

ANESTHESIOLOGY (ANE)

- ANE 500. Medical Terminology.** **1 Credit.**
In this self-paced, self-study course, students complete a programmed learning text and take a final exam at the completion of the text. Course includes word formulation, association to body systems, standard abbreviations and various surgical procedures.
Offered: Every year, Summer
- ANE 501. Ethics and Professionalism in Health Care.** **1 Credit.**
This course covers the fundamentals of professionalism, HIPAA compliance, ethics and the student and ethics of practice. Topics include treating diverse populations, religious considerations, provider-patient challenges, end of life, and case discussions.
Offered: Every year, Summer
- ANE 503. Introduction to Clinical Anesthesia.** **2 Credits.**
This course includes a brief history of anesthesia. Topics include hazards, universal precautions and infection control, personal protection, approaching the patient, the perioperative period, vascular access, obtaining arterial blood samples, types of anesthesia, the anesthesia care team, application of ASA basic monitoring requirements, preparing the operating room for the first case of the day, introduction to patient positioning, introduction to induction, maintenance and emergence from anesthesia, and identifying and managing anesthetic emergencies. This course has both a final practical exam and a written final exam at the end of the semester.
Offered: Every year, Summer
- ANE 503L. Intro to Clinical Anesthesia Lab.** **0 Credits.**
Lab to accompany introduction to clinical anesthesia course.
Offered: Every year, Summer
- ANE 510. Anesthesia Laboratory I.** **1 Credit.**
This course is the first of a three-semester sequence exploring the physical principles of measurements, operation of breathing circuits and mechanical ventilation. Students spend time in the lab setting up and running experiments, collecting data and building PowerPoint presentations that are delivered in class. Labs begin with the study of pressure measurements, flow and resistance, laminar and turbulent flow, Venturi principles, setting gas flows and concentrations, investigating carbon dioxide absorption, solubility and diffusivity of gases, time constants, compliance and resistance of breathing circuits, the circle breathing system, mechanical ventilation, and Mapleson breathing systems. Labs are built to complement material covered in courses ANE 520 Physical and Chemical Principles of Anesthesia and ANE 550 Anesthesia Delivery Systems.
Offered: Every year, Summer
- ANE 512. Anesthesia Laboratory II.** **1 Credit.**
The second of a three-semester sequence, this course focuses on the principles of patient monitoring systems. Students spend time in the lab setting up and running experiments, collecting data and building PowerPoint presentations to deliver in class. They explore the system response and how it affects the displayed waveforms and waveform parameters. They study basic measurements; ECG, noninvasive and invasive blood pressure measurements, pulse oximetry, capnography, airway pressures and flows, thermal dilution cardiac output, Doppler velocity measurement, gas emboli from entraining air into the cardiovascular system. Labs are constructed to complement material covered in the course ANE 554 Patient Monitoring.
Offered: Every year, Fall
- ANE 514. Anesthesia Laboratory III.** **1 Credit.**
This is the third of a three-semester sequence, focusing on the principles of patient monitoring systems and anesthesia machine operation. Students explore starting forces, carbon monoxide production in dry soda lime, catastrophic failure modes of different anesthesia machines, how various anesthesia machines respond to loss of oxygen and air supply, and the loss of power, and the effectiveness of various scavenging systems. The last lab of the semester is a student design lab in which the students identify a clinical problem of interest, design an experiment to answer the question, run the experiment, collect the data, analyze the data, and develop a PowerPoint presentation that is presented to all students. Labs are built to complement material covered in courses ANE 550 Anesthesia Delivery Systems, ANE 554 Patient Monitoring, and ANE 532 and ANE 534 Cardiovascular Physiology I and II.
Offered: Every year, Spring
- ANE 517. Anatomy for Anesthetists.** **4 Credits.**
This course is composed of 4 credit hours of lecture and dissection. The focus of the course is on the nervous system as the basis of regional anesthesia and control of the heart, the vascular system in terms organ perfusion as well as vascular access. Emphasis is placed on the chest, heart, lungs, brain, spinal cord, kidneys, abdomen and limbs.
Offered: Every year, Summer
- ANE 517L. Anatomy for Anesthetists Lab.** **0 Credits.**
Lab to accompany ANE 517.
Offered: Every year, Summer
- ANE 520. Physical and Chemical Principles of Anesthesia.** **2 Credits.**
This course presents an introduction to units of measure and dimensional analysis; mathematical functions; pressure, flow and resistance; partial pressures; gas laws; solubility and diffusion; osmosis; work energy and power; temperature and thermodynamics; analogous electric circuits; electrical safety; stoichiometry fires and explosions; isotopes and radiation.
Offered: Every year, Summer
- ANE 530. Introduction to Cardiovascular Physiology.** **2 Credits.**
This course is composed of 2 hours of lecture each week. Students are provided with introduction to cardiovascular physiology.
Offered: Every year, Summer
- ANE 532. Cardiovascular Physiology I.** **3 Credits.**
This course includes a review of hemodynamics and cardiovascular system; cardiac cycle; the cardiac myocyte; nervous control of the heart; electrocardiogram; control stroke volume and cardiac output; endothelial cell; microcirculation and solute exchange; vascular smooth muscle and control of blood vessels; IV fluid therapy; administration of blood products and plasma volume expanders.
Offered: Every year, Fall
- ANE 532L. Cardiovascular Physiology Lab.** **0 Credits.**
Lab to accompany ANE 532.
Offered: Every year, Fall
- ANE 533. Introduction to Pulmonary Physiology.** **2 Credits.**
This course is composed of 2 hours of lecture each week.
Offered: Every year, Summer

- ANE 534. Cardiovascular Physiology II.** **2 Credits.**
 This course covers specialization in individual circulations; cardiovascular receptors and reflexes; coordinated cardiovascular responses; atherosclerosis; Ischemic heart disease; acute coronary syndromes; valvular heart disease; heart failure; cardiomyopathies; dysrhythmias; hypertension; congenital heart disease; effects of inhalation anesthesia.
Offered: Every year, Spring
- ANE 534L. Cardiovascular Physiology II Lab.** **0 Credits.**
 Lab to accompany ANE 534
Offered: Every year, Spring
- ANE 535. Pulmonary Physiology.** **2 Credits.**
 This course explores pulmonary physiology. Topics include the atmosphere; functional anatomy of the respiratory tract; elastic forces and lung volumes; respiratory resistance; control of breathing; pulmonary ventilation; pulmonary circulation and non-respiratory functions; ventilation and perfusion; diffusion of respiratory gases; mechanical ventilation; carbon dioxide; oxygen and hemoglobin.
Offered: Every year, Fall
- ANE 537. Pulmonary Physiology II.** **2 Credits.**
 This course explores respiratory function in pregnancy; neonates and children; respiration during exercise and natural sleep; hypoxia and anemia; hyperoxia and oxygen toxicity; high altitude flying; effects of smoking; acute lung injury; lung transplantation; chronic hypoxia and anemia; ventilatory failure, airway disease; pulmonary vascular disease; parenchymal lung disease; acute lung injury; and artificial ventilation.
Offered: Every year, Spring
- ANE 538. Autonomic Nervous System Physiology and Pharmacology.** **2 Credits.**
 Topics include classical and new chemical neurotransmitters; presynaptic modulation and release of neurotransmitter theory; re-uptake and termination of neurotransmitters; action potentials and junction potentials; central autonomic control; peripheral autonomic nervous system; autonomic neuroeffector junction; autonomic neuromuscular transmission; dopaminergic neurotransmission and receptors; noradrenergic transmission and receptors; purinergic neurotransmission; acetylcholine and muscarinic receptors, acetylcholine and nicotinic receptors; acetylcholine esterase; amino acid, peptidergic and nitrergic neurotransmission; Cardiac and visceral afferents; autonomic control of airways; autonomic control of cardiac function; neurogenic control of blood vessels; autonomic control of cerebral circulation and the renal circulation.
Offered: Every year, Fall
- ANE 539. Renal Physiology.** **1 Credit.**
 This course covers basic renal processes, excretion of organic molecules, control of sodium and water excretion, regulation of extracellular volume and osmolarity, renal hemodynamics, and regulation of sodium, potassium and acid-base balance. Renal pathology includes diabetic nephropathy; interstitial nephritis; acute tubular necrosis; renal allograft rejection; and dialysis.
Offered: Every year, Spring
- ANE 540. General Pharmacology.** **3 Credits.**
 This course covers pharmacokinetics and pharmacodynamics, drug absorption, distribution, action and elimination, membrane transporters, pharmacogenetics, drug therapy, drug addiction and drug abuse, therapy of hypertension, pharmacotherapies of epilepsies, therapy of hypercholesterolemia and dyslipidemia, drug therapy of inflammation, chemotherapy of microbial diseases, drugs affecting gastrointestinal function, hormones and hormone antagonists including control of diabetes.
Offered: Every year, Spring
- ANE 544. Pharmacology for Anesthesia I.** **2 Credits.**
 In this course, emphasis is placed on drugs specifically related to the practice of anesthesia: inhaled anesthetics, local anesthetics, opioids, hypnotics and sedatives, anxiolytics, muscarinic agonists and antagonists, anticholinesterase, neuromuscular junction blockers, autonomic ganglia, adrenergic agonists and antagonists, serotonin agonists and antagonists.
Offered: Every year, Spring
- ANE 546. Pharmacology for Anesthesia II.** **2 Credits.**
 In this course, emphasis is placed on histamine antagonists, dopaminergic agonists, pharmacology of asthma, analgesic antipyretic agents, diuretics, vasopressin, renin and angiotensin, treatment of myocardial ischemia, pharmacotherapy of congestive heart failure, antidysrhythmics, calcium channel blockers, pharmacotherapy of diabetes, procoagulants and anticoagulants, thrombolytics and antiplatelet drugs, and antimicrobials.
Offered: Every year, Summer
- ANE 550. Anesthesia Delivery Systems.** **2 Credits.**
 This course presents an introduction to the anesthesia delivery system including gas distribution systems, anesthesia machines, breathing circuits, anesthesia ventilators, scavenging waste gases and monitoring pollution, and risk management, along with critical incidents in anesthesia and resuscitation equipment.
Offered: Every year, Summer
- ANE 554. Patient Monitoring.** **3 Credits.**
 This course covers the fundamental principles of measurement; measuring adequacy of perfusion, the principles, application and interpretation of various monitoring modalities including: ECG, invasive and noninvasive blood pressure, oximetry, temperature, cardiac output, respiratory gas analysis, monitoring the breathing circuit and the lungs. Additional topics include intraoperative neurophysiologic monitoring, renal function, coagulation/hemostasis and neuromuscular junction.
Offered: Every year, Fall
- ANE 556. Advanced Patient Monitoring and Anesthesia Delivery Systems.** **3 Credits.**
 This course covers advanced concepts of arterial pressure monitoring, ICP monitoring, transesophageal echocardiography, electric and radiation safety, and the hazards and complications of monitoring patients during anesthesia. Additional topics include examination of the newest generation of anesthesia delivery systems and evaluation of catastrophic failure modes, troubleshooting and resolving problems during anesthesia delivery, and discussion of advanced concepts of mechanical ventilation.
Offered: Every year, Summer

- ANE 560. Principles of Airway Management. 2 Credits.**
Students learn to recognize the difficult airway and have an opportunity to practice basic airway management techniques including pre-oxygenation, bag/mask ventilation, simple oral and nasal intubation techniques, oral and nasal airways, and application of laryngeal mask. The course involves scheduled time in the mock operating room to practice and become proficient at basic airway management skills. There is a mannequin-based practical exam in addition to an in-class final exam.
Offered: Every year, Summer
- ANE 563. Principles of Airway Management II. 2 Credits.**
The study of airway management continues with advanced techniques of airway management including fiber optic oral and nasal intubation, use of the retrograde wire, Combitube, light wands, placement of double lumen tubes and complications of endotracheal intubation. Students are required to spend time in the mock operating room becoming proficient at each technique. There is a mannequin-based practical exam in addition to an in-class final exam.
Offered: Every year, Fall
- ANE 563L. Principles of Airway Management II Lab. 0 Credits.**
Lab to accompany ANE 563.
Offered: Every year, Fall
- ANE 565. Advanced Airway Management. 1 Credit.**
Students learn management of the difficult airway, including identification of appropriate airway management techniques for the difficult pediatric and adult airway, review of the ASA Difficult Airway Algorithm, physiologic response to intubation and the surgical airway. Students are required to spend time in the mock operating room to develop the ability to assess the airway and apply the most appropriate technique to use for normal and difficult airways, including two additional back-up approaches. There is a mannequin-based simulation practical exam in addition to an in-class final exam.
Offered: Every year, Summer
- ANE 570. Anesthesia Principles and Practice I. 3 Credits.**
This is the first of a three-semester sequence of courses in which students are introduced to the clinical management of patients within the entire range of age and illness undergoing a wide spectrum of surgical procedures. Students learn to develop efficacious and safe anesthetic plans for medically diverse patients. Students are presented with unique issues from each type of patient, and learn how to modify a plan to accommodate these complexities. Students learn to identify specific concerns unique to each surgical subspecialty. The course consists of both didactic lectures and small group discussions, which focus on the specific needs of certain patient populations and the unique requirements they impose on the anesthesia team. The first segment includes anesthesia and co-morbidities for gastrointestinal surgery, gynecologic surgery, common orthopedic surgery, genitourinary surgery, ophthalmic surgery and otolaryngology surgery.
Offered: Every year, Fall
- ANE 570L. Anesthesia Principles and Practice I Lab. 0 Credits.**
Lab to accompany ANE 570.
Offered: Every year, Fall
- ANE 572. Anesthesia Principles and Practices II. 3 Credits.**
This course is a continuation of ANE 570 with cases of increasing complexity and additional comorbidities. Topics include anesthesia and comorbidities for plastic/reconstructive surgery, common pulmonary thoracic surgery, general surgery for endocrine diseases, major GI surgical procedures, complex orthopedic surgeries, renal disease and complex genitourinary surgery, vascular surgery, obstetric procedures, common pediatric surgeries and neonatal surgery.
Offered: Every year, Spring
- ANE 572L. Anesthesia Principles and Practices II Lab. 0 Credits.**
Lab to accompany ANE 572.
Offered: Every year, Spring
- ANE 574. Anesthesia Principles and Practices III. 3 Credits.**
This course is a continuation of ANE 572 with cases of increasing complexity and additional co-morbidities. Topics include anesthesia and co-morbidities for neurosurgery, cardiac surgery, complex neonatal and pediatric surgery, transplant surgery, pediatric cardiac surgery, trauma and complex orthopedic surgery, anesthesia outside of the operating room suite, managing burns and shock, anesthetic complications and practice-related issues.
Offered: Every year, Summer
- ANE 576. Regional Anesthesia I. 2 Credits.**
Through classroom lectures, students learn about the overall practice of regional anesthesia and how to determine when regional anesthesia is preferred over general anesthesia. Students gain an understanding of the anatomy specific for each type of regional block as well as techniques for establishing the block and the local anesthetics. Students learn and practice sterile techniques and placement of spinal and epidural blocks using the patient simulator. Management of the complications associated with these blocks is discussed. The course includes a skills lab, in which students are practice the techniques of neuraxial blockade to reinforce concepts taught in the lecture portion of the course. There is a practical final exam in addition to the in-class final exam.
Offered: Every year, Spring
- ANE 576L. Regional Anesthesia I Lab. 0 Credits.**
Lab to accompany ANE 576.
Offered: Every year, Spring
- ANE 577. Regional Anesthesia II. 2 Credits.**
Students gain an understanding of the use of ultrasound guidance and peripheral nerve stimulation for peripheral nerve blocks. They learn anatomy and surface landmarks and proper placement of local anesthetics for femoral, popliteal, ankle, sciatic, cervical plexus, recurrent laryngeal nerve and retrobulbar blocks. Effective management of complications arising from these blocks is presented. The course also includes a skills lab in which students practice the techniques of neural blockade to reinforce concepts taught in the lecture portion of the course. There is a practical final exam in addition to the in-class final exam.
Offered: Every year, Spring
- ANE 579. Pre-Anesthetic Evaluation. 2 Credits.**
This course covers techniques for examining patients in the process of the preoperative patient evaluation, gathering data by patient interviews and chart reviews, including basic ECG interpretation. It includes recording of relevant laboratory data as well as the summarization of preoperative consultations and special studies.
Offered: Every year, Summer

- ANE 585. Simulation for Assessment of Clinical Acumen. 1 Credit.**
Students are faced with various clinical scenarios, which are delivered through a mannequin, and work individually to appropriately assess and manage each situation.
Offered: Every year, Summer
- ANE 587. Intensive Clinical Practicum. 1-5 Credits.**
Students who are having difficulty with clinical skills or translating knowledge into clinical practice may be required to spend additional time outside of the normal course work in the operating room with a preceptor to develop skills and knowledge that are equivalent to other students in the program. This may include weekend, evening or vacation time.
Offered: Every year, All
- ANE 588. Individual Directed Study. 1-5 Credits.**
This course permits first-year students to study a particular problem or area of emphasis in anesthesiology that is not covered in-depth in the program curriculum, under the direction of a faculty member. This may be used for student research.
Offered: Every year, All
- ANE 589. Remedial Studies. 1-5 Credits.**
This course permits first-year students, under the direction of a faculty member, to enroll for review in an area of emphasis in anesthesiology in which the student is having difficulty.
Offered: Every year, All
- ANE 590. Clinical Anesthesia I. 2 Credits.**
During semesters two through four of the program, students develop knowledge and skills in delivering anesthesia and managing patients receiving anesthesia; in patient interviewing and physical examination; vascular access; and basic airway management. Clinical activity occurs at the end of each semester in the first year of the program. The knowledge and skills defined in the task progression must be mastered for each clinical rotation before the student may advance to the next clinical rotation. Each successive semester provides increasing responsibility and increased complexity for the student. Students are assigned to a single clinical site for the entire first year of the program. (45 hours/week for 4.5 weeks)
Offered: Every year, Fall
- ANE 592. Clinical Anesthesia II. 2 Credits.**
This is a continuation of ANE 590, the three-semester sequence of hospital-based clinical education and training. (45 hours/week for 5.5 weeks)
Offered: Every year, Spring
- ANE 594. Clinical Anesthesia III. 3 Credits.**
This is a continuation of ANE 592, and is the last semester of the three-semester clinical sequence. By the end of the semester IV, students should be able to deliver a safe anesthetic for an ASA physical status I patient with an uncomplicated airway. The student must be able to effectively participate as a member of the anesthesia care team in more difficult cases up to ASA physical Status III. (45 hours/week for 7.5 weeks)
Offered: Every year, Summer
- ANE 650. Second-Year Seminar I. 2 Credits.**
The course is based on a four-week clinical rotation cycle and is delivered in real-time by teleconference throughout the U.S. During the first week, students deliver a PowerPoint presentation on particular patient and procedure in whose care they participated. In week two, students present an article from the current anesthesia literature. In week three, students are given a patient scenario and asked to analyze the untoward outcome hazard or complication, and describe how the patient may be better managed from careful attention to monitoring, rapid detection of the abnormality, and treatment of the problem. In the final week, students deliver a presentation from the surgeon's perspective, including the patient's symptomology, the surgical procedure, the intraoperative issues and potential postoperative complications from the surgeon's and the anesthetic perspectives.
Offered: Every year, Fall
- ANE 652. Second-Year Seminar II. 2 Credits.**
The course is based on a four-week clinical rotation cycle and is delivered in real-time by teleconference throughout the U.S. During the first week, students deliver a PowerPoint presentation on a particular patient and procedure in whose care they participated. In week two, students present an article from the current anesthesia literature. In week three, students are given a patient scenario and asked to analyze the untoward outcome hazard or complication, and describe how the patient may be better managed from careful attention to monitoring, rapid detection of the abnormality, and treatment of the problem. In the final week, students deliver a presentation from the surgeon's perspective, including the patient's symptomology, the surgical procedure, the intraoperative issues and potential postoperative complications from the surgeon's and the anesthetic perspectives.
Offered: Every year, Spring
- ANE 654. Second-Year Seminar III. 2 Credits.**
The course is based on a four-week clinical rotation cycle and is delivered in real-time by teleconference throughout the U.S. During the first week, students deliver a PowerPoint presentation on a particular patient and procedure in whose care they participated. In week two, students present an article from the current anesthesia literature. In week three, students are given a patient scenario and asked to analyze the untoward outcome hazard or complication, and describe how the patient may be better managed from careful attention to monitoring, rapid detection of the abnormality, and treatment of the problem. In the final week, students deliver a presentation from the surgeon's perspective, including the patient's symptomology, the surgical procedure, the intraoperative issues and potential postoperative complications from the surgeon's and the anesthetic perspectives.
Offered: Every year, Summer
- ANE 670. Anesthesia Review I. 1 Credit.**
Students are required to read specific chapters in a nationally recognized authoritative textbook during their second-year clinical rotations, and are tested on the contents of those chapters at the end of each four-week rotation. Required reading is linked to specialty rotations and general rotations.
Offered: Every year, Fall
- ANE 672. Anesthesia Review II. 1 Credit.**
Students are required to read specific chapters in a nationally recognized authoritative textbook during their second-year clinical rotations and be tested on the contents of those chapters at the end of each four-week rotation. Required reading is linked to specialty rotations and general rotations.
Offered: Every year, Spring

ANE 674. Anesthesia Review III. 1 Credit.

Students are required to read specific chapters in a nationally recognized authoritative textbook during their second-year clinical rotations, and are tested on the contents of those chapters at the end of each four-week rotation. Required reading is linked to specialty rotations and general rotations.

Offered: Every year, Summer

ANE 687. Individual Clinical Practicum. 1-5 Credits.

This course permits students to enroll for review and participation in clinical areas where the student requires or requests additional clinical work. This may include general rotations or subspecialty rotations of clinical anesthesia.

Offered: Every year, All

ANE 688. Individual Directed Studies. 1-5 Credits.

This course permits students in their final year to study a particular problem or area of emphasis in anesthesiology that is not covered in-depth in the program curriculum, under the direction of a faculty member. This may be used for student research.

Offered: Every year, All

ANE 690. Clinical Anesthesia IV. 6 Credits.

During the second year (final 12 months) of the program, students are in the operating room full time. Clinical rotations are assigned in three- or four-week blocks. Rotations include open and laparoscopic surgery for: general surgery; orthopedic surgery; ophthalmology; genitourinary surgery; gynecology; ear, nose and throat; vascular surgery; thoracic surgery, trauma surgery and transplantation as well as anesthetizing sites outside of the operating room in radiology, the gastrointestinal lab and the electrophysiology lab. Students also have mandatory four-week rotations in recognized subspecialty areas of anesthesia: pediatrics; obstetrics; neurosurgery; and cardiac surgery. Clinical rotations are scheduled in both academic and private practice hospitals in many states across the country.

Offered: Every year, Fall

ANE 692. Clinical Anesthesia V. 6 Credits.

This course is a continuation of ANE 690. (45 hours/week for 15 weeks)

Offered: Every year, Spring

ANE 694. Clinical Anesthesia VI. 6 Credits.

This course is a continuation of ANE 692. (45 hours/week for 15 weeks)

Offered: Every year, Summer