Friedman School Course Syllabus
APPLIED NUTRITIONAL BIOCHEMISTRY
Fall, 2012

Time and location of the course: 9:00 AM – 12:00 PM, Thursday, Jaharis – room 156

Instructor
Dr. Alice H. Lichtenstein
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Phone: 617.556.3127

Office Hours: arrange via e-mail

Tufts Graduate Credit: 1 credit

Prerequisites for taking this course: NUTR 201 or 202 and one undergraduate level biochemistry course taken within the past five years.

Course Description: This course will focus on human nutrition and metabolism. The functional and regulatory roles of macronutrients and micronutrients will be stressed. Additional components of the course will be centered on integrating nutrition policy with nutrition science. Students will be guided in connecting the lay and scientific literature in the areas of biochemistry and nutrition, and exploring how each informs the other. Opportunities will be available for preparing short written reports and presenting oral reports. Current challenges in the field of nutrition will be related to the lecture material.

Course Objectives:
• Discuss the relationship between intermediary metabolism, and micronutrients and macronutrients.
• Update knowledge about essential nutrients.
• Explore the relationship between nutritional biochemistry and nutrition policy.
• Assess the relationship between current scientific findings and reporting/interpretation in lay venues.

Description of assignments, tests, and other required activities:
• Weekly discussion of timely nutrient related issues that have appeared in lay venues – to be identified by students.
• Weekly oral discussion and written critique of recently published peer reviewed articles related to lecture material – to be assigned by instructor.
• Written report and oral presentation for one vitamin per student – to be
• Written report and oral presentation for one mineral per student – to be assigned by instructor.
• Written critique and oral class presentation of one contemporary nutrition topic per student – to be identified by student and approved by instructor.

**Summary of Assignments and Grading**

<table>
<thead>
<tr>
<th>Assignment(s)</th>
<th>Grading Weight</th>
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<tbody>
<tr>
<td>Weekly oral discussion and written critique of recently published peer reviewed scientific article, discussion of timely nutrition related topics appearing in the lay venue.</td>
<td>20%</td>
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<tr>
<td>Written report and oral presentation for one vitamin.</td>
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<tr>
<td>Written report and oral presentation for one mineral.</td>
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<tr>
<td>Written critique and oral presentation of a contemporary nutrition topic.</td>
<td>30%</td>
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**Penalties for late or incomplete assignments:** Assignments are expected to be submitted on or before the due dates. Assignments submitted after the due date without explicit prior approval of the course instructor will be graded down, approximately 10% for each day late. Each student will have only one opportunity to complete each assignment. There will be no exceptions.

**Course texts and Materials** (for the course as a whole):
- There is no course textbook. It is expected that each student will have access to a basic biochemistry and nutrition textbook
- Course material will be posted on TRUNK.

**Academic Conduct**
Academic integrity, including avoiding plagiarism, is critically important. Each student is responsible for being familiar with the standards and policies outlined in the Friedman School’s *Policies and Procedures* manual ([http://nutrition.tufts.edu/student/documents](http://nutrition.tufts.edu/student/documents)). It is the responsibility of the student to be aware of, and comply with, these policies and standards. In accordance with Tufts University’s policy on academic misconduct, violations of standards of academic conduct will be sanctioned by penalties ranging from grade reduction or failure on an assignment; grade reduction or failure of a course; up to dismissal from the school, depending on the nature and context of any infraction ([http://uss.tufts.edu/studentaffairs/judicialaffairs/Academic%20Integrity.pdf](http://uss.tufts.edu/studentaffairs/judicialaffairs/Academic%20Integrity.pdf)).
<table>
<thead>
<tr>
<th>DATE LOCATION-J156</th>
<th>TOPIC</th>
<th>LECTURER(S)</th>
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<tbody>
<tr>
<td>September 6</td>
<td>NO CLASS</td>
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<tr>
<td>September 13</td>
<td>Introduction to course Basic biochemical concepts</td>
<td>Lichtenstein</td>
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<tr>
<td>September 20</td>
<td>Glucose and glycogen metabolism</td>
<td>Lichtenstein</td>
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<tr>
<td>September 27</td>
<td>TCA cycle/PPP</td>
<td>Lichtenstein</td>
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<tr>
<td>October 4</td>
<td>Amino acid metabolism/urea metabolism</td>
<td>Lichtenstein</td>
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<tr>
<td>October 11</td>
<td>Protein metabolism/Vitamin reports</td>
<td>Ausman/student presentations¹</td>
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<tr>
<td>October 18</td>
<td>Fatty acid metabolism/Vitamin reports</td>
<td>Lichtenstein/student presentations</td>
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<tr>
<td>October 25</td>
<td>Fatty acid metabolism/Vitamin reports</td>
<td>Lichtenstein/student presentations</td>
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<td>November 1</td>
<td>Fatty acid-Lipid metabolism/Mineral reports</td>
<td>Lichtenstein/student presentations</td>
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<tr>
<td>November 8</td>
<td>Lipid metabolism/Mineral reports</td>
<td>Lichtenstein/student presentations</td>
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<tr>
<td>November 15</td>
<td>Lipid metabolism/Mineral reports</td>
<td>Lichtenstein/student presentations</td>
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<tr>
<td>November 22</td>
<td>NO CLASS</td>
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<tr>
<td>November 29²</td>
<td>Contemporary nutrition topics</td>
<td>Student presentations</td>
</tr>
<tr>
<td>December 6³</td>
<td>Contemporary nutrition topics</td>
<td>Student presentations</td>
</tr>
</tbody>
</table>

