



El Camino College
COURSE OUTLINE OF RECORD – Official

Course Acronym:	NUTR
Course Number:	110
Descriptive Title:	Introduction to Nutrition Science
Division:	Healthcare Sciences
Department:	Nutrition Science
Course Disciplines:	Family and Consumer Sciences
Catalog Description:	This course is an introduction to nutrition science, integrating the relationship between human nutrition and health or disease states including the integration of anatomy, physiology, chemistry, biochemistry, medical science, and biotechnology to understand the full impact on the human body. Current nutrition guidance models and approaches to medical nutrition are analyzed with an emphasis on evidence-based findings. Food selection, the nutritional components of and its physiological function, metabolism, and risks associated with excesses or deficiencies throughout the lifecycle are also discussed. The impact of technological advances in nutrition is explored, along with a discussion of a lack of equity in access to food and nutrition information, fundamental principles of nutrition utilizing the scientific method and dietary approaches to health and wellness.
Prerequisite:	
Co-requisite:	
Recommended Preparation:	Eligibility for English 1A/English C1000 or equivalent
Enrollment Limitation:	
Hours Lecture (per week):	3
Hours Laboratory (per week):	0
Outside Study Hours:	6
Total Course Hours:	54
Course Units:	3
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	prior to 1992
Transfer UC:	Yes
Effective Date:	prior to 1992
General Education:	Area I, Natural Sciences
ECC	Area 5, Health and Physical Education
Term:	
Other:	
CSU GE:	Area B2 - Life Science Area E - Lifelong Understanding and Self-Development

Term:	
Other:	
CalGETC:	Area 5B
Term:	

Other:	
Student Learning Outcomes:	SLO #1 Personal Dietary Intake Utilizing dietary analysis software students will apply current nutrition standards and dietary guidelines to analyze and critique their personal dietary intake. SLO #2 Nutrition News Article Following textbook review and classroom discussion, students will analyze and evaluate the reliability and validity of a nutrition news article. SLO #3 Nutrition Fact Panel Given in-class demonstration students will interpret and evaluate information provided on a Nutrition Facts Label.

Course Objectives:

1. Explain scientific theories, concepts, data, and limitations used in nutrition science.
2. Apply scientific principles and communicate about the process of scientific discovery in nutrigenomics, microbiota, human metabolism, and nutrition science.
3. Diagram the sequential steps of the scientific method outlining the methods scientists use to explore nutritional phenomenon, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence and the use of mathematical analysis.
4. Distinguish between different types of research studies and evaluate the quality and applicability of evidence, considering the principles of experimental methodology and systematic questioning, understanding the power and limitations of science.
5. Examine evidence-based conclusions and form reasoned opinions about nutrition science-related matters of personal, public, and ethical concern in human living systems.
6. Locate, interpret, evaluate, and use peer-reviewed studies and literature to make ethical, evidence-based health-related decisions.
7. Explain the basic structure of molecules and chemical bonding in relation to nutrients.
8. Connect chemical principles to nutrition and physiological processes, illustrating their application through real-world examples.
9. Describe the hierarchical levels of structural organization within the human body, ranging from the fundamental building blocks of atoms, chemical bonding, and molecules to the complex interactions of organ systems.
10. Correlate the steps of photosynthesis in glucose production to energy metabolism in the human body.
11. Explain the chemical structure, chemical bonding, and biological functions of macronutrients; and list major food sources for each.
12. Identify the elements of basic anatomy and physiology and explain the body's mechanical, enzymatic, and hormonal aspects of digestion, absorption, metabolism, and excretion of nutrients.
13. Identify, apply, and analyze metabolic processes, pathways, and utilization of macro- and micronutrients from a cellular level to accompanying organ systems.
14. Apply understanding of molecular structures to the steps in metabolism of macro- and micronutrients in the human body.
15. Examine the principles underlying the relationship of macro- and micronutrients and optimal health and fitness, nutrient deficiency or excess, and disease in human living systems.
16. Use information technologies to locate and apply evidence-based nutrition guidelines and protocols in analyzing the nutrition adequacy of an individual's diet and provide recommendations to meet guidelines based on age, gender, fitness, and health conditions.
17. Conduct a peer review process in formulating a critical analysis of a nutrient-related health outcome using methodology of scientific inquiry.
18. Analyze the nutrient adequacy of a dietary intake by using nutrition analysis technology.
19. Identify the energy systems in relation to fuel utilization for physical activity describing how duration and intensity impact the types of fuel used for physical activity during aerobic and anaerobic metabolism.

