Nutrition, Nuclear Engineering, Kinesiology 646  
(NUTR/NUEN/KINE 646, Section 600)  
Fundamentals of Space Life Sciences  
Course Syllabus, Fall, 2014

Instructor: Nancy D. Turner, Ph.D.  214C Cater-Mattil, 847-8714  
n-turner@tamu.edu

Time/Location: Monday/Wednesday, 8:00 – 9:15, Rm. 109 AGLS

Textbook: All materials will be from original journal articles,  
supplemented with references to text books as appropriate.  
All reading materials will be posted on the web and  
students are required to access these materials through the  
Texas A&M web based system. Class readings are to be  
completed prior to the listed presentation date.

Course Description: This course is designed to integrate nutrition, biochemistry,  
physiology and radiation biology to define the major  
biological problems encountered in long duration space  
flight. It will provide an overview of each of these  
problems with potential countermeasures against the  
problems. Countermeasure development will focus  
primarily on nutrition and exercise protocols to counter  
problems of bone loss, muscle wasting, and radiation-  
enhanced carcinogenesis. Experts in each of these areas  
will provide students with a good understanding of the  
major biological problems facing long duration space  
flight, and their countermeasures.

Prerequisites: An undergraduate degree in Nutrition, Kinesiology or  
Health Physics or similar qualifications. Contact instructor  
for further guidance in this area.

Course Objectives: With successful completion of the course, you will have  
achieved:

1. An understanding of the major life science problems encountered during long duration  
   space flight.
2. An understanding of the primary agencies involved in long duration space flight  
   (NASA, NSBRI, ESA), and the types of research models used to assess the severity of  
   physiological changes occurring during long duration space flight.
3. An understanding of countermeasures against the critical problems of long duration  
   space flight, an appreciation of how countermeasures may influence responses in non-  
target tissues, and a perspective of countermeasure success.
**Evaluation:**

- Exams - 3 (100 points each)  
  - Oral presentation on a problem of long duration space flight and a proposed countermeasure (your topic must be outside of your own graduate degree program)  
  - Paper describing the topic of oral presentation

  TOTAL 600 points

**Grading Scale:**

- 90-100% A  
- 80-89 B  
- 70-79 C  
- 60-69 D  
- 59% and below F

**Make-up Policy:** Make-up examinations will be given only for university authorized absences. It is the student's responsibility to arrange a date and time with the instructor. If possible, students should make arrangements prior to the scheduled examination time.

The oral presentation will be given during the last two weeks of regular classes. **Papers will be due November 24.** The papers need to be 10-12 double spaced pages (1 inch margins and 12 point font) and the information presented should be supported by results from original research articles (n > 15) and review articles (no more than 5).

**Americans with Disabilities Act (ADA) Policy Statement:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information, visit [http://disability.tamu.edu](http://disability.tamu.edu).

**Academic Integrity Statement:** All syllabi shall contain a section that states the Aggie Honor Code and refers the student to the Honor Council Rules and Procedures on the web ([http://aggiehonor.tamu.edu/RulesAndProcedures/HonorSystemRules.aspx](http://aggiehonor.tamu.edu/RulesAndProcedures/HonorSystemRules.aspx)). All students should make themselves aware of correct citation techniques by reviewing the Academic Integrity Tutorials available on the library web site ([http://library.tamu.edu/help/help-yourself/using-materials-services/online-tutorials/academic-integrity/index.html](http://library.tamu.edu/help/help-yourself/using-materials-services/online-tutorials/academic-integrity/index.html)).

**Aggie Honor Code:** “An Aggie does not lie, cheat, or steal or tolerate those who do.”
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<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>1</td>
<td>9/1</td>
<td>Introduction to the course, content and methods of evaluation. The role of NASA and NSBRI in space life sciences. (Turner)</td>
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<td>9/3</td>
<td><strong>Space physiology.</strong> The space environment and how it differs from earth. Major research methods and techniques to study space-related problems and their countermeasures. (Bloomfield)</td>
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<td>2</td>
<td>9/8</td>
<td>Bone loss and risk of fracture and renal stones I (Bloomfield)</td>
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<td></td>
<td>9/10</td>
<td>Bone loss and risk of fracture and renal stones II (Bloomfield)</td>
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<td>3</td>
<td>9/15</td>
<td>Cardiovascular deconditioning I (Woodman)</td>
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<td></td>
<td>9/17</td>
<td>Cardiovascular deconditioning II (Woodman)</td>
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<td>4</td>
<td>9/22</td>
<td>Skeletal muscle adaptations to microgravity I (Fluckey)</td>
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<td></td>
<td>9/24</td>
<td>Skeletal muscle adaptations to microgravity II (Fluckey)</td>
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<td>5</td>
<td>9/29</td>
<td><strong>Exam: Space physiology</strong></td>
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<td>10/1</td>
<td><strong>Space Radiation:</strong> Radiation and radiation production (Braby)</td>
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<td>6</td>
<td>10/6</td>
<td>Radiations in Space, solar cycle and regions of space (Braby)</td>
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<td>10/8</td>
<td>Radiation detection and measurement (Braby)</td>
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<td>10/13</td>
<td>Interactions between spacecraft and radiation environment (Braby)</td>
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<td>10/15</td>
<td>Consequences of shielding and review (Braby)</td>
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<td>8</td>
<td>10/20</td>
<td>Radiation chemistry and DNA damage and repair (Ford)</td>
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<td>10/22</td>
<td>Biological effects of high and low LET radiation, synergistic effects of microgravity/altered gravity and radiation (Ford)</td>
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<td>9</td>
<td>10/27</td>
<td>Biological effects of space radiation observed in astronauts, radiation protection and regulations for space flight (Ford)</td>
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<td>10/29</td>
<td>Biomedical countermeasures to radiation exposure (Ford)</td>
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<td>10</td>
<td>11/3</td>
<td><strong>Exam: Space Radiation</strong></td>
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<td>11/5</td>
<td><strong>Space Nutrition:</strong> Antioxidants and other vitamin roles in space (Walzem)</td>
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Week 11
11/10  Mineral requirements, balance studies and other measures of turnover, e.g. Calcium (Scott Smith recording)
11/12  Space flight and ground based research in nutrition and review of space food, intake patterns (Turner)

Week 12
11/17  Depressed food intake and its consequences (Turner)
11/19  Protein and amino acid turnover - relationship to loss of muscle mass (Wu)

Week 13
11/24  Radiation-induced colon carcinogenesis – dietary mitigation (Turner)
11/26  Diet and the intestinal microbiome (Turner)

Week 14
12/1   **EXAM: Space Nutrition**
12/3   Student presentations

Week 15
12/8   Student presentations-redefined Friday
12/10  Reading day, no classes (or possible presentations if class wants)

Week 16
12/16  **Final Exam time 3:30-5:30** – Used for Student presentations, class evaluation