations will be provided on the course website.
2. Recorded video clinical correlation(s) and/or case studies relating to the basic science material.
3. Lecture notes for each video lecture are available as PDF downloads enabled for direct note taking.
4. Opportunity for clarification of the material via email.
5. Practice on-line quizzes (not for grade) to advance the understanding of the material provided in lectures.
6. Example exam questions (not for grade) to test knowledge and prepare for each examination.
9. Recommended text (not required, but useful): Student may wish to supplement the course videos and PDF handout by purchasing an online version of "Berne & Levy Physiology, 7th Edition" 2018. Author: Bruce M. Koeppen & Bruce A. Stanton. ISBN: 9780323393942.

COMMUNICATION WITH FACULTY
If a student is unclear regarding parts of a topic, the student is encouraged to contact the relevant lecturer via Canvas messaging.

STRUCTURE OF CONTENT
The course content is structured into Blocks. The six Blocks are: Foundational Basics+Endocrine Part 1; Endocrine Part 2; Cardiovascular+Muscle; Respiratory; Renal; and Gastrointestinal+Integrated Physiology. The content of the Blocks is shown later in this syllabus.

COURSE CALENDAR and RECOMMENDED TIME MANAGEMENT
The calendar of all course event is shown in an accompanying figure. The videos and corresponding PDF notes are available throughout the entire time the course is open, from the first day through the end of the course on the day the grades are reported to the Registrar. Also, each Exam is available to complete at any time during the semester. For each Block the course content lecture titles should be viewed in the order shown later in this syllabus. For Block 1 and Block 6 in particular, note in the following Figure our recommended calendar dates for breakdown of when to view the videos and PDFs of the content in those Blocks—as a guide to help in managing time, students may use these recommendations or may alternatively adapt your own learning pace.
EXAMINATIONS AND GRADING
There will be 6 multiple choice examinations, each covering the contents of a Block. Exam 1 covers Foundational Basics + Endocrine Part 1; Exam 2 covers Endocrine Part 2; Exam 3 covers Cardiovascular + Muscle, Exam 4 covers Respiratory, Exam 5 covers Renal, and Exam 6 covers Gastrointestinal + Integrated Physiology. All exams will be monitored by ProctorU, a UF chosen service that allows the students to complete their exams at home while still ensuring academic integrity. Students will take all examinations at a computer that meets the technical requirements of ProctorU including a web cam and microphone. Students will make the arrangements for exam proctoring. **We recommend you make an appointment with ProctorU at least two weeks in advance of each exam date.** All costs of these exams are covered in the registration costs. You may schedule your exams any time during the semester, as long as the exams are scheduled by the due date listed on the exam in Canvas. Scores are reported as a percent. The points used to compute final grades will be determined after all exams have been completed. The final grade is based simply on the overall percentage of points covering all 6 Exams; in other words the contribution of each Exam to the final percentage is weighted according to the number of questions on each Exam. The final letter grade for the entire course will be issued within 72h after the due date for the six exams.

**Grading scale:** A final numerical score for the entire course will be computed at the end of the semester for each student. After dropping his/her single lowest exam, the points will then be computed based on the five remaining exam scores. The faculty may also factor in other considerations in adjusting scores to a possibly higher score. A final letter grade will be assigned as follows, per University of Florida standards:

- 93-100% = A
- 90-92% = A-
- 87-89% = B+
- 83-86% = B
- 80-82% = B-
- 77-79% = C+
- 73-76% = C
- 70-72% = C-
- 67-69% = D+
- 63-66% = D
- <63% = E

**GRADING POLICY**
There are no make-up exams unless otherwise granted by the course coordinator prior to an examination date. Failure to take an exam without prior permission from the course coordinator will be recorded as 0.