	20. Summarize the use of carbohydrates, fats, proteins, minerals, vitamins, and water in building and maintenance of tissue.
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Major Topics:

- I. Overview of nutrition science (6 hours, lecture)
 - A. Introduction to Nutrition Science Information Literacy
 - 1. Science Communication and Information Literacy
 - 2. Evaluating Health Claims
 - 3. Relationship between scientific advancements, historical perspectives in developing theories in nutrition science, and their application to personal and public health.
 - B. Principles of Scientific Inquiry
 - 1. Sequential steps of the scientific method
 - 2. Peer-reviewed journals
 - 3. Scientific Consensus
 - 4. Types of research studies
 - 5. Challenges of studies
 - a) Unequal representation of the population
 - b) Preliminary data
 - c) Small sample sizes
 - d) Varying target populations
 - e) Evolving scientific developments
 - f) Case studies and their applicability
 - g) Cause vs connection
 - h) Disclosure reviews/conflict of interest
 - i) Ethical considerations
 - 6. Evidence-based guidelines and limitations of research, including the challenges of studying complex dietary patterns
 - 7. Advantages and limitations of epidemiology and experimental research
 - 8. Evaluation tools and techniques related to reviewing current research findings
 - a) How to apply nutrition findings when researching an evolving topic where scientific findings seem to contradict one another or are subject to conflicting interpretations
- II. Designing a healthy diet (3 hours, lecture)
 - A. Chronic Disease
 - 1. Leading causes of death in the US
 - a) The role of genetics, nutrition, and various non-nutritional lifestyle factors
 - B. Nutrition Guidance Models
 - 1. Scientific basis, strengths, limitations, and applications of various nutrient guides including the Dietary Guidelines for Americans, MyPlate, and the Dietary Reference Intakes (DRIs) Standards, Health People 2030
 - C. Nutrient Composition of Food
 - D. Factors Driving Food Choices
 - 1. Hunger
 - 2. Appetite including culture, social, emotional, environmental influences
 - E. Supplements and their place in a balanced nutrient consumption pattern

	F. Plant-based phytochemicals and their influence on health and disease G. Food package labeling 1. Nutrition facts label 2. Food allergen warning 3. Health and nutrient claims
III.	Human Physiologic Processes Related to Nutrition (4 hours, lecture) A. Levels of structural organization of the human body from atoms and molecules to the whole organism including the basic characteristics of cells and the organ systems B. Photosynthesis and the production of glucose A. The anatomy and physiology of the digestive system 1. Functions of the organs of the gastrointestinal tract 2. Hormonal and nervous system regulation of the digestive tract a) Definition and function of enzymes b) Enzyme-substrate interactions c) Factors affecting enzyme activity 3. Accessory organs of digestion and their roles in digestion 4. Diseases of the gastrointestinal tract a) Causes, treatment, and management b) GERD, IBS, and others C. Cardiovascular, lymphatic, and excretory systems involvement in nutrient transport, regulation, and waste removal D. Biologic processes related to nutritional disorders of the digestive tract and accessory organs E. Current research on the microbiome
IV.	Carbohydrates (6 hours, lecture) A. Functions 1. Fuel for the brain, for red blood cells, and the primary source of energy during high intensity exercise B. Chemical Structure 1. Simple carbohydrates: monosaccharides, disaccharides a) Types, differences, enzymatic digestion 2. Complex carbohydrates: polysaccharides (starch, fiber, and glycogen) a) Types, differences, enzymatic and bacterial digestion C. Sources 1. Photosynthesis and carbohydrate production 2. Food sources of simple and complex carbohydrates 3. Food manufacturing and the anatomy of a wheat kernel: from the whole wheat kernel to refined, enriched, and fortified grains D. Selecting nutritious choices E. Recommendations 1. Calculate the carbohydrate recommendations based on the Acceptable Macronutrient Distribution Ranges F. Metabolism 1. Mechanical and chemical digestion of carbohydrates throughout