Weekly assignments – please refer to Course Schedule, all readings will be posted on TRUNK
² Schedule will be posted on TRUNK
³ Class will start at 8 am rather than 9 am
This schedule is subject to modifications at the discretion of the instructor.
Course Schedule  
(Weekly Readings, Learning Objectives and Assignments)

**September 13th**: Introduction to course, basic biochemical concepts  
Instructor(s): Lichtenstein

**Learning Objectives**: Upon completion of this class, students will be able to:

- Discuss course goals, structure and assignments
- Review basic concepts of the biochemistry – nutrition intersection
- Review definitions for essential and conditionally essential nutrients, non-nutritive dietary compounds
- Discuss examples of contemporary nutrition topics as presented in lay press
- Discuss major metabolic control mechanisms

**Required Readings**: None

**September 20th**: Glucose and Glycogen Metabolism  
Instructor(s): Lichtenstein

**Learning Objectives**: Upon completion of this class, students will be able to:

- Discuss needs of different organs for glucose (background)
- Discuss glycogen metabolism
- Discuss glucose metabolism
- Discuss integration of monosaccharides other than glucose into intermediary metabolism
- Discuss capacity of cells for anaerobic glycolysis
- Explore relationship between glycolysis and gluconeogenesis

**Required Readings**: Posted on TRUNK, peer reviewed articles related to Glucose and Glycogen Metabolism, published within the past 2 years.

**Weekly assignment for instructor assigned peer reviewed topical articles;**  
Articles will be assigned by instructor and posted in TRUNK. Each student will independently write a brief critique and be prepared to discuss the article in class (~ 1 single typed page, 1 inch margins, 12 pt font, material can be presented as text or bullet format) to address the following:

- Central thesis of article
- General study design
- Main finding(s)
• Main discussion point(s) related to the findings
• General comment on some aspect of the findings or interpretation of findings
• Limitations (if relevant)

Completed assignments should be deposited 24 hours prior to the scheduled class session in the appropriate ‘drop box’ folder in TRUNK.

September 27th: TCA Cycle/HMS Cycle
Instructor(s): Lichtenstein

Learning Objectives: Upon completion of this class, students will be able to:

• List contributions of the pentose phosphate pathway to intermediary metabolism
• Describe the role of the TCA cycle
• List sources of acetyl CoA for the TCA cycle
• List cofactors for the pyruvate dehydrogenase complex and pyruvate carboxylase enzyme
• Explain why electron shuttles are a critical component of intermediary metabolism

Required Readings: Posted on TRUNK, peer reviewed articles related to TCA Cycle/HMS Cycle, see assignment as described for the week of September 20th.

October 4th: Amino Acid Metabolism
Instructor(s): Lichtenstein

Learning Objectives: Upon completion of this class, students will be able to:

• List the major functions of protein in the human body
• Review the definitions for essential/indispensable amino acids and conditionally indispensable amino acids
• Describe the metabolic difference between glucogenic and ketogenic amino acids
• Summarize the major fates of the α-keto acids of dietary amino acids
• Describe the relationship between the urea cycle and the TCA cycle

Required Readings: Posted on TRUNK, peer reviewed articles related to TCA Amino Acid Metabolism, see assignment as described for the week of September 20th.
October 11th: Protein Metabolism/Vitamin Reports  
Instructor(s): Ausman/Student Presenters

**Learning Objectives:** Upon completion of this class, students will be able to:

**Protein – Dr. Ausman**
- Summarize the current food environment in terms of dietary protein
- Discuss protein metabolism
- Review approaches used to estimate protein requirements
- Relate dietary patterns to protein status

**‘Weekly’ Vitamins and Minerals – Student Presenters** (20 minutes/student group)
- Review the basic functions and food sources of the nutrient
- Summarize prevalent types/forms of supplements for the nutrient and cost associated with the supplement.
- Summarize typical examples of web-based or print-based health claims for the nutrient
- Discuss a recent research article about the nutrient (to be approved by the instructor)