**ACADEMIC HONESTY**
Please review the complete policy of the University of Florida regarding academic dishonesty, found in the online student handbook at: [http://graduateschool.ufl.edu/media/graduate-school/pdf-files/handbook.pdf](http://graduateschool.ufl.edu/media/graduate-school/pdf-files/handbook.pdf)

Students are expected to abide by the [University of Florida Academic Honesty Guidelines](http://graduateschool.ufl.edu/media/graduate-school/pdf-files/handbook.pdf) and to adhere to the following pledge:

"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

**COURSE EVALUATION POLICY**
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at [https://gatorevals.aa.ufl.edu/students/](https://gatorevals.aa.ufl.edu/students/). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via [https://ufl.blueria.com/ufl/](https://ufl.blueria.com/ufl/). Summaries of course evaluation results are available to students at [https://gatorevals.aa.ufl.edu/public-results/](https://gatorevals.aa.ufl.edu/public-results/).
## BLOCK 1

### PHYSIOLOGY FOUNDATIONAL BASICS
Section Coordinator Bruce Stevens Ph.D. ([stevensb@ufl.edu](mailto:stevensb@ufl.edu))

<table>
<thead>
<tr>
<th>Introduction to Foundational Basics Section</th>
<th>Stevens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transporters, Pumps, and Channels – Part I</td>
<td>Stevens</td>
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<tr>
<td>Transporters, Pumps, and Channels – Part II</td>
<td>Stevens</td>
</tr>
<tr>
<td>Physiology of Voltage &amp; Concentration Gradients – Part I</td>
<td>Stevens</td>
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<tr>
<td>Physiology of Voltage &amp; Concentration Gradients – Part II</td>
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</tr>
<tr>
<td>Body Fluids I</td>
<td>Baylis</td>
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<tr>
<td>Body Fluids II</td>
<td>Baylis</td>
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<tr>
<td>Receptors and Signaling – Part I</td>
<td>Sumners</td>
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<tr>
<td>Receptors and Signaling – Part II</td>
<td>Sumners</td>
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<tr>
<td>Autonomic Nervous System – Part I</td>
<td>Scheuer</td>
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<tr>
<td>Autonomic Nervous System – Part II</td>
<td>Scheuer</td>
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<tr>
<td>Autonomic Nervous System – Part III</td>
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</tbody>
</table>

### ENDOCRINE Part 1
Section Coordinator Jaya Kolli M.D. ([jkolli@ufl.edu](mailto:jkolli@ufl.edu))

<table>
<thead>
<tr>
<th>Introduction to the Endocrine Section</th>
<th>Conrad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Endocrinology Physiology</td>
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<tr>
<td>Hypothalamus and Pituitary – Part I</td>
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<td>Hypothalamus and Pituitary – Part II</td>
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<tr>
<td>Adrenal Medulla – Part I</td>
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<td>Adrenal Medulla – Part II</td>
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<tr>
<td>Adrenal Cortex – Part I</td>
<td>Wood</td>
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<td>Adrenal Cortex – Part II</td>
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<tr>
<td>Thyroid Hormones – Part I</td>
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<tr>
<td>Clinical Correlation: Thyroid – Part I</td>
<td>Winter</td>
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<tr>
<td>Clinical Correlation: Thyroid – Part II</td>
<td>Winter</td>
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<tr>
<td>Quiz covering Foundational Basics plus Endocrine Part 1</td>
<td>Faculty</td>
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</tbody>
</table>

* Block 1 Multiple Choice Exam #1 on Foundational Basics + Endocrine Part 1
## ENDOCRINE Part 2
Section Coordinator Jaya Kolli M.D. (jkolli@ufl.edu)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>Calcium/Phosphate Regulation - Part I</td>
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<td>Calcium/Phosphate Regulation – Part II</td>
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<td>Calcium/Phosphate Regulation – Part III</td>
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<td>Calcium Phosphate Regulation – Par IV</td>
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<tr>
<td>Fluid Balance &amp; Cardiovascular Control</td>
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<tr>
<td>Growth Hormone – Part I</td>
<td>Raizada</td>
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<tr>
<td>Growth Hormone – Part II</td>
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<td>Blood Glucose Regulation – Part I</td>
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<td>Blood Glucose Regulation – Part II</td>
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<tr>
<td>Blood Glucose Regulation – Part III</td>
<td>Raizada</td>
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<td>Reproduction (Sexual Differentiation – Part I)</td>
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<tr>
<td>Reproduction (Sexual Differentiation - Part II)</td>
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<td>Reproduction Male – Part I</td>
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<td>Reproduction Male – Part II</td>
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<tr>
<td>Reproduction Female – Part I</td>
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<td>Reproduction Female – Part IV</td>
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<td>Reproduction Pregnancy – Part I</td>
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<td>Reproduction Pregnancy – Part IV</td>
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<td>Special Topic: Carbohydrate Metabolism in Pregnancy</td>
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<tr>
<td>Clinical Correlation : Assisted Reproductive Technologies – Part I</td>
<td>Rhoton</td>
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<td>Clinical Correlation: Assisted Reproductive Technologies – Part II</td>
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<tr>
<td>Quiz</td>
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</tbody>
</table>