	entire gastrointestinal tract, including enzymes and accessory organs a) From whole food to individual monosaccharides 2. Absorption of monosaccharides across the epithelial cells lining the small intestine and into the circulatory system 3. Conversion of fructose and galactose to glucose in the liver 4. Utilization: ATP production, glycogen storage, or fat storage
G.	Blood sugar regulation 1. The role of insulin and pancreas 2. The role of glucagon and the liver
H.	Impact on Health 1. Carbohydrates and weight management 2. Fiber's protective role a) Mechanism for blood glucose regulation b) Mechanism for cholesterol management and lowering heart disease risk c) Mechanism for reduced risk of constipation, hemorrhoids, appendicitis, and diverticula d) Research indicating an inverse association with lowering cancer risk and proposed mechanisms
I.	Lactose intolerance 1. Mechanism and management
J.	Inadequate carbohydrate intake 1. Ketosis 2. Impact on the biochemical reactions of protein and fat metabolism
K.	Blood Sugar 1. Type 1 vs Type II Diabetes: criteria, causes, mechanism, and symptoms a) Management: dietary patterns, physical activity, and medication 2. Hypoglycemia
L.	Evolving Topics/Controversies 1. Evidence for, against, and remaining questions surrounding the use of non-nutritive sweeteners, alternative sweeteners, and sugar alcohols as sugar replacements 2. Added sugars and health implications 3. Additives and the generally recognized as safe list (GRAS) a) Evidence and margins of safety
M.	Historical and Social Implications 1. Discovery of refined grains' impact on the rise of children born with neural tube defects a) Resulting FDA mandate to enrich grains

- V. Lipids (4 hours, lecture)
 - A. Functions
 - 1. Energy storage, primary fuel at rest, cell membrane structure, and other functions
 - B. Chemical Structure
 - 1. Triglycerides
 - a) Glycerol backbone and hydrophilic properties
 - b) Fatty acids and hydrophobic properties
 - (1) Carboxyl and methyl end identification
 - (2) Short-, medium-, and long-chain differentiation
 - (3) Saturated vs unsaturated
 - (4) Cis vs trans configuration
 - 2. Impact of chemical structure on physical properties of pure fats
 - a) Higher proportion of saturated fats, more solid at room temperature
 - b) Higher proportion of unsaturated fats, more liquid at room temperature
 - 3. Phospholipids
 - 4. Sterols
 - C. Sources from foods
 - 1. Proportion of saturated to unsaturated present in different foods
 - D. Selecting nutritious choices
 - E. Recommendations
 - 1. Calculate the lipid recommendations based on the Acceptable Macronutrient Distribution Ranges
 - F. Metabolism
 - 1. Mechanical and chemical digestion of lipids throughout entire gastrointestinal tract, including enzymes, emulsifiers, and accessory organs
 - a) *From whole food to free fatty acids, glycerol, and monoglycerides*
 - 2. Absorption into the epithelial cells lining the small intestine and reforming triglycerides to be packaged within a chylomicron
 - 3. Crossing the small intestine
 - 4. Transport of short- and medium chain fatty acids into the circulatory system and chylomicrons into the lymphatic system for use throughout the body
 - 5. Utilization: ATP production, synthesis of other lipid-based compounds, or fat storage
 - 6. The roles of LDL and HDL in lipid transportation
 - a) Mechanisms for removing or depositing cholesterol in the body
 - G. Impact on Health
 - 1. Heart disease risk
 - a) Causes, mechanism, and symptoms
 - b) Modifiable vs unmodifiable risk factors
 - c) Management: dietary patterns, physical activity, and medication

