Course Description
The purpose of this course is to develop the sciences necessary to understand the workings of the various interrelated systems operating within the human body. The skeletal-muscular system converts muscle contractions into human motion. It will be shown how human strength depends on muscle size and how human speed is independent of muscle size. That is why rabbits and elephants run at the same speed. The science of biomechanics is relevant here. The cardio-vascular system transports blood throughout the body, carrying oxygen to the sites of muscle contractions and removing carbon-dioxide and heat. It will be shown how heart rate and blood pressure increase during strenuous exercise, and why such exercise is beneficial for good health. The science of fluid dynamics is relevant here. The respiratory system transports oxygen into the blood supply and carbon dioxide out of the blood supply. It will be shown how this consumed oxygen is converted into work and heat, and how the rate of oxygen consumption varies with speed in athletic efforts such as walking, running, swimming, and cycling. The science of thermodynamics is relevant here. The nervous system transports electrical signals from the sensory receptors to the brain and from the brain to the muscles. It will be shown how these signals determine human reaction time, coordination, and optimal strategies for human performance. The sciences of electrodynamics and optimal control theory are relevant here. All of these systems, working together, make possible human motion and thought. Understanding how this is accomplished can help in improving human health and happiness.
The course has a significant laboratory component, with experiments that demonstrate important course concepts. There will be projects on forces, muscles, walking, running, jumping, temperature, heat, and physiological adjustments to exercise.

There will be two in-class exams and a cumulative final exam. Questions from the exams will be based on the readings, lecture discussions, problems done in the lecture, homework problems, and laboratory experiments. It is important to bring a calculator and course textbooks to the laboratory sessions. You will also need to bring a calculator to all exams.

**Course texts**
1. *Physics in Biology and Medicine*, by Paul Davidovitz
2. *Notes on Human Body Systems*, by Richard Brandt

### Course Grade

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Examination 1</td>
<td>25%</td>
</tr>
<tr>
<td>Examination 2</td>
<td>25%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>25%</td>
</tr>
<tr>
<td>Final examination (cumulative)</td>
<td>25%</td>
</tr>
</tbody>
</table>

Note: Students must register for a lab section. Students must attend the lab for which they are registered.

**Exam dates:**

- Exam 1: February 23
- Exam 2: April 4

### Missed Exams

There are no make-up exams for this course. If you miss an examination, for a valid reason (illness, injury or family emergency), your grade will be based on the following allocations:

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Exam</td>
<td>35%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>25%</td>
</tr>
<tr>
<td>Final examination (cumulative)</td>
<td>40%</td>
</tr>
</tbody>
</table>

If you miss both in-class examinations your grade will be based on the following scheme:

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td>25%</td>
</tr>
<tr>
<td>Final examination (cumulative)</td>
<td>75%</td>
</tr>
</tbody>
</table>

**Final Exam**

A make-up for the final examination will be given under exceptional circumstances, which must be discussed with Prof. Brandt before the examination. In this case a grade of incomplete will be assigned and the make-up will be scheduled for the Fall 2005 semester. Please avoid making travel plans before the date of the final exam. No alternative date for the final examination will be offered before the beginning of the Fall 2005 semester.
HUMAN BODY SYSTEMS (2005)

LECTURE CONTENTS

1. INTRODUCTION
   A. The human body
   B. Human body sciences

2. MUSCULO-SKELETAL SYSTEM
   A. Mechanics
   B. Muscles
   C. Skeletal system
   D. Scaling laws
   E. Walking and running

3. CARDIO-VASCULAR SYSTEM
   A. Fluid mechanics
   B. The heart
   C. Blood circulation
   D. Swimming

4. RESPIRATORY SYSTEM
   A. Work and energy
   B. The lungs
   C. Energy consumption
   D. Mechanical energy expenditure
   E. Thermodynamics
   F. Heat production and dissipation

5. NERVOUS SYSTEM
   A. Electrodynamics
   B. Neurons
   C. Reaction time

6. HUMAN LOCOMOTION
   A. Walking
   B. Running
   C. Bicycling
   D. Skating
   E. Swimming

(BOOK)

