

# PERFUSION (PR)

## PR 500. Theoretical Foundations of Cardiovascular Perfusion. 2 Credits.

This course exposes students to role expectations, practice, ethics and professionalism. Students gain an appreciation of the history of key individuals and progress through discoveries that influenced the development of current practice in cardiothoracic surgery and extracorporeal circulation. Students become familiar with the role of organizations that impact their field, including those responsible for overseeing national certification exams and continuing education programs. A minimum grade of B is required to progress.

**Prerequisites:** None

**Offered:** Every year, Fall

## PR 502. Systems Anatomy and Physiology I. 3 Credits.

This course examines selected organ systems 503 procedures performed by the perfusionist. Students study the structure and function of the cardiovascular, lymphatic, immune and pulmonary systems. Emphasis is placed on group discussion and the application of knowledge to solving problems that arise in clinical situations. A minimum grade of B is required to progress.

**Prerequisites:** None

**Offered:** Every year, Fall

## PR 503. Systems Anatomy and Physiology II. 3 Credits.

This course examines selected organ systems pertinent to cardiopulmonary bypass and related procedures performed by the perfusionist. Students study the structure and function of the nervous, hepatic, renal and endocrine systems. Emphasis is placed on group discussion and application of knowledge to solving problems that arise in clinical situations. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 500, PR 502, PR 504, PR 508, PR 516.

**Offered:** Every year, Spring

## PR 504. Pathophysiology for Cardiovascular Perfu. 4 Credits.

A comprehensive introduction to diseases of the cardiovascular system. Integrating pathophysiology with patient care in the clinical setting, this course will emphasize the mechanisms by which cardiac illnesses develop. Coverage will include atherosclerosis, ischemic heart disease, valvular heart disease, heart failure and cardiomyopathies, cardiac arrhythmias, diseases of the peripheral vasculature and congenital heart disease.

**Prerequisites:** None

**Offered:** Every year, Fall

## PR 506. Pharmacologic Intervention in Cardiovascular Perfusion. 4 Credits.

This course is an intensive study of pharmacokinetics, pharmacodynamics, mechanism of action, indications and contraindication of drugs administered to the patient undergoing cardiopulmonary bypass. Cardiovascular drugs, anticoagulants and anesthetic agents administered by the perfusionist are emphasized. Students also become familiar with many drugs used to treat other disease states that may be taken by patients with significant comorbidities. A minimum grade of B- is required to progress.

**Prerequisites:** Take PR 500, PR 502, PR 504, PR 508, PR 516.

**Offered:** Every year, Spring

## PR 508. Extracorporeal Circuitry and Laboratory I. 1 Credit.

Students receive orientation in both the laboratory and the cardiac operating room to equipment operation and techniques applicable to providing extracorporeal circulation during cardiac surgical procedures. Emphasis is placed on developing student skills in researching best practice methods as found in the medical literature. Competent operation of equipment, including the heart lung machine, ventricular assist devices, intra-aortic balloon counterpulsation pump, and autologous blood recovery devices must be demonstrated. A minimum grade of B is required to progress.

**Prerequisites:** None

**Offered:** Every year, Fall

## PR 509. Extracorporeal Circuitry and Lab II. 1 Credit.

This intensive study of the appropriate procedures for providing extracorporeal circulation for a variety of purposes includes operation of specialized medical devices, quality control and troubleshooting techniques. Intra-aortic balloon counterpulsation, autologous blood recovery and ventricular assist devices are covered. Students are expected to search recent medical publications and generate discussion in an attempt to resolve controversial issues pertaining to best practice. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 500, PR 502, PR 504, PR 508, PR 516.

**Offered:** Every year, Spring

## PR 510. Surgical Techniques. 2 Credits.

This course examines the cardiothoracic surgical procedures that require extracorporeal circulatory support. Students develop an understanding of the techniques used in numerous open-heart procedures performed on adults and children. Special application of extracorporeal circulation in rare surgical procedures is included. Students are required to view a number of these procedures in the operating rooms of affiliated institutions to increase their understanding of the skills required to perform these operations. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 500, PR 502, PR 504, PR 508, PR 516.

**Offered:** Every year, Spring

## PR 512. Pediatric Perfusion. 4 Credits.

This course presents a study of the embryological formation of the cardiopulmonary system, a description of congenital cardiopulmonary anomalies and the application of perfusion techniques during corrective surgical procedures. Students work both independently and in groups to evaluate the results of clinical studies that contribute to current thinking and practice in the specialized area of pediatric perfusion. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 500, PR 502, PA 535, PR 508, PR 516.

**Offered:** Every year, Spring

## PR 514. Special Topics in Cardiovascular Perfusion. 2 Credits.

This course explores less common and newly introduced procedures for perfusionists, including the use of investigational drugs that modify the biochemical impact of adult and infant extracorporeal membrane oxygenation, extracorporeal carbon dioxide removal, total artificial hearts and newly introduced ventricular assist devices. Old standards of practice are reexamined in the light of new evidence. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 503, PR 506, PR 509, PR 510, PR 512.

**Offered:** Every year, Spring

**PR 516. Physiologic Monitoring.****4 Credits.**

This course covers monitoring of the physiological impact of extracorporeal circulation, administration of drugs, blood products and anesthetic agents on the patient undergoing surgery requiring cardiopulmonary bypass. Monitoring of intravascular arterial and venous pressures in the systemic and pulmonary circulations, cardiac output measurement are covered. An emphasis is placed on 12-lead electrocardiogram, blood anticoagulation measurement, analysis and interpretation of arterial and venous blood gases, fluid and electrolyte balance and cerebral oxygen saturation. After mastering the basic concepts of each section, students work through case-study scenarios to apply theory to practice. Electronic simulators are used. A minimum grade of B is required to progress.

**Prerequisites:** None**Offered:** Every year, Fall**PR 520. Research Methods in Cardiovascular Perfusion.****2 Credits.**

This course explores ethical issues in medical research, provides an overview of grant proposal writing and includes development of a research project, data collection and analysis using statistical programs for computers. Students develop a presentation and employ various computer presentation techniques to present student project data. Students work individually on the project and require the approval of the instructor to pursue a particular topic. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 503, PR 506, PR 509, PR 510, PR 528.**Offered:** Every year, Summer**PR 522. Research Methods in CV Perfusion II.****2 Credits.**

This course is a continuation of PR 520. It provides the perfusion student with an introduction to current areas of research being conducted in the open-heart field, scientific principles of experimental design and analysis and methods of reporting results to the scientific community. This course enables students to complete the collection/analysis of data that was begun in PR 520, prepare the final written report and present the results of the research project to the perfusion community. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 520.**Offered:** Every year, Fall**PR 526. Mechanical Circulatory Support.****4 Credits.**

This course will expose students in the Cardiovascular Perfusion Program to mechanical circulatory support devices such as ventricular assist devices (short and long term implantation), newborn, pediatric and adult extracorporeal membrane oxygenation (ECMO) including techniques of support using veno-veno, and veno-arterial extracorporeal life support. Students will learn both the theory and application of these life support techniques.

**Prerequisites:** Take PR 500 PR 508 PR 516.**Offered:** Every year, Spring**PR 528. Congenital Defects and Clinical Practice.****2 Credits.**

This course is a study of the management of cardiopulmonary bypass in neonates, infants and children. The course includes a description of the embryological development of the human fetus, focusing on the development of the cardiovascular system. The pathophysiology of congenital heart disease and the surgical techniques for repair of those lesions are presented, stressing both physiologic considerations for the perfusion of the neonatal and pediatric patient as well as related specific perfusion techniques.

**Prerequisites:** Take PR 500 PR 502 PR 516.**Offered:** Every year, Spring**PR 600. Clinical Practicum I.****5 Credits.**

This course provides experience in the areas of heart-lung bypass for adult, pediatric and infants, including long-term supportive extracorporeal circulation, adjunctive techniques and patient monitoring. Students focus on hypothermia, pulsatile devices, and monitor hemodynamics, blood gases, bubble detection, level sensing, temperature, electrophysiology, coagulation potential and fluid electrolytes. Special applications also are covered. Students must successfully complete a sufficient variety and number of perfusions to satisfy recommendations of the American Board of Cardiovascular Perfusion. Students meet as a group every six weeks, and individually present a patient case study at grand rounds. A minimum grade of B is required to pass.

**Prerequisites:** Take PR 503, PR 506, PR 509, PR 510, PR 528.**Offered:** Every year, Summer**PR 602. Clinical Practicum II.****5 Credits.**

This course provides experience in the areas of heart-lung bypass for adult, pediatric and infants, including long-term supportive extracorporeal circulation, adjunctive techniques and patient monitoring. Students focus on hypothermia, pulsatile devices and monitor hemodynamics, blood gases, bubble detection, level sensing, temperature, electrophysiology, coagulation potential and fluid electrolytes. Special applications also are covered. Students must successfully complete a sufficient variety and number of perfusions to satisfy recommendations of the American Board of Cardiovascular Perfusion. Students meet as a group every six weeks, and individually present a patient case study at grand rounds. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 600.**Offered:** Every year, Fall**PR 604. Clinical Practicum III.****5 Credits.**

This course provides experience in the areas of heart-lung bypass for adult, pediatric and infants, including long-term supportive extracorporeal circulation, adjunctive techniques and patient monitoring. Students focus on hypothermia, pulsatile perfusion devices and monitor hemodynamics, blood gases, bubble detection, level sensing, temperature, electrophysiology, coagulation potential and fluid electrolytes. Special applications also are covered. Students must successfully complete a sufficient variety and number of perfusions to satisfy recommendations of the American Board of Cardiovascular Perfusion. A final comprehensive exam covering all aspects of the program and clinical practice is taken at the end of this course. A successful performance on the examination is required to complete the program. A minimum grade of B is required to progress.

**Prerequisites:** Take PR 602.**Offered:** Every year, Spring