**School of Health Professions**

| **PROFESSOR:** |  |
| --- | --- |
| **OFFICE LOCATION:** |  |
| **OFFICE HOURS:** |  |
| **PHONE NUMBER:** |  |
| **E-MAIL:** |  |
| **SEMESTER:** |  |
| **DELIVERY METHOD:** |  |

**I. COURSE NUMBER AND TITLE, CATALOG DESCRIPTION, CREDITS:**

**CVT 2421 INVASIVE CARDIOLOGY II (3 CREDITS)**

This course is designed to tie together cardiac disease processes with diagnostic and interventional cardiac catheterization procedures. Students will be presented with classifications, equipment, and techniques used in invasive cardiology. The course offers an in-depth presentation of various cardiac diseases including coronary artery disease, angina, myocardial infarction, heart failure, valve diseases, cardiomyopathies, pericardial disorders, arrhythmias, and congenital anomalies, and repair procedures. Additionally, students learn the various calculations performed in the catheterization lab including cardiac outputs, vascular resistance, valve areas, and shunts.

**II. PREREQUISITES FOR THIS COURSE:**

CVT 2420 and CVT 2805

**CO-REQUISITES FOR THIS COURSE:**

CVT 2205 and CVT 2840L

**III. GENERAL COURSE INFORMATION:**

Topic Outline:

* Acquired and congenital cardiac diseases
* Cardiac catheterization lab hemodynamic calculations
* Cardiac catheterization lab pharmacology and drug calculations
* Percutaneous coronary interventional procedures
* Cardiac pacemakers and implantable cardioverter defibrillators (ICD’s)
* Electrophysiology studies

**IV. ALL COURSES AT FLORIDA SOUTHWESTERN STATE COLLEGE CONTRIBUTE TO THE GENERAL EDUCATION PROGRAM BY MEETING ONE OR MORE OF THE FOLLOWING GENERAL EDUCATION COMPETENCIES:**

**C**ommunicate clearly in a variety of modes and media.

**R**esearch and examine academic and non-academic information, resources, and evidence.

**E**valuate and utilize mathematical principles, technology, scientific and quantitative data.

**A**nalyze and create individual and collaborative works of art, literature, and performance.

**T**hink critically about questions to yield meaning and value.

**I**nvestigate and engage in the transdisciplinary applications of research, learning, and knowledge. **V**isualize and engage the world from different historical, social, religious, and cultural approaches. **E**ngage meanings of active citizenship in one’s community, nation, and the world.

**A. General Education Competencies and Course Outcomes**

1. Listed here are the course outcomes/objectives assessed in this course which play an integral part in contributing to the student’s general education along with the general education competency it supports.

General Education Competency: **Think**

Course Outcomes or Objectives Supporting the General Education Competency Selected:

* Differentiate the major acquired cardiac disease processes.
* Discuss the general description, etiology, pathogenesis, clinical manifestations and treatments of each of the diseases presented.

2. Listed here are the course outcomes/objectives assessed in this course which play a supplemental role in contributing to the student’s general education along with the general education competency it supports.

General Education Competency: Evaluate

Course Outcomes or Objectives Supporting the General Education Competency Selected:

* Students will be able to perform, by hand, the typical hemodynamic calculations normally done in the cardiac catheterization laboratory by the physiologic monitoring computer.

**B. Other Course Objectives/Standards**

* **The student will be able to discuss, compare, and contrast the general description, etiology, pathogenesis, and clinical manifestations, including patient presentation; EKG, stress, and cardiac catheterization findings, detailed hemodynamic and angiographic findings, laboratory values, etc.; and treatments of the following cardiac diseases:**

A) Coronary artery disease

1) Atherosclerosis

2) Thrombus formation

3) Restenosis after angioplasty and interventions

B) Stable angina

C) Unstable angina

D) Prinzmetal’s or variant angina

E) Acute Coronary Syndrome, Acute myocardial infarction (UA/NSTEMI, STEMI) F) Right side heart failure

G) Left side heart failure

H) Dilated cardiomyopathy

I) Hypertrophic cardiomyopathy with and without obstruction

J) Restrictive cardiomyopathy

K) Myocarditis

L) Endocarditis

M) Pericarditis

N) Pericardial disorders and effusion

O) Constrictive pericarditis

P) Cardiac tamponade

Q) Aortic stenosis and insufficiency

R) Mitral stenosis and insufficiency

S) Pulmonary stenosis and insufficiency

T) Tricuspid stenosis and insufficiency

U) Various congenital anomalies

1) Patient ductus arteriosis

2) Atrial septal defect

3) Ventricular septal defect

4) Trunctus arteriosis

5) Bicuspid aortic valve

6) Coarctation of the aorta

7) Tetralogy of fallot

8) Transposition of the great vessels

9) Tricuspid atresia

10) Anomalous venous return

11) Kawasaki’s disease

12) Ebstein’s anomaly

V) Aortic dissection and aneurism

* **The student will be able to perform the following calculations, know the normal values, and describe the implications and treatments for abnormal values.**