NOTES

(1,2,4) book
2a,2b notes
3a
4a
4b
4c
(7,8)
4h
4h
(9,10,11)
2c
5a
3b,5b
2d
5c
(13)
(5d)
5d
5d
5e
Laboratory Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Laboratory Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 20, 21</td>
<td>no lab</td>
</tr>
<tr>
<td>2</td>
<td>Jan 27, 28</td>
<td>no lab</td>
</tr>
<tr>
<td>3</td>
<td>Feb 3, 4</td>
<td>LAB 1: math review + spring force</td>
</tr>
<tr>
<td>4</td>
<td>Feb 10, 11</td>
<td>LAB 2: friction force</td>
</tr>
<tr>
<td>5</td>
<td>Feb 17, 18</td>
<td>LAB 3: muscle force</td>
</tr>
<tr>
<td>6</td>
<td>Feb 24, 25</td>
<td>LAB 4: muscle dynamics</td>
</tr>
<tr>
<td>7</td>
<td>Mar 3, 4</td>
<td>LAB 5: physiological scaling I</td>
</tr>
<tr>
<td>8</td>
<td>Mar 10, 11</td>
<td>LAB 6: physiological scaling II</td>
</tr>
<tr>
<td>9</td>
<td>Mar 17, 18</td>
<td>No lab – spring break</td>
</tr>
<tr>
<td>10</td>
<td>Mar 25, 25</td>
<td>LAB 7: temperature and heat I</td>
</tr>
<tr>
<td>11</td>
<td>Apr 31, May 1</td>
<td>LAB 8: temperature and heat II</td>
</tr>
<tr>
<td>12</td>
<td>Apr 7, 8</td>
<td>no lab</td>
</tr>
<tr>
<td>13</td>
<td>Apr 14, 15</td>
<td>LAB 9: adjustments to exercise I</td>
</tr>
<tr>
<td>14</td>
<td>Apr 21, 22</td>
<td>LAB 10: adjustments to exercise II</td>
</tr>
<tr>
<td>15</td>
<td>Apr 28, 29</td>
<td>no lab</td>
</tr>
</tbody>
</table>
Laboratory Sessions
These weekly sessions are an important part of the course. You will have to submit a lab report documenting your experiment, observations, and data. The lab report will be due in lab one week after the experiment has been performed. Questions about the experiments could appear on examinations. The laboratory sessions will be held in Meyer 103 (4 Washington Place), and will begin the third week of class. The lab instructors have offices in 4 Washington Place.

Laboratory sessions meet at the following days and times:

<table>
<thead>
<tr>
<th>Section</th>
<th>Day</th>
<th>Instructor</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Thursday</td>
<td>Alex Jaoshvili</td>
<td>1 – 2:40 pm</td>
</tr>
<tr>
<td>3</td>
<td>Thursday</td>
<td>Alex Jaoshvili</td>
<td>3 – 4:40 pm</td>
</tr>
<tr>
<td>4</td>
<td>Thursday</td>
<td>Ronnie Jansson</td>
<td>5 – 6:40 pm</td>
</tr>
<tr>
<td>5</td>
<td>Friday</td>
<td>Ronnie Jansson</td>
<td>9 – 10:40 am</td>
</tr>
</tbody>
</table>

Each laboratory session will have a grade of 50 points associated with it. These will be distributed as follows.

Lab report 40 points
Attendance 10 points
Total points 50 points

Attendance
If you arrive at least 10 minutes late for the lab session you will lose the 10 points attendance credit.

Absence Policy
Excused absences will only be given in the case of illness (with a doctor’s note) or observation of a religious holiday. You must notify your lab instructor in advance in writing if you miss a lab due to religious reasons. All other absences will be considered unexcused and will result in a lab grade of zero.

Late Assignments
Late assignments will be penalized five points for each day late (excluding weekends).
Academic Guidelines for Students
Morse Academic Plan, College of Arts and Science

To help foster common academic expectations among students and instructors, the following guidelines for MAP courses are offered to students. While these represent minimum expectations across the curriculum, individual faculty members may set additional course requirements. Students should therefore consult the course syllabus for details of policies in each class.

