Nutrition (NTR)

NTR 210 Introduction to Community Food Security (3 credit hours)
This introductory interdisciplinary course teaches students about the many facets of food security in the United States, including historical impacts of race and social class on food security; food justice and food accessibility; the roles of non-profit organizations, government agencies, and disciplinary experts in developing food security efforts; and approaches to developing programs and policies, federal to local, to address the problem. In addition, service-learning experiences in students own communities allow them to gain knowledge about the specific agencies approaches to community food security, critically reflecting upon the experience and creating their own community food security action plan.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Summer only

NTR 220 Food and Culture (3 credit hours)
This course explores traditional food cultures around the world; highlighting foodways, flavor profiles, and commonly used ingredients. This course focuses on how and to what extent traditional foodways of US immigrants are impacted by the majority culture and how regional cuisines have been impacted by historical migration patterns. Students will examine their own food culture, biases, and how these impact personal interactions with others through a semester-long project. Food tastings and sensory experiences will expose students to a variety of global and US regional cuisines allowing students to compare and contrast flavor profiles and commonly used ingredients. Course is available to all majors.

GEP Global Knowledge
Typically offered in Summer only

NTR 301/FS 301 Introduction to Human Nutrition (3 credit hours)
Functions, dietary sources, digestion and absorption, deficiencies and excesses of essential nutrients in humans; dietary guidelines; food labels; the study of diet-disease relationships; the role of diet in heart disease, diabetes, hypertension, osteoporosis; energy balance and weight control; dietary supplement regulation; diet and athletic performance.

Prerequisite: Sophomore standing
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

NTR 302 Introduction to Nutrition Research, Communication, and Careers (3 credit hours)
This course exposes students to scientific literature, communication, and careers in the field of nutrition. Students will learn how to critically evaluate scientific literature and communicate that information both orally and in writing. Course topics include: research design, nutritional epidemiology, statistics, scientific writing, professionalism, and current nutrition-related “hot topics.” Class time will be a combination of lecture and small or large group discussions and individual or group in-class assignments. Student evaluations include in-class assignments, writing assignments, oral presentations, and exams.

Prerequisite: NTR 301
Typically offered in Fall and Summer

NTR 320 Nutrition Education (3 credit hours)
This course exposes students to the principles behind the development, implementation, and evaluation of nutrition education programs in the United States. Course topics will cover behavior change models, educational pedagogies, nutrition needs assessments, curricular and tool development, social marketing, and social media and technology related to nutrition education. The course is a flipped-course design with course content posted online through pre-recorded lectures and reading assignments. In-class lecture time will be reserved for class discussion and in-class assignments. Student evaluations include exams, in-class assignments, and a term paper.

Prerequisite: NTR 301
Typically offered in Fall only

NTR 330 Public Health Nutrition (3 credit hours)
Students will explore factors that affect the health and nutrition of the population as well as how those factors are identified, studied, and applied to improve health issues. Students will identify services and programs available to address nutrition and health issues. Students will analyze current events related to public health, evaluate nutrition related policy, and advocate for issues related to nutrition.

Typically offered in Fall and Summer

NTR 401/FS 401/NTR 501/FS 501 Advanced Nutrition and Metabolism (3 credit hours)
Nutritional biochemistry and physiology as it relates to establishment of nutrient requirements and Dietary Reference Intakes. Digestion, absorption, metabolism, storage, and excretion of nutrients and other markers of nutritional adequacy or excess with emphasis on micronutrients. Functions of nutrients, in bone muscle, blood, growth and development and communication. Credit will not be awarded for both NTR (FS) 401 and NTR (FS) 501.

Prerequisite: (NTR 301 or NTR 415) and (CH 221 or CH 220 or CH 225)
Typically offered in Fall and Summer

NTR 410/NTR 510 Maternal and Infant Nutrition (3 credit hours)
Students will explore the current research, controversies, and biological mechanisms related to nutrition for women before, during, and after pregnancy, as well as for infants in utero and after birth.

Prerequisite: NTR 301
Typically offered in Spring and Summer

NTR 415/PO 415/PO 515/NTR 515/ANS 515/ANS 415 Comparative Nutrition (3 credit hours)
Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.

Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223 or CH 227
Typically offered in Fall, Spring, and Summer

NTR 419 Human Nutrition and Chronic Disease (3 credit hours)
Current concepts regarding, and physiological bases of the roles of nutrition in the prevention and treatment of acute and chronic disease states in humans with emphasis on the process of scientific discovery, reading of original research and transformation of research findings to public policy.

Prerequisite: Junior standing, ANS 230, or ANS/FS/NTR 301 or ANS/NTR/PO 415
Typically offered in Spring only
NTR 420 Applied Nutrition Education (3 credit hours)
In this service-learning course, students will develop nutrition education, lesson planning, conflict management, and knife safety skills through implementation of a nutrition education course in a community-based setting. Students will team-teach the nutrition education course at an established community partner location, gaining experience collaborating with nonprofit organizations to teach the clients they serve. Through critical reflection assignments and discussions, students will set goals to improve teaching, honing nutrition education and communication skills. Students are expected to provide their own transportation to community partner locations in the greater Raleigh area. Junior standing, NTR 301 and NTR 320 prerequisites.

Prerequisites: NTR 301 and NTR 320, and junior standing or greater required
Typically offered in Spring only

NTR 421/NTR 521 Life Cycle Nutrition (3 credit hours)
This course focuses on the physiologic changes and nutritional needs throughout the life cycle. Additionally, students will explore psychosocial and environmental influences on food consumption and diet quality at each stage of life. Pregnancy and lactation, fetal development, infancy, early childhood, childhood, adolescence, young and middle adulthood, and geriatrics will be examined. Student will apply course content to real-world settings through individual and/or group service-learning projects. Credit will not be given for both NTR 421 and NTR 521.

Prerequisite: NTR 301 and junior standing required
Typically offered in Spring only

NTR 425/ANS 425/FM 425/PO 425/NTR 525/FM 525/ANS 525/PO 525 Feed Manufacturing Technology (3 credit hours)
Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.

Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225
Typically offered in Fall, Spring, and Summer

NTR 454/ANS 554/ANS 454 Lactation, Milk and Nutrition (3 credit hours)
Nutritional properties of milk as a high-quality food with nutritional diversity. Principles of physiology, biochemistry and cell biology in the mammary gland. Procedures of milk production and milk collection for milk quality and nutrition. Human lactation vs. that of domestic animals. Impacts of biotechnology and food safety on dairy production. Credit will not be given for both ANS 454 and 554.

Prerequisite: ANS 230 or FS/NTR 400; BCH 451 or ZO 421
Typically offered in Spring only

NTR 490 Senior Capstone Experience in Nutrition (4 credit hours)
In this capstone course, students will work in groups to complete research and service projects for community partners while gaining professional experiences in nutrition. Students will be expected to apply their knowledge and skills gained throughout their nutrition coursework to develop solutions to problems in public health and community nutrition. Students will complete comprehensive written and poster presentations about their work as a group, in addition to individual reflection(s) about their learnings. Students must provide their own transportation when visiting their community partner site. Students should complete this course in the last semester (or year) of their degree. NTS and NTA Majors only; Senior status required.

Prerequisite: NTR 301, NTR 302, and NTR 401; Nutrition Science majors only; Senior status required
Typically offered in Fall and Spring

NTR 492 Professional Internship Experience in Nutrition Science (1-3 credit hours)
This course provides an opportunity for students to gain real-world experience relevant to their academic and career goals. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Undergraduate Teaching Coordinator for Nutrition prior to the start of the experience. To gain approval, a student must submit the completed NTR 492 contract and have it approved by his/her experience supervisor, academic advisor and the undergraduate teaching coordinator/course instructor. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.

Typically offered in Fall, Spring, and Summer

NTR 493 Research Experience in Nutrition Science (1-3 credit hours)
This course provides an opportunity for students to gain real-world experience in a scientific research program. A minimum of 42 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Undergraduate Teaching Coordinator for Nutrition prior to the start of the experience. To gain approval, a student must submit the completed NTR 493 contract and have it approved by his/her research supervisor, academic advisor and the NTR 493 coordinator. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.

Typically offered in Fall, Spring, and Summer

NTR 494 Teaching Experience in Nutrition Science (1-3 credit hours)
This course provides an opportunity for students to gain teaching experience relevant to their academic and career goals. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Undergraduate Teaching Coordinator for Nutrition prior to the start of the experience. To gain approval, a student must submit the completed NTR 494 contract and have it approved by his/her experience supervisor, academic advisor and the undergraduate teaching coordinator/course instructor. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.