1. Mean Arterial Pressure
2. Cardiac output: a) Fick, b) thermodilution, c) angiography, d) green dye
3. Cardiac index
4. Ejection fraction
5. Regurgitated fractions
6. Systemic and pulmonary vascular resistance
7. Systolic ejection period, diastolic filling period
8. Valve area calculations (Gorlin and Hakki formulas)
9. Shunts: Right to Left and Left to Right
10. Systemic blood flow, SBF, Pulmonary blood flow PBF
11. Shunt Ratio Qp:Qs
12. Percent shunt
13. Absolute shunt

* **The student will demonstrate an advanced knowledge of the common cardiac medications and I.V. therapy including discussing the indications, contraindications, actions, risks, benefits, dosages of the medications listed, and drug calculations.**
* **The student will demonstrate knowledge of the indications, coding, set-up, trouble shooting of cardiac pacemakers and automatic implantable cardioverter defibrillators (ICD’s).**
* **The student will demonstrate knowledge of indications, risks, benefits, equipment utilized and data obtained in an electrophysiology study.**

PERFORMANCE OBJECTIVES

These performance objectives are designed to measure individual student competency in the concepts and skills associated with lecture, laboratory and clinical components of Cardiac Catheterization. All competencies must be successfully completed prior to graduation. Objectives/Competencies will be evaluated by written quizzes and/or examinations and/or class participation/review utilizing polling/clicker devices and/or demonstration in a laboratory/clinical environment.

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**CORONARY ARTERY DISEASE**

* Describe the determinants of myocardial oxygen supply and demand
* Describe the sequela of myocardial oxygen supply and demand mismatch
* Describe the process of atheroscorosis
* Describe the process of restenosis after coronary interventional procedures
* Describe the sequela of thrombus formation and coronary artery obstruction by a thrombus ∙ Describe the sequela of coronary artery spasm
* Differentiate between stable, unstable, and variant (prinzmetals) angina
* Describe the etiology, pathogenesis, clinical manifestations, and treatment of the three types of angina listed above
* Describe the etiology, pathogenesis, clinical manifestations, and treatment of acute coronary syndrome, acute myocardial infarction including UA/NSTEMI, STEMI
* Describe the physical examination findings including chest pains, ECG, enzyme, laboratory results, etc., of stable, unstable, and variant angina and ACS acute myocardial infarction
* Describe the effects of aspirin, thrombolytics, beta blockers, calcium channel blockers, nitrates, morphine, platelet inhibitors, lifestyle modifications, and interventional procedures on the three types of angina and ACS, acute myocardial infarction
* Describe an ergonovine challenge and its significance

**CONGESTIVE HEART FAILURE**

* Define the syndrome of congestive heart failure
* Describe how the human body compensates for decreases in cardiac output and blood pressure common in congestive heart failure
* Describe the negative consequences of the normal bodies compensation on CHF
* Differentiate between left side heart failure and right-side heart failure with respect to its etiologies, pathogenesis, clinical findings, including hemodynamic and physical exam findings and treatments ∙ Describe the role of oxygen, digitalis, diuretics, beta blockers and ACE inhibitors in CHF

**CARDIOMYOPATHY**

* Define cardiomyopathy
* Differentiate between dilated cardiomyopathy, restrictive cardiomyopathy, hypertrophic cardiomyopathy with and without obstruction with respect to their etiologies, pathogenesis, clinical manifestations including hemodynamic findings and treatments
* Explain the significance of a sub-valvular gradient
* Explain the significance of a positive Brockenbrough Braunwald sign
* Explain the significance of an M or W pattern on an atria or pulmonary capillary wedge pressure wave form. Explain the significance of a square root or dip and plateau sign in a ventricular wave form

**PERICARDIAL DISORDERS**

* Explain the structure and function of the pericardium and pericardial fluid
* Differentiate between acute pericarditis, constrictive pericarditis, pericardial effusion, and cardiac tamponade with respect to their etiologies, pathogenesis, clinical manifestations, hemodynamic findings and treatments ∙ Differentiate between restrictive cardiomyopathy and constrictive pericarditis
* Explain the significance of an M or W pattern on an atria or pulmonary capillary wedge pressure wave form. Explain the significance of a square root or dip and plateau sign in a ventricular wave form ∙ Describe the hemodynamic findings of cardiac tamponade and constrictive pericarditis ∙ Describe the procedures for pericardiocentesis