* Block 2 Multiple Choice Exam #2 on Endocrine Part 2*
**BLOCK 3**

**MUSCLE and CARDIOVASCULAR**
Section Coordinator Erin Bruce Ph.D. ([ebruce5@ufl.edu](mailto:ebruce5@ufl.edu))

- The Structure of Muscle  
  Walter
- The Molecular Structure of Muscle  
  Walter
- Muscle Function and Regulation – Activation  
  Walter
- Muscle Function and Regulation – Force Modulation I  
  Walter
- Muscle Dysfunction and Disease – Force Modulation II  
  Walter
- Comparing Skeletal and Cardiac Muscle  
  Walter
- Comparing Skeletal, Cardiac and Smooth Muscle  
  Walter
- Clinical Correlation-Muscular Dystrophy  
  Walter
- Introduction to Cardiovascular Physiology I  
  Kolli
- Introduction to Cardiovascular Physiology II  
  Kolli
- Cardiac Cycle  
  Kolli
- Electrocardiogram I  
  Kolli
- Electrocardiogram II  
  Kolli
- Electrocardiogram III  
  Kolli
- Cardiac Ion Channels I  
  Kolli
- Cardiac Ion Channels II  
  Kolli
- Quiz 1  
  Faculty
- Hemodynamics, Arteries I  
  Wood
- Hemodynamics, Arteries II  
  Wood
- Venous Return  
  Wood
- Fetal Circulation  
  Wood
- Pulmonary Circulation I  
  Scheuer
- Pulmonary Circulation II  
  Scheuer
- Neural Control I  
  Scheuer
- Neural Control II  
  Scheuer
- Neural Control III  
  Scheuer
- Local Control of Blood Flow  
  Kolli
- Regulation of Arterial Pressure  
  Kolli
- Microcirculation  
  Kolli
- Integrated Control of Cardiovascular System I  
  Kolli
- Integrated Control of Cardiovascular System II  
  Kolli
- Shock and Heart Failure – Clinical correlation  
  Kolli
- Quiz 2  
  Faculty

*Block 3 Multiple Choice Exam #3 on Muscle and Cardiovascular*
RESPIRATORY PHYSIOLOGY
Section Coordinator: Peter P. Sayeski Ph.D. (psayeski@ufl.edu)

Introduction to Respiration Section
Introduction and Functional Anatomy
The Respiratory Pump and Lung Volumes
Lung Compliance Part I
Lung Compliance Part II
Airway Resistance Part I
Airway Resistance Part II
The Work of Breathing Part I
The Work of Breathing Part II
Alveolar Ventilation and Gas Composition Part I
Alveolar Ventilation and Gas Composition Part II
Gas Diffusion Part I
Gas Diffusion Part II
Oxygen Transport Part I
Oxygen Transport Part II
Quiz I
Oxygen Content Part I
Oxygen Content Part II
CO₂ Transport and Content
Clinical Correlation: O₂ and CO₂ Assessment Part I
Clinical Correlation: O₂ and CO₂ Assessment Part II
Pulmonary Circulation Part I
Pulmonary Circulation Part II
Clinical Correlation: Pulmonary Edema Part I
Clinical Correlation: Pulmonary Edema Part II
Acid-Base Part I
Acid-Base Part II
Respiratory Control Part I
Respiratory Control Part II
High Altitude Respiration
Quiz 2
Clinical Correlation: Case Studies Part I
Clinical Correlation: Case Studies Part II

