VTTP 123 Foundations of Physiology
Credits 3. 3 Lecture Hours.
Introduction to fundamental concepts in physiology and the practice of physiology research through exploration of mathematical models used in physiology research; emphasis on prediction of complex adaptive behavior in health and disease from elementary math, physics, chemistry and biology.

VTTP 223 Design of Experiments for Physiology Research
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Team or group formulation and refinement of novel hypotheses and design of controlled in vitro experiments; emphasis on production of publishable research in physiology.
Prerequisite: VTTP 123 or approval of instructor.

VTTP 224 In Vitro Experimentation in Physiology Research
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Team or group collection, analysis and interpretation of data from in vitro experiments; emphasis on production of publishable research in physiology.
Prerequisite: VTTP 223 or approval of instructor.

VTTP 234 Design of Models for Physiology Research
Credits 3. 3 Lecture Hours.
Team or group design of novel models of physiological systems to predict homeostatic behavior arising from the interaction of subsystems; emphasis on production and formal presentation of basic research in physiology.
Prerequisite: VTTP 123 or approval of instructor.

VTTP 235 Analysis and Validation of Models for Physiology Research
Credits 3. 3 Lecture Hours.
Team or group analysis and validation of models of physiological systems to explain disease states and design potential clinical interventions; emphasis on production of publishable applied research in physiology.
Prerequisite: VTTP 234 or approval of instructor.

VTTP 281 Seminar
Credits 4. 4 Other Hours.
Exposure to scientists from a variety of biomedical disciplines through attendance at seminars followed by review and discussion of current scientific work in physiology and related subjects, and subsequent student seminar presentations.
Prerequisites: Freshman or sophomore classification; approval of instructor.

VTTP 285 Directed Studies
Credits 0 to 4. 0 to 4 Other Hours.
Course for freshman and sophomore students who desire additional laboratory work in physiology to supplement required courses.
Prerequisites: Freshman or sophomore classification; approval of department head.

VTTP 289 Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.
Selected topics in an identified area of veterinary physiology and pharmacology. May be repeated for credit.

VTTP 291 Research
Credits 0 to 4. 0 to 4 Other Hours.
Laboratory and/or field research supervised by a faculty member. Must be taken on a satisfactory/unsatisfactory basis.
Prerequisites: Freshman or sophomore classification; approval of instructor.

VTTP 323 Physiology of Domestic Animals
Credits 3. 3 Lecture Hours.
Physiology essential to understanding of life processes. For students in agriculture and related fields.
Prerequisite: Junior classification.

VTTP 401/BMEN 400 History of Human and Veterinary Medicine in Europe
Credits 4. 4 Lecture Hours.
Addresses the major developments in human and veterinary medicine in Europe from the Middle Ages to the present; explores key events and figures in medical history and analyzes issues of current biomedical concern in a historical context; for example, animal rights, ethics of humane experimentation, euthanasia.
Prerequisites: Admitted to major degree sequence in biomedical engineering; VTTP 434.
Cross Listing: BMEN 400/VTPP 401.

VTTP 423 Biomedical Physiology I
Credits 4. 3 Lecture Hours. 2 Lab Hours.
Physiological principles, review of cellular physiology, and development of an understanding of the nervous system and muscle, cardiovascular, and respiratory physiology; clinical applications related to organ systems.
Prerequisites: VIBS 305; junior or senior classification.

VTTP 424/VIBS 424 Biomedical Neuroendocrinology and Endocrine Disorders
Credits 3. 3 Lecture Hours.
Neuroendocrine (hypothalamus-pituitary) control of puberty, menstruation, ovulation, pregnancy, labor, lactation, female reproductive cycles, male reproductive functions, thyroid and parathyroid, adrenal and kidney, diabetes, obesity, sleep, memory, learning and aging and their endocrine disorders; overview on biosynthesis, transport and signaling of peptide and neuropeptide hormones, steroids and prostaglandins.
Prerequisites: Honors, junior or senior classification, or approval of instructor.
Cross Listing: VIBS 424/VTPP 424.

VTTP 425 Pharmacology
Credits 3. 3 Lecture Hours.
Introduction to pharmacokinetics and pharmacodynamics; survey of major pharmaceutical classes; uses, mechanisms of action and adverse reactions of selected agents.
Prerequisites: VTTP 423 or approval of instructor; junior or senior classification.

VTTP 427 Biomedical Physiology II
Credits 3. 3 Lecture Hours.
Continuation of VTTP 423. Fluid balance and acid-base balance; development of an understanding of renal, gastrointestinal, endocrine and reproductive physiology using human and other mammalian models; clinical applications related to organ systems.
Prerequisites: VTTP 423; junior or senior classification.

VTTP 429 Introduction to Toxicology
Credits 3. 3 Lecture Hours.
An overview of toxicology with emphasis on environmental, human and animal health issues.
Prerequisite: Junior or senior classification.
VTPP 434 Physiology for Bioengineers I
Credits 4. 3 Lecture Hours. 1 Lab Hour.
Cellular anatomy, cellular physiology and biochemistry; systems analysis of digestive, endocrine and musculoskeletal system function including information related to gross anatomy, histology and disease states; quantitative aspects of physiology and engineering applications to clinical medicine.
Prerequisites: Junior or senior classification; biomedical engineering major or approval of instructor.

VTPP 435 Physiology for Bioengineers II
Credits 4. 3 Lecture Hours. 1 Lab Hour.
A systems analysis of nervous, cardiovascular, respiratory and urinary function including information related to gross anatomy, histology and disease states; quantitative aspects of physiology and engineering applications to clinical medicine.
Prerequisites: VTPP 434; junior or senior classification.

VTPP 438 Analysis of Genomic Signals
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Overview of current high throughput technology for data acquisition and analysis of genomic signals (e.g. mRNA or proteins); emphasis on the microarray technology, methods for analyzing microarray data, and approaches to model the underlying phenomena from the systems biology perspective.
Prerequisites: Junior or senior classification; BIMS 320/GENE 320 or GENE 320/BIMS 320 and BIOL 111, BIOL 112 or BIOL 213 or equivalent; STAT 302 or equivalent.

VTPP 439 Non-Coding RNA’s
Credits 3. 3 Lecture Hours.
Advanced topics in noncoding RNA’s in gene regulation; investigation of the role of noncoding RNAs and epigenetic regulatory factors in modulating gene expression, physiological functions and disease development.
Prerequisite: Junior or senior classification or approval of instructor.

VTPP 444 Practicum in Biomedical Research
Credits 3. 3 Other Hours.
Team or group development of sustainable collaborations that include biomedical research, high-impact educational practices and community service; focus on connecting research experience to future career goals.
Prerequisites: VTPP 423 and VTPP 427 or VTPP 434 and VTPP 435; junior or senior classification.

VTPP 450 Stem Cell Physiology
Credits 3. 3 Lecture Hours.
Advanced topics in stem cell biology; exploration of mammalian stem cells, stem cell characteristics, cell differentiation potency, molecular basis of stem cell signaling, regulatory pathways, research tools and experimental models.
Prerequisite: Junior or senior classification or approval of instructor.

VTPP 452 Fetal and Embryo Physiology
Credits 3. 3 Lecture Hours.
Introduction to the physiologic processes driving embryonic development and pregnancy; focus on embryo implantation, establishment of the placenta, development of the fetal circulatory systems and the molecular processes governing embryo differentiation and development; special emphasis on the major organ systems affected by pediatric disease and on the actions of teratogens.
Prerequisite: BICH 410 or equivalent, or approval of instructor.