Attendance
Inasmuch as students have voluntarily sought admission to the University, they are expected to attend all class meetings, including all lectures and all meetings of associated recitation, workshop, or laboratory sections. Students may be excused for documented medical or personal emergency and will receive reasonable accommodation for the observance of religious holidays. In these cases, they should contact their instructors in advance or, in cases of emergency, as soon as is practicable. Students are responsible for making up any material or assignments they miss.

Classroom Decorum
The classroom is a space for free and open inquiry and for the critical evaluation of ideas, and it should be free of personal prejudice. Students and instructors alike have an obligation to all members of the class to create an educational atmosphere of mutual trust and respect in which differences of opinion can be subjected to deliberate and reasonable examination without animus.

As a matter of courtesy to their fellow students and instructors, students should arrive at class promptly, prepared and ready to participate. Students are reminded particularly to shut off all cellular telephones and pagers and, except in cases of emergency, to remain in the classroom for the duration of the lecture or section meeting. If it is necessary to leave or enter a room once class has begun, students should do so quietly and with as little disruption as possible. Under University policy, disruptive classroom behavior may be subject to faculty review and disciplinary sanction.

Completion of Assignments
Students are expected to submit course work on time and to retain copies of their work until a final grade has been received for the course. Instructors are not obliged to accept late work and may assign a failing or reduced grade to such assignments.

Students who encounter sudden and incapacitating illness or other comparably grave circumstance that prevents them from completing the final examination or assignment in a course may request a temporary mark of Incomplete from the course instructor. To receive an Incomplete, students must have completed all other requirements for the course, including satisfactory attendance, and there must be a strong likelihood they will pass the course when all work is completed.

Questions and Concerns
Up-to-date course information is available on the MAP website: www.nyu.edu/cas/map. Questions, concerns, comments, and feedback may be directed to the following members of the MAP staff, located in 903 Silver Center, 212-998-8119. Complaints will remain confidential.

Foundations of Contemporary Culture:  Dr. Vincent Renzi  map.fcc@nyu.edu
Foundations of Scientific Inquiry:  Dr. Trace Jordan  map.fsi@nyu.edu
MAP Administration:  Mike Summers  morse.plan@nyu.edu

(over)
Statement on Academic Integrity
Morse Academic Plan, College of Arts and Science

As a student at New York University, you have been admitted to a community of scholars who value free and open inquiry. Our work depends on honest assessment of ideas and their sources; and we expect you, as a member of our community, likewise to maintain the highest integrity in your academic work. Because of the central importance of these values to our intellectual life together, those who fail to maintain them will be subject to severe sanction, which may include dismissal from the University.

Plagiarism consists in presenting ideas and words without acknowledging their source and is an offense against academic integrity. Any of the following acts constitutes a crime of plagiarism.

- Using a phrase, sentence, or passage from another person's work without quotation marks and attribution of the source.
- Paraphrasing words or ideas from another's work without attribution.
- Reporting as your own research or knowledge any data or facts gathered or reported by another person.
- Submitting in your own name papers or reports completed by another.
- Submitting your own original work toward requirements in more than one class without the prior permission of the instructors.

Other offenses against academic integrity include the following.

- Collaborating with other students on assignments without the express permission of the instructor.
- Giving your work to another student to submit as his or her own.
- Copying answers from other students during examinations.
- Using notes or other sources to answer exam questions without the instructor's permission.
- Secreting or destroying library or reference materials.
- Submitting as your own work a paper or results of research that you have purchased from a commercial firm or another person.

*Particular emphasis is placed on the use of papers and other materials to be found on the World-Wide Web, whether purchased or freely available. In addition to having access to the same search engines as students, faculty also have at their disposal a number of special websites devoted to detecting plagiarism from the web.*

Plagiarism and other cases of academic fraud are matters of fact, not intention. It is therefore crucial that you be diligent in assuring the integrity of your work.

- Use quotation marks to set off words not your own.
- Learn to use proper forms of attribution for source materials.
- Do your own original work in each class, without collaboration, unless otherwise instructed.
- Don't use published sources, the work of others, or material from the web without attribution.
- For further information, consult the Bulletin of the College of Arts and Science, the CAS Academic Handbook, and the Student's Guide to NYU.

revised 11/2003