* Block 4 Multiple Choice Exam #4 on Respiratory Physiology
# BLOCK 5

**RENAL**
Section Coordinator Jaya Kolli M.D. ([jkolli@ufl.edu](mailto:jkolli@ufl.edu))

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td>Introduction to Renal Physiology Section</td>
<td>Baylis</td>
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<tr>
<td>General Functions of the Kidney. Renal Anatomy</td>
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<td>Clearance- Part I</td>
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<td>Clearance Part II</td>
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<td>Renal Hemodynamics – Part I</td>
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<tr>
<td>Renal Hemodynamics – Part IV</td>
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<td>Renal epithelial sodium transport</td>
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<td>Control of sodium balance – Part I</td>
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<td>Control of sodium balance – Part IV</td>
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<td>Renal handling of Calcium and Phosphate</td>
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<td>Renal handling of Potassium</td>
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<td>Concentration and Dilution – Part I</td>
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<td>Concentration and Dilution – Part IV</td>
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<tr>
<td>Acid/Base Balance – Part I</td>
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<tr>
<td>Acid/Base Balance – Part III</td>
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<tr>
<td>Kidney Diseases</td>
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<tr>
<td>Quiz 2</td>
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</table>

* **Block 5 Multiple choice Exam #5** on Renal Physiology
BLOCK 6

GASTROINTESTINAL
Section coordinator Bruce Stevens Ph.D. ([stevensb@ufl.edu](mailto:stevensb@ufl.edu))

- Introduction to Gastrointestinal Physiology Section
- Gastrointestinal Nervous System & Motility Part I
- Gastrointestinal Nervous System & Motility Part II
- Gastrointestinal Nervous System & Motility Part III
- Gastrointestinal Nervous System & Motility Part IV
- Phases of Digestion and Salivary Gland Physiology
- Exocrine Pancreas
- Gastric Physiology Part I
- Gastric Physiology Part II
- Small Intestine Epithelium and Protein Digestion/Absorption
- Carbohydrate Digestion/Absorption
- Liver and Gallbladder Part I
- Liver and Gallbladder Part II
- Lipid Digestion and Absorption Part I
- Lipid Digestion and Absorption Part II
- GI Electrolytes and Fluids Part I
- GI Electrolytes and Fluids Part II
- Summary map of digestion and absorption
- Study guides: GI hormones and GI regulators
- Gastrointestinal Commensal Microbiota – Part I
- Gastrointestinal Commensal Microbiota – Part II
- Quiz

INTEGRATED PHYSIOLOGY
Section Coordinator Peter Sayeski Ph.D. ([psayeski@ufl.edu](mailto:psayeski@ufl.edu))

- Introduction to Integrated Physiology Section
- Pregnancy Physiology: Maternal – Part I
- Pregnancy Physiology: Maternal – Part II
- Pregnancy Physiology: View from the Fetus
- Aging Physiology: Kidney
- Aging Physiology: Cardiovascular
- Integration: Muscle and the cardiovascular system
- Exercise Physiology and Cardiovascular – Part I
- Exercise Physiology and Cardiovascular – Part II
- Exercise Physiology and Lungs
- Stress
- Quiz

*Block 6 Multiple choice Exam #6 on Gastrointestinal + Integrated Physiology*
EXPECTATION OF PROFESSIONALISM

Student Learning Objective (SLO): Students will conduct themselves in a professional manner in all aspects of the course, as described below.

The University of Florida College of Medicine is committed to developing and nurturing professionalism in its learners. Specifically, the following areas are emphasized in our interactive program:

1. Honesty
2. Respect
3. Caring
4. Work Ethic
5. Reflection and self-assessment
6. Seeking excellence

Professional is also a component of the curriculum and academic expectations for this program. Accordingly, the following aspects of a learner’s conduct will be considered as part of the learner’s grade,

1. Respect for students, faculty, and staff
2. Collegiality and collaboration with others
3. Demonstrated engagement in all parts of the learner’s curriculum, including professional growth and development
4. Positive response and receptiveness to feedback from faculty
5. Constructive approach to conflict resolution that avoids disruption
6. Punctuality in relation to College activities and project/assignment deadlines

In instances where a lack of professional behavior is deemed to have potentially occurred, the impact of said behavior on grading will be made collectively by the Course Director, the Program Director, and the Department Chair. Additionally, unprofessional conduct that is disruptive to the academic or professional environment may be referred to appropriate University officials to review for potential student conduct violations, that may lead to disciplinary action.

Professionalism is determined by the following sources of assessment:

1. The faculty's interaction with the student.
2. Observation by faculty of a student's interaction with other students.
3. Observation by faculty of a student's interaction with other faculty and staff (e.g., secretaries and assistants).
4. Reports of student interactions by staff (e.g., secretaries and assistants).
5. Reports of student interactions with their peers.