Typically offered in Fall, Spring, and Summer
NTR 495  Special Topics in Nutrition  (1-6 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Typically offered in Fall, Spring, and Summer

NTR 500  Principles of Human Nutrition  (3 credit hours)
Overview of fields of Nutritional Sciences; functions of nutrients in the human body; sources and properties of nutrients; relationships of food industry practices to nutrition. Credit will not be given for both NTR (FS)400 and NTR 500

Prerequisite: CH 220 and (CH 221 or CH 223) and (ZO 160 or BIO 181/183)
Typically offered in Fall and Summer

NTR 501/FS 501/NTR 401/FS 401  Advanced Nutrition and Metabolism  (3 credit hours)
Nutritional biochemistry and physiology as it relates to establishment of nutrient requirements and Dietary Reference Intakes. Digestion, absorption, metabolism, storage, and excretion of nutrients and other markers of nutritional adequacy or excess with emphasis on micronutrients. Functions of nutrients, in bone muscle, blood, growth and development and communication. Credit will not be awarded for both NTR (FS) 401 and NTR (FS) 501.

Prerequisite: (NTR 301 or NTR 415) and (CH 221 or CH 220 or CH 225)
Typically offered in Fall and Summer

NTR 510/NTR 410  Maternal and Infant Nutrition  (3 credit hours)
Students will explore the current research, controversies, and biological mechanisms related to nutrition for women before, during, and after pregnancy, as well as for infants in utero and after birth.

Prerequisite: NTR 301
Typically offered in Spring and Summer

NTR 515/ANS 515/ANS 415/NTR 415/PO 415/PO 515  Comparative Nutrition  (3 credit hours)
Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.

Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223 or CH 227
Typically offered in Fall, Spring, and Summer

NTR 521/NTR 421  Life Cycle Nutrition  (3 credit hours)
This course focuses on the physiologic changes and nutritional needs throughout the life cycle. Additionally, students will explore psychosocial and environmental influences on food consumption and diet quality at each stage of life. Pregnancy and lactation, fetal development, infancy, early childhood, childhood, adolescence, young and middle adulthood, and geriatrics will be examined. Student will apply course content to real-world settings through individual and/or group service-learning projects. Credit will not be given for both NTR 421 and NTR 521.

Prerequisite: NTR 301 and junior standing required
Typically offered in Spring only

NTR 525/FM 525/ANS 525/PO 525/NTR 425/ANS 425/FM 425/PO 425  Feed Manufacturing Technology  (3 credit hours)
Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.

Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225
Typically offered in Fall and Spring

NTR 550/ANS 550  Applied Ruminant Nutrition  (3 credit hours)
Applied concepts in ruminant nutrition for the practicing agricultural professional. Protein, energy, vitamin and mineral nutrition in relation to the nutritional needs and practical feeding of beef cattle, dairy cattle, sheep, and goats. New developments in feeding systems, feed additives and the prevention and treatment of metabolic disorders. Emphasis on solving problems in case studies. Permission given to undergraduates

Prerequisite: ANS 230 or ANS(NTR,PO) 415. Permission given to undergraduates
Typically offered in Fall only

NTR 554/FS 554  Lactation, Milk, and Nutrition  (3 credit hours)
Nutritional properties of milk as a high-quality food with nutritional diversity. Principles of physiology, biochemistry and cell biology in the mammary gland. Procedures of milk production and milk collection for milk quality and nutrition. Human lactation vs. that of domestic animals. Impacts of biotechnology and food safety on dairy production. Credit will not be given for both ANS 454 and 554.

Prerequisite: ANS 230 or FS/NTR 400; BCH 451 or ZO 421
Typically offered in Spring only

NTR 555/FS 555  Exercise Nutrition  (3 credit hours)
Metabolism of macro- and micronutrients as affected by exercise and physical activity. Effects of dietary patterns, specific foods, dietary supplements and ergogenic aids on sports performance. Reading and discussion of current literature and individual or group projects.

