ADMISSION REQUIREMENTS

- **AOS CARDIAC ELECTROPHYIOLOGY TECHNOLOGIST PROGRAM**

1. All applicants for the AOS degree programs will be ranked using a point system in specific categories. Refer to the Admission Point System form.
2. A letter grade of B, or a minimum GPA of 3.0 is required for all General Education courses in the AOS programs.
3. A high school diploma or its equivalent.
4. Documentation of high school transcript or GED certificate.
5. Documentation of college credits and advanced degree(s) if applicable.
6. Proficiency in keyboarding is preferred.
7. Prior allied health work experience is preferred.
8. A personal interview at the school between applicant and Admissions Officer.
9. A pre-enrollment interview with the Director of Education.
10. Completion of entrance examination.
11. Three (3) Professional references.
12. Resume (one page).
13. Submission of a formal application as provided by the school. Arrangements for high school or college transcripts will be made prior to enrollment.
14. The above factors will determine the applicant's ranking in the point system.

PROGRAM: CARDIAC ELECTROPHYSIOLOGY TECHNOLOGIST

Program Description:
The AOS Cardiac Electrophysiology Technologist program provides the student the necessary technical skills to work with physicians who diagnose and treat cardiac arrhythmias. Student will learn the standard protocols utilized during an electrophysiology study and the diagnostic and interventional procedures performed in the lab.

The core courses in the AOS Cardiac Electrophysiology Technologist Program include a foundation in anatomy, physiology & pathology, basic and advanced electrocardiography, physics, pharmacology, IV administration, vital signs, and patient assessment.

As the student progresses to the specialized courses in Cardiac EP, focus is placed on sterile technique and radiation safety, cardiac pathology, basic hemodynamics, cardiac pharmacology, and advanced ECG which concentrates on lethal arrhythmia recognition and intervention. In addition, principles of cardiac electrophysiology, pacemakers, and implantable cardioverter defibrillators

are thoroughly reviewed to reinforce the understanding of cardiac rhythm and arrhythmias. Special attention is given to monitoring systems, measurement of intervals, mapping and navigational systems, ablation techniques and tilt table testing. Student will learn to identify atrial and ventricular study components, programmed electrical stimulation, sinus node recovery time, measurement of intervals and EP catheter location during this program. Advanced Cardiac Life Support (ACLS) is presented according to the guidelines of the American Heart Association.

The externship rotation is an integral part of the training program. Eligible students are assigned to school-approved hospital site or medical facility and will maintain this rotation until all required hours have been successfully completed within the duration of eligibility. Refer to Student Handbook.

The student's performance of program objectives is closely monitored by the school's Education Department, Program Supervisor, and hospital preceptor. Site visits to hospitals are conducted on a regular basis by the school externship coordinator to assess the satisfactory progress of the student.

Due to the technical nature of the AOS Cardiac Electrophysiology Technologist program, it is preferred that the student have prior allied health training, recent clinical work experience and college credits. Class size is limited to assure close supervision during classroom and externship training.

Upon successful completion of the AOS Cardiac Electrophysiology Technologist program, and the knowledge and skills acquired in this program, prepare students for responsible career entry positions with advancement opportunities in hospitals and other related healthcare facilities. There is a widespread demand for competent Cardiac Electrophysiology Technologists.

Marketable Skills / Outcomes:
Upon completion of program requirements, Carnegie AOS Cardiac Electrophysiology Technologist graduates will be able to:

- Utilize, communication, critical thinking and mathematic skills in assessment, planning, intervention, and evaluation of patient care.
- Demonstrate understanding of cardiac, vascular, respiratory, and renal anatomy, physiology and pathology
- Demonstrate thorough understanding of ECG and related medical terminology
- Prepare patient for electrocardiogram
- Perform electrocardiogram
- Standardize and operate various types of electrocardiograph instruments
- Recognize and correct various types of artifact
- Perform time/voltage measurements on the ECG
- Perform axis measurement and recognize significance

