Nutrition, Metabolism, and Human Aging

Course Syllabus

Course Number: **GMS 6459**

Credit Hours: Three (3) credit hours. Students are expected to engage in approximately 9 hours of coursework per week for this 3-credit class.

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

Course Description:

Explores the link between diet, metabolism, and aging. Examines how nutrition affects age-related health, chronic disease prevention, and longevity. Evaluates evidence-based interventions like caloric restriction, protein optimization, and emerging approaches such as nutraceuticals and microbiome modulation to promote healthy aging.

Course Director:

Rui Xiao, PhD
Associate Professor
Department of Physiology and Aging
College of Medicine
Email: rxiao@ufl.edu
Phone: 352-273-9389
Office hour: Fridays, 4–5 PM (by appointment only)

Schedule: This course will be offered yearly during each semester.

Course Goals:

The goals of the course are to: (1) **Understand how metabolic pathways influence biological of aging and nutrition:** Analyze how aging affects human metabolism and nutritional needs, with emphasis on physiological, biochemical, and cellular changes during aging; (2) **Evaluate evidence behind longevity-focused dietary interventions, including caloric restriction, intermittent fasting, protein optimization and microbiome modulation:** Critically assess current and emerging dietary strategies aimed at preventing or mitigating age-related diseases, preserving function, and promoting longevity; and (3) **Apply scientific knowledge to real-world aging challenges:** Develop the ability to translate nutrition science into into practical strategies and interventions that support healthy aging across clinical, community, or personal wellness settings.

Learning Outcomes:

Upon completion of this course, students are expected to be able to:

1. Explain the physiological and metabolic changes that occur with aging and how these impact nutritional requirements and health outcomes.
2. Communicate evidence-based nutritional strategies tailored to aging populations, considering both individual and public health perspectives.
3. Critically analyze scientific literature to evaluate the effectiveness, mechanisms, and limitations of nutritional interventions aimed at promoting healthy aging.

Learning Resources:

1. Topic articles will be placed on the course website. The information in these articles is coordinated with online lecture materials and serves as the required text for the course.
2. An on-line discussion will be available every week to address questions related to the lectures or other learning material.
3. The weekly discussion questions will stimulate critical thinking about issues relevant to that week's topic.

Course Outline and Assignments:

The course is divided into 15 modules. Each module consists of specific reading assignments, videos, and other internet resources. For each module students will: (1) review the learning objectives and corresponding lecture notes; (2) read and complete the assignments as given; (3) participate in weekly discussion boards as assigned. Examples of course assignments include:

Reading Assignments:

- Each module includes carefully selected readings from textbooks, peer-reviewed articles, and other online resources that provide in-depth information about the module topic.
- Students are expected to read all assigned materials before completing the activities for that module. These readings will form the foundation for lectures and discussions.

Writing Assignments:

- Short essays or case studies: Students will respond to questions or real-world scenarios, demonstrating their ability to apply course concepts to practical situations.
- In certain modules, students may be asked to solve problems or design hypothetical dietary strategies based on scientific evidence.

Weekly Discussion Boards:

- Students are required to participate in online discussion forums. Each forum will feature a discussion prompt based on the module's topic.
- Participation involves posting thoughtful responses to the prompt, referencing course materials, and engaging in meaningful dialogue with peers.
- Peer Interaction: Students should reply to at least two peers' posts, offering constructive feedback or asking questions to deepen the conversation.
- Discussion board posts should demonstrate critical thinking and an understanding of the module's content, encouraging collaborative learning.

Final Project:

- A final project, due at the end of the course, will require students to apply the knowledge gained from all modules to a comprehensive analysis. This could include:
    - Designing a nutrition intervention aimed at improving health outcomes in a specific population.
    - Reviewing a body of literature on an emerging area in aging and metabolism.
    - Creating a practical guide or recommendation based on scientific research that incorporates course content.
- Students could be asked to submit a research paper, presentation, or project report that integrates course concepts and demonstrates their ability to synthesize information.

Late Work Policy:

All assignments/projects must be submitted via the deadline provided on the course web site. For assignments that require manual grading (e.g., research papers, projects), unless you have an approved excused absence, a 10% deduction will be applied for each week when the assignment is late.