**VALVULAR DISORDERS**

* Describe the structure, size, and function of the tricuspid, pulmonic, mitral, and aortic valves ∙ Differentiate between stenotic and insufficient valves with respect to their effects on the heart and vessels ∙ Describe the etiology, pathogenesis, clinical manifestations, hemodynamic findings, murmurs, and treatments
* of aortic stenosis, aortic insufficiency, mitral stenosis, mitral insufficiency, pulmonic stenosis, pulmonic insufficiency, tricuspid stenosis, and tricuspid insufficiency
* Describe the specific hemodynamic pressure gradients and wave form abnormalities associated with the above listed valvular disorders
* Define critical stenosis of the mitral and aortic valves
* ∙Identify and differentiate between various artificial valves

**VALVULAR CALCULATIONS**

* + - Describe the hemodynamic gradients found with stenotic valves
    - Describe the process of “retracing”, or “phase shifting” valve gradients to compensate for the delay in some pressure wave forms
    - Define, identify, and measure the systolic ejection period (SEP)
    - Define, identify, and measure the diastolic filling period (DFP)
    - Calculate mitral and aortic valvular areas utilizing the Gorlin formula
    - Calculate mitral and aortic valve areas using the Hakki (shortcut) formula

**ELECTROPHYSIOLOGY**

* + - Describe the indications, risks, and benefits of an electrophysiology study
    - Describe the catheters utilized and the process of an electrophysiology study
    - Explain the characteristics of intracardiac electrograms including high right atrial, HIS bundle, right ventricular apex, coronary sinus
    - Describe the A, H, V deflections and normal and abnormal A-H and H-V intervals of a HIS bundle electrocardiogram
    - Explain the pathophysiology of re-entry tachyarrhythmias
* Describe and differentiate between orthodromic, antidromic, and reciprocating AV nodal re-entry tachyarrhythmias and Wolff-Parkinson-White syndrome
* Describe the indications, procedures, and risks of radio frequency ablation

**PACEMAKERS**

* Describe the indications, risks, and benefits of pacemaker implantation
* Explain the 3 and 5 letter code for pacemakers (example: VVI, DDD, DDDR)
* Describe a typical pacemaker insertion
* Describe how to “set up” a pacemaker
* Define capture, threshold, and sensitivity
* Differentiate between temporary and permanent pacemakers and unipolar and bipolar leads

**CARDIAC CATH LAB CALCULATIONS**

* + - Measure, calculate and evaluate the following calculations and describe their significance:
      * Mean arterial pressure
      * Systemic vascular resistance
      * Pulmonary vascular resistance
      * Total pulmonary resistance
      * Ejection fraction
      * Regurgitant fraction
    - Differentiate between Fick, angiographic, thermodilution, and green dye cardiac output measurements ∙ Calculate cardiac output using the Fick and angiographic methods

**PHARMACOLOGY**

* Demonstrate retention of previously instructed pharmacology concepts in CVT 1200 and CVT2420 ∙ Describe, discuss, and demonstrate knowledge of IV access and IV equipment:
* uses of IV equipment
* aseptically drawing up medications
* aseptically drawing up medication onto sterile field
* IV cannulation techniques
* basic principles of IV therapy
* veins commonly used for IV cannulation
* advantages and disadvantages of various IV cannulation sites
* troubleshoot IV Equipment
* assess an IV site
* Demonstrate calculating medication dosages:
* abbreviations used in medication orders
* conversion between unit systems
* calculate dosages
* calculate IV concentrations
* mixture of IV medications
* calculate IV drip rates
* standard types of IV equipment
* Describe and demonstrate Advanced Cardiac Life Support (ACLS) procedures:
* personal responsibilities in a cardiac arrest
* when and how to call a code (site specific)
* the code team and their responsibilities
* management of a cardiac arrest
* intubation and oxygenation
* IV lines
* precordial thump
* defibrillation
* cough CPR
* correction of acidosis
* Demonstrate the following ACLS algorithms:
* ventricular fibrillation-monitored
* ventricular fibrillation-unmonitored
* ventricular tachycardia-conscious with pulse
* ventricular tachycardia-unconscious with pulse
* ventricular tachycardia-unconscious-without a pulse
* bradycardia