Prerequisite: NTR 400/500
Typically offered in Spring only

NTR 557/FS 557  Nutraceuticals and Functional Foods  (3 credit hours)
This course evaluates the weight of evidence from peer-reviewed scientific literature relating food bioactives, whole foods, and diets to disease prevention, athletic performance, and cognitive development/ enhancement. Data are viewed in the context of processing effects, global food and supplement regulations, as well as commercial marketing claims. Key concepts include dose-response, signal transduction, and the use of advanced technologies such as genomics, proteomics and metabolomics. Students will work in teams to develop and write a critical review manuscript suitable for publication.

Typically offered in Fall only

NTR 561/ANS 561  Equine Nutrition  (3 credit hours)
This course explores concepts in equine nutrition including digestive physiology of horses, nutrient requirements for different classes of horses and feed management. Ration evaluation and balancing, as well as problem solving will be a core component to this course.

Prerequisite:NTR 500 or NTR/FS 501 or NTR/PO 515
Typically offered in Spring only
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>NTR 565/ANS 565</td>
<td>Advanced Canine and Feline Nutrition</td>
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<td>This course is about the advanced principles of nutrition within canines and felines. The course focuses on the unique gastro-intestinal tracts for the two species as well as their specific nutrient requirements and how the animal industry addresses them.</td>
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<td>Restriction: Graduate Student or Senior with 3.35 GPA; Prerequisite: 400-level Nutrition Course</td>
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<td>Typically offered in Fall only</td>
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<tr>
<td>NTR 594</td>
<td>Special Topics in Nutrition</td>
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<td></td>
<td>The study of special problems and selected topics of current interest in nutrition and related fields.</td>
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<td>Typically offered in Fall, Spring, and Summer</td>
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<tr>
<td>NTR 601</td>
<td>Master's Seminar</td>
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<td></td>
<td>Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.</td>
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<td>Typically offered in Fall and Spring</td>
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<td>NTR 624</td>
<td>Topical Problems In Nutrition</td>
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<td>Analysis of current problems in nutrition. Also entails the scientific appraisal and solution of a selected problem designed to provide training and experience in research.</td>
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<td>Prerequisite: Graduate standing or Senior standing</td>
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<td>Typically offered in Fall, Spring, and Summer</td>
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<tr>
<td>NTR 625</td>
<td>Advanced Special Problems In Nutrition</td>
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<td></td>
<td>Directed research in a specialized phase of nutrition designed to provide experience in research methodology and philosophy.</td>
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<td>Prerequisite: Graduate standing</td>
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<td>Typically offered in Spring only</td>
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<tr>
<td>NTR 685</td>
<td>Master's Supervised Teaching</td>
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<td>Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.</td>
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<td>Prerequisite: Master's student</td>
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<td>Typically offered in Fall and Spring</td>
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<tr>
<td>NTR 690</td>
<td>Advanced Special Problems In Nutrition</td>
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<td>Directed research in a specialized phase of nutrition designed to provide experience in research methodology and philosophy.</td>
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<td>Prerequisite: Graduate standing</td>
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<td>Typically offered in Fall only</td>
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<tr>
<td>NTR 693</td>
<td>Master's Supervised Research</td>
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<td>Instruction in research and research under the mentorship of a member of the Graduate Faculty.</td>
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<td>Prerequisite: Master's student</td>
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<td>Typically offered in Fall, Spring, and Summer</td>
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<tr>
<td>NTR 695</td>
<td>Master's Thesis Research</td>
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<td>Thesis research</td>
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<td>Prerequisite: Master's student</td>
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<td>Typically offered in Fall, Spring, and Summer</td>
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<tr>
<td>NTR 696</td>
<td>Summer Thesis Research</td>
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<td>For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.</td>
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<td>Prerequisite: Master's student</td>
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<td>Typically offered in Summer only</td>
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<tr>
<td>NTR 699</td>
<td>Research In Nutrition</td>
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<td>Original research preparatory to the thesis for Master of Science or Doctor of Philosophy degree.</td>
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<td>Prerequisite: Graduate standing</td>
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<td>Typically offered in Fall, Spring, and Summer</td>
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<tr>
<td>NTR 701/ANS 701</td>
<td>Protein and Amino Acid Metabolism</td>
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<td>Study of protein and amino acid metabolism, regulation, dietary requirements and techniques for their investigation in human and other animals.</td>
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<td>Prerequisite: BCH 453, ZO 421, a 400-level nutrition course</td>
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<td>Typically offered in Spring only</td>
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<tr>
<td>NTR 706/FM 706</td>
<td>Vitamin Metabolism</td>
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<td>Structures, chemical and physical properties, functions, distribution, absorption, transport, metabolism, storage, excretion, deficiencies, and toxicity of vitamins in humans and domestic animals. Interactions between vitamins and other factors affecting vitamin metabolism or bioavailability as well as the nutritional significance of essential fatty acids and metabolism of prostaglandins, prostacyclins and leukotrienes. Application of knowledge will include critical review of scientific literature, experimental design, and formulation of vitamin supplements.</td>
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<td>Prerequisite: ANS(NTR,PO) 415 and BCH 453</td>
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<td>Typically offered in Fall only</td>
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<td>NTR 708</td>
<td>Energy Metabolism</td>
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<td>Relationship of biochemical and physiological events within the cell, tissue, organ and system with the nutrient needs as sources of energy for productive animal life. Digestion, absorption and metabolism of energy sources. Presentation of process of energy transformations within living structures in relation to energetics, biological oxidations, coupled reactions, anabolic and catabolic systems, metabolic control, partitioning and efficiency.</td>
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<td>Prerequisite: BCH 453 and an introductory NTR course</td>
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<td>Typically offered in Fall only</td>
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<tr>
<td>NTR 764/PHY 764/CBS 764</td>
<td>Advances in Gastrointestinal Pathophysiology</td>
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<td>This course will focus on advanced gastrointestinal physiology and the pathophysiology of diseases of relevance to scientists involved in animal-related research. In particular, the course will cover the pathophysiology of ulceration, infectious diarrhea, ischemia, motility disorders, and inflammatory diseases of the gut. An in-depth review paper will be required based on recent literature regarding a specific gastrointestinal disease.</td>
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<td>Prerequisite: PHY 503, PHY 504</td>
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NTR 775/PO 775  **Mineral Metabolism**  (3 credit hours)
Requirements, function, distribution, absorption, excretion and toxicity of minerals in humans and domestic animals. Interactions between minerals and other factors affecting mineral metabolism or availability. Emphasis on mechanisms associated with mineral functions and the metabolic bases for the development of signs of deficiency.