Grading:

Each student's final grade for the course will be calculated as follows:

- Module Projects: 50%. These projects will be graded according to a rubric defined each week. This may include short papers, presentations, and reflections in response to a writing prompt. Each module project is worth 10 to 25 points and is graded on application of the module content to the specific prompt and media used.
- Discussions/Online forums: 25%.
- Final project (week 15): 25%. Drawing on the material covered throughout this course, identify and discuss your current favorite nutritional intervention for promoting healthy aging. Additionally, select the nutritional strategy you believe holds the greatest future potential in supporting longevity and age-related health? Create a video presentation (PowerPoint with voice-over) with a minimum of 30 slides. Your presentation should:
    1. Explain the mechanisms and scientific rationale behind both interventions
    2. Compare their advantages, potential benefits, and real-world applications
    3. Discuss the challenges, limitations, and areas requiring further research
    4. Support your arguments with evidence from current studies and course content.

Grading Scale:

A = 93-100%	C+ = 77-79%
A- = 90-92%	C = 73-76%
B+ = 87-89%	C- = 70-72%
B = 83-86%	D+ = 67-69%
B- = 80-82%<	D = 63-66%
D- = 59-62%	E < 59%

A grade of incomplete (I) may be given if a student fails to complete the course as scheduled for unforeseen circumstances beyond the student's control.

Course Schedule:

Schedule	Module
Week 1	**Introduction to Human Nutrition** • Basics of nutrients: macronutrients and micronutrients • Dietary guidelines and nutritional requirements
Week 2	**Digestion and Absorption of Nutrients** • Overview of the digestive system • Mechanisms of nutrient absorption and transport
Week 3	**Nutrition and Aging: An Overview** • How nutritional needs change with age • Impact of aging on appetite, digestion, and nutrient requirements
Week 4	**Aging and the Digestive System** • Age-related changes in digestion and nutrient absorption • Common gastrointestinal issues affecting elderly nutrition
Week 5	**Carbohydrate Metabolism in the Elderly** • Alterations in glucose tolerance and insulin sensitivity with aging • Implications for diet and risk of type 2 diabetes
Week 6	**Lipid Metabolism and Aging** • Changes in lipid profiles and fat distribution • Role of lipids in age-related cardiovascular risk
Week 7	**Protein Metabolism and Sarcopenia** • Protein needs to prevent muscle loss in aging • Impact of anabolic resistance on muscle protein synthesis
Week 8	**Micronutrient Requirements and Deficiencies in Older Adults** • Common vitamin and mineral deficiencies in aging (e.g., B12, vitamin D, calcium) • Strategies to address micronutrient gaps
Week 9	**Energy Metabolism Changes with Aging** • Decline in basal metabolic rate and its nutritional implications • Adjusting caloric intake to prevent frailty and weight loss • Metabolic Flexibility and aging
Week 10	**Metabolic Responses to Fasting and Stress in the Elderly** • Differences in metabolic flexibility and recovery • Risks associated with malnutrition and catabolic stress
Week 11	**Nutritional Status in Older Adults** • Nutritional biomarkers sensitive to aging • Challenges in diagnosing malnutrition and undernutrition in elderly • Microbiome and inflammaging

Week 12	**Nutrition's Role in Healthy Aging and Longevity** • Impact of diet patterns (e.g., Mediterranean, caloric restriction) on aging • Nutritional interventions to delay aging processes • Critical analysis of blue zones and longevity diets
Week 13	**Age-Related Metabolic Disorders** • Metabolic syndrome, diabetes, and obesity in older populations • Strategies for supporting healthy metabolism in older adults
Week 14	**Gut Microbiota, Nutrition, and Aging** • Interaction between diet, gut microbiota, and metabolism • Influence on immune function and health in elderly
Week 15	**Nutritional Interventions for Healthy Aging** • Dietary supplements and functional foods • Personalized nutritional approaches for aging populations • Evidence review of NAD+, NMN and longevity supplements

A sample of the reading list for week 1:

1) Dietary Guidelines for Americans, 2020–2025. https://pmc.ncbi.nlm.nih.gov/articles/PMC8713704/
2) Macronutrient balance and micronutrient amounts through growth and development. https://ijponline.biomedcentral.com/articles/10.1186/s13052-021-01061-0.
3) The relationship between nutrition and the immune system. https://pmc.ncbi.nlm.nih.gov/articles/PMC9772031/
4) The Macronutrients, Appetite, and Energy Intake. https://www.annualreviews.org/content/journals/10.1146/annurev-nutr-121415-112624
5) A Review of Nutritional Requirements of Adults Aged ≥65 Years in the UK. https://jn.nutrition.org/article/S0022-3166(22)02291-X/fulltext

Academic Policies and Resources:

Standard University academic policy information about class attendance, academic honesty, and academic resources can be found here: https://go.ufl.edu/syllabuspolicies.