2. Hypertension
 - a) Dash Diet
 3. Hydrogenation of unsaturated fats
 - a) The hydrogenation chemical reaction and its impact on unsaturated fatty acids
 - b) Appeal for use in food manufacturing
 - c) Health concerns
 4. The protective roles of EPA and DHA
 - a) Association with lower risk of some cancers and supports brain, heart, and cell membrane structure
 - b) Impact on cholesterol levels
 - c) Food sources
 - d) Evidence for recommended amounts
 - H. Evolving Topics/Controversies
 1. Moving towards the Mediterranean Diet for health
 2. Food manufacturing solutions: fat replacers for a lower fat diet
 - I. Historical and Social Implications
 1. The increase in trans fat consumption: labeling, production, concerns
 - a) The unintentional impact of reducing trans fats and raising saturated fat in the diet
 - (1) Comparison of the products of partial hydrogenation vs full hydrogenation reaction
- VI. Proteins, Amino Acids, and Nucleic Acids (4 hours, lecture)
- A. Function in the Body
 1. Hormones, enzymes, antibodies, cell repair and growth, neurotransmitters, nutrient transport, fluid balance, and others
 - B. Chemical Structure
 1. Essential, conditionally essential, nonessential amino acids
 2. Side chain properties
 3. Peptide bonds and formation of di-, tri-, and polypeptides
 4. Primary, secondary, tertiary, and quaternary structures
 5. The relationship between structure, shape, and function
 - C. Sources from foods
 1. Complete sources, incomplete sources, and supplements
 2. Vegetarian and vegan eating patterns
 3. Complementing proteins
 - D. Selecting nutritious choices
 - E. Recommendations
 1. Calculate the protein recommendations based on the Acceptable Macronutrient Distribution Ranges
 2. Recommendations for protein in health, impact of physical activity, disease, and across the lifespan
 - F. Metabolism
 1. Mechanical and chemical digestion of proteins throughout the entire gastrointestinal tract, including enzymes and accessory organs

	a) From whole food to individual amino acids, dipeptides, and tripeptides 2. Absorption across the epithelial cells lining the small intestine into the circulatory system for transportation throughout the body 3. Utilization: build other protein-based molecules, converted into a nonessential amino acid, conversion to glucose, or fat storage 4. Protein synthesis a) Mechanism and process of transcription and translation from stimuli to protein production (1) Defining genes and DNA (a) The instructions in DNA (b) Identifying their location in the cell (2) Stimuli, activation of appropriate portion of DNA in the appropriate cell, a copy of the instructions is made (mRNA) and exits the nucleus to enter the cytoplasm, mRNA attaches to ribosome, tRNA collects the appropriate amino acid and adds it to the growing chain until the sequence and protein are complete (a) Impact of amino acid pool and limiting amino acids on protein production
	G. Impact on Health 1. Protein deficiency 2. Protein excesses a) Competing amino acids, kidney disease, bone loss and osteoporosis, and cancer 3. Sickle cell anemia and the impact of single nucleotide substitutions H. Evolving Topics/Controversies 1. Gluten concerns and celiac disease I. Historical and Social Implications 1. Malnutrition and poverty in the United States and globally a) Possible causes b) Genetic engineering solutions to increase crop yields and reduce hunger c) Evidence for, against, and the unknowns of the genetic modification of foods
VII.	Micronutrients (4 hours, lecture) A. Water-soluble vitamins, lipid-soluble vitamins, and minerals 1. Food sources 2. Absorption in the digestive tract 3. Transport, storage and excretion 4. Biological and physiological functions 5. Nutritional requirements 6. Consequences of excesses and deficiencies
VIII.	Water (4 hours, lecture) A. Comparing various food and beverages as sources B. Absorption throughout the digestive tract

- C. Biological functions
- D. Nutritional requirements
- E. Consequences of excesses and deficiencies
 - 1. Dehydration and hyponatremia
- F. Fluid and electrolyte balance