**INTERVENTIONAL CARDIAC CATHETERIZATION TECHNIQUES**

* Describe and discuss Percutaneous Transluminal Coronary Angioplasty (PTCA), Percutaneous Coronary Intervention (PCI):
* history of PTCA/PCI and technological improvements
* current techniques in PTCA/PCI
* indications and contraindications for PTCA/PCI
* risks and complications of PTCA/PCI
* Explain the purpose, sizing, structure, and techniques of equipment used in PTCA/PCI including:
* Guiding catheters
* balloon catheters and balloon materials
* stents
* guide wires
* steering devices
* indeflators
* techniques of PTCA/PCI
* set up the back table with the correct equipment for PCI
* demonstrate proper use of the equipment for PCI
* demonstrate balloon and stent prepping techniques
* discuss medications used in PCI
* newer techniques of treatment
* peripheral angioplasty
* rotational atherectomy (rotablator)
* directional coronary atherectomy (DCA)
* transluminal extraction catheter (TEC)
* intra coronary stenting
* indications for stenting
* complications of stenting
* stent designs
* in restenosis
* drug eluting stents
* Describe Valvuloplasty:
* techniques
* indications
* expected results
* balloon septostomy

**CONGENITAL HEART DISEASE**

* Describe the growth of the fetal heart starting with the heart tubes to the fully developed heart ∙ Describe the formation of the intra-atrial septum and the intraventricular septum
* Describe fetal circulation
* Describe the circulatory changes that occur at birth
* Identify normal vital signs and hemodynamic values for the newborn
* Describe the pathogenesis, clinical manifestations, hemodynamic findings, and treatments of the following congenital anomalies:
* Patent ductus arteriosus
* Ventricular septal defect
* Truncus arteriosus
* Sub-aortic stenosis
* Coarctation of the aorta
* Tetralogy of fallot
* Complete transposition of the great vessels
* Atrial septal defect
* Tricuspid atresia
* Anomalous venous return
* Ebstein’s anomaly
* Kawasaki’s syndrome
* Describe the following palliative and corrective surgical procedures:
* Blalock Taussig shunt
* Glen anastomosis – unidirectional and bidirectional
* Watterson – Cooley shunt
* Potts shunt
* Rashkind procedure
* Mustard procedure
* Arterial switch or Janteen procedure
* Fontan procedure
* Rastelli repair
* Pulmonary artery banding

**SHUNT CALCULATIONS**

* Describe the process of a saturation run in the cardiac catheterization lab
* Describe methods of determining mixed venous saturation and content in patients with shunts
* Differentiate between right to left, left to right, and bi-directional shunts
* Using saturations, calculate the percent shunt and shunt ratio
* Using oxygen content, calculate systemic blood flow (SBF), pulmonary blood flow (PBF), absolute shunt, percent shunt, and shunt ratio
* Differentiate mild, moderate, and severe shunts

**V. DISTRICT-WIDE POLICIES:**

**PROGRAMS FOR STUDENTS WITH DISABILITIES**

Florida SouthWestern State College, in accordance with the Americans with Disabilities Act and the College’s guiding principles, offers students with documented disabilities programs to equalize access to the educational process. Students needing to request an accommodation in this class due to a disability, or who suspect that their academic performance is affected by a disability should contact the Office of Adaptive Services at the nearest campus. The office locations and telephone numbers for the Office of Adaptive Services at each campus can be found at http://www.fsw.edu/adaptiveservices.

**REPORTING TITLE IX VIOLATIONS**

Florida SouthWestern State College, in accordance with Title IX and the Violence Against Women Act, has established a set of procedures for reporting and investigating Title IX violations including sexual misconduct. Students who need to report an incident or need to receive support regarding an incident should contact the Equity Officer at equity@fsw.edu. Incoming students are encouraged to participate in the Sexual Violence Prevention training offered online. Additional information and resources can be found on the College’s website at <http://www.fsw.edu/sexualassault>.

1. **REQUIREMENTS FOR THE STUDENTS:**

List specific course assessments such as class participation, tests, homework assignments, make-up procedures, etc.

1. **ATTENDANCE POLICY:**

The professor’s specific policy concerning absence. (The College policy on attendance is in the Catalog and defers to the professor.)

1. **GRADING POLICY:**

Include numerical ranges for letter grades; the following is a range commonly used by many faculty:

| **Grade Percent** | **Letter Grade** |
| --- | --- |
| 90 - 100 | A |
| 80 - 89 | B |
| 70 - 79 | C |
| 60 - 69 | D |
| Below 60 | F |

(Note: The “incomplete” grade [“I”] should be given only when unusual circumstances warrant. An “incomplete” is not a substitute for a “D,” “F,” or “W.” Refer to the policy on “incomplete grades.)

1. **REQUIRED COURSE MATERIALS:**

(In correct bibliographic format.)

1. **RESERVED MATERIALS FOR THE COURSE:**

Other special learning resources.

1. **CLASS SCHEDULE:**

This section includes assignments for each class meeting or unit, along with scheduled Library activities and other scheduled support, including scheduled tests.

1. **ANY OTHER INFORMATION OR CLASS PROCEDURES OR POLICIES:**

(Which would be useful to the students in the class.)