Academic Integrity:

See the UF Conduct Code website for more information: https://sccr.dso.ufl.edu/process/student-conduct-code/.
Students are expected to abide by the University's Academic Honesty Policy, and to adhere to the following pledge:
"We, the member 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."

According to the UF Student Guide, Academic dishonesty includes the following.

- Cheating - copying another's work for academic gain. Plagiarism - representing another's work as your own.
- Bribery - offering, giving, soliciting, or receiving goods or services of value for academic gain.
- Misrepresentation - altering facts (e.g., signing an absent classmate's name to an attendance sheet).
- Conspiracy - planning with others to commit academic dishonesty. Fabrication - making up information to avoid punishment or other difficulty.

Copyright Information:

Please review the policy for the use of copyrighted materials, which can be found on the UF Smathers Library's web page: https://guides.uflib.ufl.edu/copyright.

Acknowledging Use of AI-Generated Content:

When do I need to acknowledge the use of an AI tool?

Any assignments that allow the use of AI tools should include an acknowledgement of your AI use.
Do not assume that you are allowed to use AI tools on an assessment. Check with your instructor if you are unsure. Policies will vary from instructor to instructor.
How do I acknowledge my use of AI?
Include an acknowledgement in an appendix to your assignment or in a location designated by your instructor.

Acknowledgement of how you used AI tools on an assignment should include the following:

- The name of the tool used and a link to the website for the tool
- A description of the type of task you used the tool to accomplish (e.g., generate text, generate images, edit text, generate code, etc.)
- A list of the specific prompt(s) used
- An explanation of how you used the output in your final work

Example Statement:

"I, [student's full name], declare that I have used generative artificial intelligence (AI) as an academic tool in the completion of this assignment. All AI-generated content has been properly cited and attributed to [name of AI tool used]. The prompts I provided include: [list of prompts], and the resulting output was used to [explain how the output was used]. Despite this assistance, I affirm that the assignment reflects my own understanding, critical thinking, and original work. I acknowledge the college's academic integrity policy and confirm that I have complied with its guidelines. I understand that any violation of this policy may result in disciplinary action."

Accommodation Policy:

Students requesting classroom accommodation must first register with the Dean of Students' office, 202 Peabody Hall, 392-1261. The DSO will provide documentation to the student who must then provide this documentation to the instructor.

Student Support Services:

As a student in a distance learning course or program you have access to the same student support services that on campus students have. For course content questions contact your instructor. For any technical issues you encounter with your course please contact the UF computing Help Desk at 352-392-4357. For Help Desk hours visit: http://helpdesk.ufl.edu/.

Special Accommodations:

Students requesting disability-related academic accommodations must first register with the Disability Resource Center. https://disability.ufl.edu/.
The Disability Resource Center will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

Complaints:

Should you have any complaints with your experience in this course please visit http://www.distance.ufl.edu/student-complaints to submit a complaint.

Course Evaluation:

Students are expected to provide thoughtful, professional, and respectful feedback on the quality of instruction in this course by completing the online course evaluations. Your input is valued and helps improve teaching and learning at UF. You can complete evaluations in any of the following ways:

1. Via the link emailed to you from **GatorEvals**,
2. Through the **GatorEvals** section in your course menu on **Canvas**, or
3. By visiting the central evaluation portal at https://my-ufl.bluera.com.

Guidance on providing constructive feedback can be found at https://gatorevals.aa.ufl.edu/students/. You will receive a notification when the evaluation period begins.

Campus Health and Wellness Resources:

UF Whole Gator Resources: Visit https://one.uf.edu/whole-gator/discover for resources that are designed to help you thrive physically, mentally, and emotionally at UF.

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress,

please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.