- IX. Biologic and Psychologic Factors Associated with Weight Regulation (6 hours, lecture)
- A. Chemical nature of ATP and the role of ATP in energy metabolism
 - B. Major steps of energy metabolism including aerobic and aerobic respiration
 - C. Glycolysis and Citric Acid Cycle
 - D. Measurement and classification of obesity and distribution of adiposity
 - 1. Body weight, body mass index (BMI), body fat percentage, and waist circumference for assessing health
 - a) Assessing and measuring
 - b) Parameters for health
 - c) Scientific basis behind these methods
 - d) Applicability and limitations
 - E. Assessing food intake
 - 1. Diet record vs 24-hour diet recall.
 - F. Underweight and Overweight
 - 1. Definitions and health risks
 - G. Factors influencing energy balance and the role in weight regulation
 - H. Total energy needs: basal metabolic rate (BMR), activity, and the thermic effect of food (TEF)
 - I. Functions of Ghrelin, GLP1, Insulin and Leptin
 - J. Scientific research and Theoretical causation for overweight and obesity
 - 1. Set-point theory
 - 2. Thermogenesis
 - 3. Genetics
 - 4. Environmental cues
 - 5. Food addiction
 - K. Obesity treatment
 - 1. Lifestyle modification
 - 2. Medications
 - 3. Surgery
 - L. Societal disparities related to overweight and underweight
 - M. Pathophysiology and classification of disordered eating
 - 1. Disordered eating patterns
 - 2. Anorexia nervosa, bulimia nervosa, and binge eating disorder
 - 3. Symptoms and treatment
- X. Nutrition and physical activity (3 hours, lecture)
- A. Benefits of physical fitness
 - B. Anaerobic vs aerobic physical activity and biological pathways
 - 1. Glycolysis
 - 2. Tricarboxylic acid cycle
 - 3. Catabolic and anabolic reactions
 - C. Impact of duration, intensity, and training of physical activity on macronutrient fuel utilization
 - 1. Cardiorespiratory activity

- 2. Weight resistance training
- D. Macronutrient, micronutrient, and energy needs for athletes
 - 1. Performance diets
- E. Evaluation of current research regarding performance-enhancing supplements
 - 1. Ergogenic aids
- F. Hydration status and exercise performance
 - 1. Fluids and temperature regulation
- XI. Nutrition through the lifecycle (4 hours, lecture)
 - A. Pregnancy
 - 1. Physiological changes and nutrients of concern
 - 2. Commonly addressed feeding needs and concerns
 - 3. Exercise tolerance
 - 4. Health concerns
 - B. Infant and child nutrition
 - 1. Breast milk vs formula
 - 2. First foods
 - 3. Nutrients of concern
 - 4. Commonly addressed feeding needs and concerns
 - 5. Health concerns
 - C. Child and adolescent nutrition
 - 1. Nutrients of concern
 - 2. Commonly addressed feeding needs and concerns
 - 3. Health concerns
 - D. The middle years
 - 1. Nutrients of concern
 - 2. Commonly addressed feeding needs and concerns
 - 3. Health concerns
 - E. Aging
 - 1. Physiological changes and nutrients of concern
 - 2. Commonly addressed feeding needs and concerns
 - 1. Health concerns
- XII. Food safety and Technology (5 hours, lecture)
 - A. Causes of foodborne illness
 - B. Advances in food safety
 - 1. Packaging and treatment
 - C. Government agencies
 - 1. Food law
 - D. Food additives
 - 1. Pesticides and contaminants
 - 2. Toxins
 - a) Naturally found in foods
 - b) Environmental toxins
 - c) Concerns and management
 - E. Food science technology

1. Food processing and nutrient value
2. Irradiation
3. Genetically modified organisms (GMO)
4. Organic foods

F. Nutrigenomics

1. Personal nutrition: evaluation of pros and cons
2. Accessibility

XIII. Global nutrition (1 hour, lecture)

A. Hunger and food insecurity

1. Regenerative agriculture, biofortification, and sustainability

Total Lecture Hours:	54
Total Laboratory Hours:	0
Total Hours:	54
Primary Method of Evaluation:	Substantial writing assignments
Typical Assignment Using Primary Method of Evaluation:	Nutrient Analysis Using the Scientific Method The student will apply the steps of the scientific method to analyze and evaluate their own dietary intake. Using nutrient analysis technology, they will enter dietary data, obtain a detailed nutrient analysis, and evaluate the results by comparing them to evidence-based guidelines. They will develop a hypothesis regarding their intake in relation to meeting the evidence-based guidelines for promoting long-term health. They will critically analyze their results and based on their evaluation they will make specific informed recommendations to align their nutrient intake with the evidence-based guidelines.
Critical Thinking Assignment 1:	Nutrition Product Claim and Website Critique The student will critically evaluate a website promoting a nutrition-related product or claim. Their critique will address the credibility of the claims made on the website, analyze the evidence provided (if any), and assess whether the information aligns with evidence-based scientific research
Critical Thinking Assignment 2:	Peer-Reviewed Research Topic Paper Students will create a draft research paper based on a hypothesis regarding the effect of a nutrient, nutritional supplement, or other consumed substance on one specific aspect of health. The student will conduct a review of peer-reviewed research studies related to their topic. The strength and credibility of the evidence presented in these studies will be analyzed and the student will discuss how the research supports or contradicts their hypothesis. Students will peer review 2-3 other students' topic papers basing the evaluation on hypothesis clarity and relevance, quality of literature review, analysis and discussion, organization, clarity, and proper citation. The student will complete their research paper with modifications based on feedback from peers and the instructor. Students will comment on the limitations of the research and make suggestions for where they feel additional areas of research could strengthen the hypothesis.

Other Evaluation Methods:	Research Projects Class Participation Class Work Exams/Tests Group Projects Skills Demonstration Journals Oral Presentation Papers Portfolios Projects Quizzes Homework
Instructional Methods:	Audio/Visual Aids Computer Tutorials/Aids Demonstration Observation Discussion Distance Education Group Projects/Activities Guest Speakers Lecture Learning Modules

If other:	
Work Outside of Class:	Students are expected to read and study handouts, lecture notes, and the textbook. Students will also prepare written assignments, practice skills, and study for exams. Students will receive critical thinking-based scenarios to apply course concepts to and share finding in class discussions, debates, and group activities.
If Other:	
Up-To-Date Representative Texts:	Smith, Anne, <u>Wardlaw's Contemporary Nutrition: 2024 Release</u>, McGraw-Hill, 2024. Schiff, Wendy, <u>Nutrition for Healthy Living: 2024 Release</u>, McGraw-Hill, 2024. University of Hawai'i at Mānoa Food Science and Human Nutrition Program. <u>Human Nutrition</u>. 2e Simple Book Publishing. https://pressbooks.oer.hawaii.edu/humannutrition2e22/. Licensed under CC by 4.0. Callahan, A., H. Leonard, T. Powell (2020). <u>Nutrition: Science and Everyday Applications</u> (OER/e). OER Commons(https://openoregon.pressbooks.pub/nutritionscience). ISBN: 9781636350035 Morrill, J., S (2022). <u>Science, Physiology, and Nutrition for the Nonscientist</u> (OER ed./e). OER Commons(https://med.libretexts.org/Bookshelves/Nutrition/Science). ISBN: 9798818908366
Alternative Texts:	

Required Supplementary Readings:	- Throughout the course, students will review and analyze scientifically sound and valid research regarding nutrition information that is more current than the textbook information provides. - Handouts and study materials authored or presented by the instructor.
Other Required Materials:	Dietary Analysis Software program Natural Medicines Comprehensive Database (https://naturalmedicines.therapeuticresearch.com/Home/ND) Online diet tracking website. (i.e. chronometer.com, gbhealthwatch.com)
Requisite:	
Category:	
Requisite course(s): List both prerequisites and corequisites in this box.	
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	
Requisite Skill:	
Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable	
Requisite course:	Eligibility for English 1A/English C1000 or equivalent
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	It is recommended that students should be able to read and comprehend textbooks that include science-based information and write an essay that demonstrates critical thinking. Summarize, analyze, evaluate, and synthesize college-level texts. Write a well-reasoned, well-supported expository essay that demonstrates application of the academic writing process.
Requisite Skill:	
Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable	

Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Nancy Hufstetler
Date:	09/01/1977
Original Board Approval Date:	
Last Reviewed and/or Revised by:	Myra Bremen
Date:	10/23/2025
Last Board Approval Date:	01/21/2026
Effective Term:	FA 2026