**Required Readings:** Posted on TRUNK, peer reviewed articles related to Protein Metabolism and “Vitamins of the Week”.

**Assignment – Vitamin and Mineral Reports:**  
One vitamin and one mineral to be assigned to each student during the second week of the course (refer to class schedule for general timing of presentations, student specific dates will be assigned at the time of nutrient assignment). For the assigned nutrient students will;

- Identify a peer reviewed article focused on the nutrient (preference for studies involving humans) published within the past 12 months, or for some nutrients the past 24 months
- Write a summary of the basic facts about the nutrient (2-3 pages, double spaced, 1 inch margins, 12 pt font, with citations) which will include the following information;
  - Brief description of basic functions and food sources
  - Prevalent types/forms of supplements commercially available and cost
  - Examples of web-based or print-based health claims, if appropriate
- Write a brief critique of the peer reviewed article, with specific emphasis on how the new findings relate to current knowledge about the nutrient (~ 1 page, double spaced, 1 inch margins, 12 pt font)
- Prepare and present to the class a 10 minute summary of the basic points identified in the written report.
• Completed written report should be posted in the drop-box on TRUNK 24-hours prior to the scheduled presentation.

Citation format for all reports/critiques

• Format should correspond to that specified for the American Journal of Clinical Nutrition
• Insert reference to citations within report and list all citations at the end of the report
• Please note, only use primary references for factual citations, for example, Wikipedia is not considered a primary reference.

October 18th: Fatty Acid Metabolism/Vitamin Reports
Instructor(s): Lichtenstein/Study Presenters

Learning Objectives: Upon completion of this class, students will be able to:

• see objectives for fatty acid metabolism
• see objectives for nutrients of the week

Required Readings: Posted on TRUNK, peer reviewed articles related to Fatty Acid Metabolism and “Vitamins of the Week”.

October 25th: Fatty Acid-Lipid Metabolism/Vitamin Reports
Instructor(s): Lichtenstein/Student Presenters

Learning Objectives: Upon completion of this class, students will be able to:

Lipids Metabolism – Dr. Lichtenstein
• Summarize the current food environment in terms of dietary fat
• Discuss lipoprotein metabolism
• Review current approaches used to estimate cardiovascular disease risk
• Discuss the genesis of atherosclerotic lesion development
• Relate dietary patterns to cardiovascular disease risk

• see objectives for nutrients of the week

Required Readings: Posted on TRUNK, peer reviewed articles related to Lipid Metabolism and “Vitamins of the Week”.
November 1st: Lipid Metabolism/Minerals Reports
Instructor(s): Lichtenstein/Student Presenters

Learning Objectives: Upon completion of this class, students will be able to:

• see objectives for lipid metabolism
• see objectives for nutrients of the week

Required Readings: Posted on TRUNK, peer reviewed articles related to Lipid Metabolism and “Minerals of the Week”.

November 8th: Lipid Metabolism/Minerals Reports
Instructor(s): Lichtenstein/Student Presenters

Learning Objectives: Upon completion of this class, students will be able to:

• see objectives for lipid metabolism
• see objectives for nutrients of the week

Required Readings: Posted on TRUNK, peer reviewed articles related to Lipid Metabolism and “Minerals of the Week”.

November 15th: Lipid Metabolism/Minerals
Instructor(s): Lichtenstein/Student Presenters

Learning Objectives: Upon completion of this class, students will be able to:

• see objectives for lipid metabolism
• see objectives for nutrients of the week

Required Readings: Posted on TRUNK, peer reviewed articles related to Lipid Metabolism and “Minerals of the Week”.

November 29th: Contemporary Topic in the Field of Nutrition
Instructor(s): Lichtenstein/Student Presenters

Learning Objectives: Upon completion of this class, students will be able to:

• Expand awareness of contemporary topics in the field of nutrition
• Discuss controversial issues related to the topics with fellow students
**Required Readings**: Peer viewed articles published with in past 12 months, identified by student, approved by instructor, posted on TRUNK.

**Assignment** – Contemporary Topic in the Field of Nutrition (20 minutes/student);
- Identify a nutrition related contemporary topic that has appeared in the lay press within the past 12-months. Discuss with instructor and obtain approval.
- Conduct a survey of the topic that includes both the scientific literature and lay press.
- Summarize the current issues associated with the topic.
- Indicate how the basic science supports or does not support lay press reports.
- Prepare oral report (15 minutes) and written report (~ 5 pages, double spaced, 1 inch margins, 12 pt font).

**December 6th**: Contemporary Topic in the Field of Nutrition
Instructor(s): Lichtenstein/Student Presenters

**Learning Objectives**: Upon completion of this class, students will be able to:
- Expand awareness of contemporary topics in the field of nutrition
- Discuss controversial issues related to the topics with fellow students.

**Required Readings**: Peer viewed articles published with in past 12 months, identified by student, approved by instructor, posted on TRUNK.