Prerequisite: ANS(NTR,PO) 415, BCH 451 and ZO 421
Typically offered in Fall only

NTR 785  **Digestion and Metabolism in Ruminants**  (3 credit hours)
Advanced concepts in ruminant digestion and metabolism, with emphasis on bovine, ovine, and caprine species. Major topics include voluntary intake, ruminal fermentation, mechanisms and rates of digestion, absorption and passage of dietary components, and postabsorptive metabolism of carbohydrates, lipids, and proteins. New developments in feeding systems, feed additives and the prevention and treatment of metabolic disorders.

Prerequisite: Graduate standing
Typically offered in Spring only

NTR 790/FM 790  **Advanced Feed Formulation**  (3 credit hours)
Principles of feed and ingredient quality assurance and how to develop a comprehensive quality assurance program. The course will include the development of an approved supplier list, ingredient specifications, feed manufacturing quality assurance procedures, and risk based feed safety programs.

Prerequisite: NTR(FM) 525
Typically offered in Fall only

NTR 794  **Special Topics in Nutrition**  (1-6 credit hours)
The study of special problems and selected topics of current interest in nutrition and related fields.

Typically offered in Fall, Spring, and Summer

NTR 801  **Doctoral Seminar**  (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

Typically offered in Fall and Spring

NTR 824  **Topical Problems In Nutrition**  (1-6 credit hours)
Analysis of current problems in nutrition. Also entails the scientific appraisal and solution of a selected problem designed to provide training and experience in research.

Prerequisite: Graduate standing or Senior standing
Typically offered in Fall, Spring, and Summer

NTR 825  **Advanced Special Problems In Nutrition**  (1-6 credit hours)
Directed research in a specialized phase of nutrition designed to provide experience in research methodology and philosophy.

Prerequisite: Graduate standing
Typically offered in Fall only

NTR 885  **Doctoral Supervised Teaching**  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

NTR 890  **Doctoral Preliminary Examination**  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

NTR 893  **Doctoral Dissertation Research**  (1-9 credit hours)
Institution in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

NTR 895  **Doctoral Dissertation Research**  (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

NTR 896  **Summer Dissertation Research**  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

NTR 899  **Doctoral Dissertation Preparation**  (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer