

Course Schedule Perfusion Track

At least 30 hours of graduate work of which 15 must be in the major field is required. Courses must include: Biochemistry BIOC 462a,b or equivalent; Pharm. Basis of Therp. PHCL 501; Prin. Perf. Tech. I PHCL 670; Perf. Tech. Lab PHCL 671; Prin. Perf. Tech. II PHCL 672; Perf. Preceptorship PHCL 691L; Prin. of Pharmacology PHCL 620; Physiology PSIO 580; Biostatistics FCM 576; Research PHCL 900; Student Seminar PHCL 696a.

FALL - FIRST YEAR

<u>Course</u>	<u>Units</u>
Biochemistry, BIOC 462a	3
Prin. Pharmacology, PHCL 620	3
Prin. Perf. Tech. I, PHCL 670	3
Perf. Tech. Lab, PHCL 671	1
Perf. Preceptorship, PHCL 691L	3
Total	<u>13</u>

SPRING - FIRST YEAR

<u>Course</u>	<u>Units</u>
Biochemistry, BIOC 462b	3
System Physiology, PSIO 580	5
Student Seminar, PHCL 696a	1
Prin. Perf. Tech. II, PHCL 672	2
Perf. Preceptorship, PHCL 691L	3
Total	<u>14</u>

SUMMER I - FIRST YEAR

<u>Course</u>	<u>Units</u>
Perf. Preceptorship, PHCL 691L	1
Research, PHCL 900	1
Total	<u>2</u>

SUMMER II - FIRST YEAR

<u>Course</u>	<u>Units</u>
Perf. Preceptorship, PHCL 691L	1
Research, PHCL 900	1
Total	<u>2</u>

FALL - SECOND YEAR

<u>Course</u>	<u>Units</u>
Biostatistics, FCM 576	3
Perf. Preceptorship, PHCL 691L	3
Thesis, PHCL 910	3
Elective	3
Total	<u>12</u>

SPRING - SECOND YEAR

<u>Course</u>	<u>Units</u>
Pharm. Basis of Therp., PHCL 501	6
Perf. Preceptorship, PHCL 691L	3
Student Seminar, PHCL 696a	1
Thesis, PHCL 910	2
Total	<u>12</u>

SUMMER I - SECOND YEAR

<u>Course</u>	<u>Units</u>
Perf. Preceptorship, PHCL 691L	1
Research, PHCL 900	1
Total	<u>2</u>

SUMMER II - SECOND YEAR

<u>Course</u>	<u>Units</u>
Perf. Preceptorship, PHCL 691L	1
Research, PHCL 900	1
Total	<u>2</u>

Clinical Perfusion Preceptorship 691L includes a colloquium which meets once per week throughout the year

Satisfactory completion of the Circulatory Sciences Program requires successful completion of all requirements (didactic, research, and clinical) of this dual track program. It is understood that some students may require greater than 24 months for the completion of all aspects of the program.

PRINCIPLES OF PERFUSION TECHNOLOGY I

Description: An introduction to the components of the extracorporeal circuit. Each component will be examined in terms of design, function, and rational for use. Topics of discussion will include blood propelling devices, gas and heat transfer principles, perfusion pharmacology, filtration, rheology, biological materials, adult vs. pediatric perfusion techniques, hematology, monitoring systems, and perfusion safety.

Credit 3.

TEXT: Techniques in Extracorporeal Circulation Ionescu

Cardiopulmonary Perfusion
Charles Reed

OBJECTIVES:

- To understand the design and function of the perfusion systems available for clinical use.
- To understand the pharmacological rational of drugs used during extracorporeal circulation.
- To understand the physiology and pathophysiology of extracorpeal circulation.
- To understand basic principles of electronics and monitoring systems.
- To understand perfusion safety.

GRADE:

6 Exams	60%
Report	10%
Comprehensive Final	30%

PRINCIPLES OF PERFUSION TECHNOLOGY II

Description: An indepth study of perfusion systems. The topics of discussion include: extracorporeal life support, artificial heart systems, ventricular assist devices, intra-aortic balloon pump, pulsatile perfusion techniques, hemoconcentration, autotransfusion, circulatory arrest, and safety.

Credit 2

TEXT:

Literature

Pathophysiology and Techniques of
Cardiopulmonary Bypass
Vol. I & II
By Joe Utley

Heart-Lung Bypass
By Pierre M. Galletti

OBJECTIVES:

To understand related perfusion techniques and understand when and how the procedures are to be used.

To understand the pharmacological support required for these systems.

To understand how to deal with the various types of pump catastrophies related to these systems.

To understand the physiology related to these systems.

GRADE:

4 Exams	60%
Report	10%
Comprehensive Final	30%

DISCUSSION TOPICS

Pump Systems

- Mechanical pumps
- Gas exchange - human and mechanical
- Principles of heat exchange
- Oxygenator systems; bubbler, membrane, fiber
- Circuits and perfusion techniques
- Primes; hemodilution, blood components
- Filtration

Perfusion Pharmacology

- Anti-coagulation
- Anesthetics for cardiac surgery
- Inotropes
- Diuretics
- Vasoactive drugs
- Electrolyte management
- Anti-arrhythmics

Perfusion Physiology/Pathophysiology

- Rheology
- Endocrine response
- Coagulation system
- Hematology
- Central nervous system, hepatic, renal, pulmonary
- Immune and reticuloendothelial systems

Myocardial Preservation

- Subendocardial perfusion
- Temperature
- Fibrillation
- pH - buffer
- Substrate
- Membrane stabilization
- Osmolarity/oncoticity

Electronics

- Basic electronics
- Pressure monitoring
- ECG
- Blood flow measuring systems

Safety

- Check lists
- Electronic
- Low level detection systems
- Air detection systems
- Catastrophic event management

PERFUSION TECHNIQUES LABORATORY I

Description: The study of the extracorporeal circuit and the application of basic perfusion techniques in a controlled laboratory environment. In vitro and in vivo experimental systems will be utilized. Topics to be studied in the laboratory will parallel those discussed in Principles of Perfusion Technology I plus a detailed study of cardiac surgical procedures.

Credit 1

Ojective: To understand and apply the principles and technics presented in the lecture.

GRADE:	Reports	90%
	Instructor	10%

CLINICAL PERFUSION ROTATION I

Description: The integration of the didactic experience with the practical operating room setting. All clinical activities will be conducted under the direct supervision of a certified perfusionist. The topics that will be emphasized include; sterile technique, understanding patient pathophysiology, conduct of perfusion, safety, and record keeping.

Credit 3

OBJECTIVES: At the completion of this rotation the student will be able to perform the following functions:

Manage pressure monitoring

Demonstrate a thorough knowledge of sterile technique

Carry out pre-operative evaluations

Prepare extracorporeal circuit

Smoothly initiate and terminate bypass

Manage the respiratory status

Manage the metabolic status

Manage the hemodynamic status

Perform post-bypass follow up

DISCUSSION TOPICS

Pulsatile vs. non-pulsatile blood flow
microcirculation
endocrine response
CNS perfusion

Artificial heart systems (CardioWest, Novacor)
external/internal
drivers
biological materials
ventricles
pharmacological support
safety

Ventricular Assist Devices (VAD)
single
dual
pharmacological support
safety

Intra-aortic balloon pump
insertion
synchronization
pharmacological management
complications
safety

Hemoconcentration
integration into extracorporeal system

Autotransfusion
anti-coagulation
filtration

Circulatory arrest techniques
Thoracic aortic aneurysm
Pediatric cardiac surgery

PERFUSION TECHNIQUES COLLOQUIM I

Description: Discussions will be related to specialized perfusion topics. The topics will be related to adjunctive perfusion techniques and issues, including; perfusion of the pregnant patient, total body washout, hypothermic resuscitation, isolated limb perfusion, organ perfusion, hemodialysis, retrograde coronary perfusion, perfusion immunology, organ preservation, and portable CPB systems.

Credit 1

OBJECTIVES: To develop an understanding of specialized perfusion techniques that are not commonly performed on a daily basis.

To build a bibliography of these specialized procedures.

GRADE:	Written report	40%
	Final exam	60%

PERFUSION TECHNIQUES COLLOQUIM II

Description: The course will focus on the safety and legal aspects of clinical perfusion. Topics for discussion will include; perfusion safety systems, a detailed examination of catastrophic event management, medical/legal issues, and professional ethics.

Credit 1

OBJECTIVES: To develop a comprehensive systems check list

To develop a detailed understanding of how to deal with extracorporeal related catastrophic events

To develop the understanding of medical/legal issues related to extracorporeal management.

To develop the understanding of professional ethics related to life and death patient issues.

GRADES:	Written report	60%
	Final exam	40%