- Demonstrate understanding of waveform morphology
- Recognize ECG wave patterns and significance
- Recognize and interpret normal vs. abnormal wave patterns on the ECG with emphasis on lethal arrhythmias
- Recognize and interpret arrhythmias and heart block abnormalities
- Assist in the performance of exercise stress testing
- Demonstrate understanding of the indications for pacemakers, mechanisms, normal function, signs of malfunction, and ECG patterns
- Recognize electrocardiographic changes which occur in chamber enlargement and myocardial ischemias/infarction
- Perform intravenous administration, blood pressure and vital sign measurements
- Demonstrate understanding of the principles related to basic and ultrasound physics
- Demonstrate understanding of pharmacology and pharmacokinetics related to cardiac and vascular function
- Demonstrate knowledge of cardiopulmonary resuscitation through American Heart Association Healthcare Provider course
- Respond to the occurrence of a lethal arrhythmia following ACLS standards
- Demonstrate sterile technique in scrubbing and patient prep
- List and describe indications/contraindications for EP studies and ablation
- Identify and explain various arrhythmia mechanisms, symptom correlation, resolution of symptoms, and treatment end point
- Use appropriate format for patient preparation and procedural documentation
- Demonstrate knowledge of the basic ECG, arrhythmias, action potentials and their relationship to intracardiac electrograms
- Recognize, label and measure intracardiac electrograms
- Demonstrate understanding of programmed electrical stimulation
- Identify and explain atrial and ventricular study components, programmed electrical stimulation, sinus node recovery time, measurement of intervals and catheter location
- Demonstrate knowledge of specific tachyarrhythmias, the physiology of specific arrhythmias and treatment of atrial and ventricular tachycardias that can be cured
- Describe the theory and practice of radiofrequency ablation
- Demonstrate understanding of the CARTO and ENSITE navigational systems
- List and describe the equipment and catheters needed to perform an AVNRT ablation and AVRT ablation
- Describe the equipment and catheters needed to perform an atrial flutter ablation
- Demonstrate understanding of equipment and catheters needed to perform an atrial fibrillation ablation
- Demonstrate understanding of equipment and catheters needed to perform ventricular tachycardia ablation

- Identify pacemaker components, describe pacing modes and timing cycles and interpret pacing strips
- Identify implantable cardioverter defibrillator components, describe arrhythmia detection and therapies
- Demonstrate simple pacing/ICD programming functions
- Explain indications for CRT systems and the hemodynamic benefit
- Assist with patient prep and equipment needed for pacemaker implantation, ICD implantation and loop recorder implants
- Demonstrate understanding of indications, patient prep and equipment needed for device/lead extraction
- Demonstrate understanding of indications, patient prep and equipment needed for tilt table testing
- Adhere to the principles of medical ethics as applied to the role of the Cardiac Electrophysiology Technologist

Delivery:

Hybrid – synchronous and asynchronous

- "Distance Education Program" means a program in which all courses are delivered via distance education teaching and learning activities, without the need for any on-campus in person classes/activities.
- "Hybrid" or "Blended" means courses or programs in which some portion of on-campus instruction is replaced by distance education teaching and learning activities.
- "Synchronous" means courses where all students are required to participate at the same time with an instructor; however, the students and the instructor are in separate locations. These courses may be delivered by video conferencing, web conferencing, audio conferencing, etc.
- "Asynchronous" means courses where students are not required to participate in any distance education teaching and learning activities live/in real time with an instructor, but instead engage in such activities based upon teaching materials and assignments compiled and made available by an instructor.

Quarterly Schedule of Instruction:

Twenty-One (21) Months

Seven (7) 12 Week Quarters and 810- Hour Externship

Quarter I: – Asynchronous

Quarters II – III:

- Tuesday & Thursday, 6 PM - 9:30 PM, 5:30-9PM
- Saturday, 8 AM - 3 PM

Quarter IV:

- Tuesday & Thursday, 8-4:30PM

- Saturday, 8AM-2PM
- Quarters V - VII:
  - Saturday, 8 AM - 1 PM
- Externship: 16 hours/week

Course	Contact Hours	Quarter Credit Hours
Quarter I		
GE011: Anatomy & Physiology	45	4.5
GE112: Algebra I	45	4.5
GE130: Written and Oral Communication	45	4.5
Work Outside of Class: 67.5 Hours		
Total Quarter I:	**135**	**13.5**
Quarter II		
C100a: Anatomy & Physiology / Pathophysiology / Therapeutic Communications / HIPAA	54	3.5
C101a: Physics I - Basic Ultrasound	12	0.5
C115a: Pharmacology	18	1.0
C118a1: ECG I - Theory	36	2.5
C118a2: ECG I – Practical – Telemetry & Exercise Stress Testing	36	2.0
Work Outside of Class: 99 Hours		
Total Quarter II:	**156**	**9.5**
Quarter III		
C100b: Anatomy & Physiology / Pathophysiology	42	2.5

Course	Contact Hours	Quarter Credit Hours
C101b: Physics II - Pulsed Ultrasound	12	0.5

C115b: Pharmacology	18	1.0
C110: Vital Signs: Theory & Practical / IV Administration: Theory & Practical	12	0.5
C128b1: ECG II - Theory	36	2.5
C128b2: ECG II - Practical - 12-Lead Analysis, Arrhythmia Interpretation	32	2.0
C129 Healthcare Provider Basic Life Support	4	0.0
Work Outside of Class: 39 Hours		
Total Quarter III:		**9.0**
Quarter IV		
C130: Clinical Preparation Skills	80	5.0
C140: Invasive Cardiac Diagnostics, Diagnostic Catheterization Techniques, Cardiac Pathology, Basic Hemodynamics, Advanced ECG	132	9.0
C150: Advanced Cardiovascular Life Support (ACLS)	40	2.0
Work Outside of Class: 76 Hours		
Total Quarter IV:	**252**	**16.0**
Quarter V		
C011: Interdisciplinary Survey of Medical Imaging	30	3.0
C220a: Principles of Cardiac Electrophysiology I	60	4.0
C260a: Clinical Site Rotation / Externship	180	6.0
Work Outside of Class: 15 Hours		
Total Quarter V:	**270**	**13.0**
Quarter VI		
C220b: Principles of Cardiac Electrophysiology II	60	4.0
C260b: Clinical Site Rotation / Externship	180	6.0
Work Outside of Class: 15 Hours		
Total Quarter VI:	**240**	**10.0**
Quarter VII		

C270: Principles of Device Technology - Pacemakers, Implantable Cardioverter Defibrillator (ICD), Cardiac Resynchronization Therapy (CRT)	60	4.0
C260c: Clinical Site Rotation / Externship	180	6.0
Work Outside of Class: 15 Hours		
Total Quarter VII:	**240**	**10.0**
Clinical Site Rotation / Externship		
C260d: Clinical Site Rotation / Externship	270	9.0
Clinical Site Rotation / *Externship Total:*	**270**	**9.0**
PROGRAM TOTAL Work Outside of Class: 531 Hours ***Note:*** *Total work outside of class hours are approximate.*	**1719**	**90.0**

Definitions:

- A "didactic learning environment (**theory**)" is one which is led by a qualified faculty member for the intention of teaching and learning and can be in a classroom or laboratory setting of instruction.
- A "supervised laboratory setting of instruction (**practical**)" is one where students engage in discussion and/or the practical application of information presented in the didactic portion of the program or discovered through out-of-class work/preparation.
- "Out-of-class work/preparation" is that which students engage in as a means to prepare for the didactic learning environment or supervised laboratory setting of instruction.
- "Externship" is a component of a program offered in a bona fide occupational setting for which training and education are provided, the externship component occurs during or after coursework is completed. The objectives and goals of an externship must be to allow students to apply the knowledge and skills taught in didactic and laboratory settings of instruction.

Course Descriptions:

GE011: Anatomy & Physiology

In this course, the essential basics of structures and functions of the human body systems will be discussed. Topics on all individual major organ systems will be examined, while considering them in the state of health versus the state of disease, focusing mainly on structures. Various clinical implications and possible deviations from norm of each organ system will be brought up throughout the course.

GE112: Algebra I
This course is designed to give students the math skills that provide a foundation for more advanced courses. Students will explore writing and solving linear and nonlinear equations, powers and exponents, quadratic equations, polynomials and factoring, graphing and solving linear inequalities, and functions.

GE130: Written and Oral Communication
In this course, students will explore the fundamental analog and digital skills of oral and written communication to help create professional written and oral communication within their career. This is an introduction to a variety of methods used to communicate effectively and create language that articulates information in a way that connects a speaker to an audience.

C011: Interdisciplinary Survey of Medical Imaging
In this course, the student is introduced to basic imaging modalities in medical imaging. Five common imaging modalities will be discussed which include radiography (including fluoroscopy, mammography and computed tomography), magnetic resonance imaging, nuclear medicine, ultrasound and radiation therapy. Clinical applications are discussed throughout the course.

C100a: Anatomy & Physiology / Pathophysiology / Therapeutic Communications / HIPAA
Covers the principles of human anatomy and physiology with emphasis on the cardiovascular system. Topics include cell biology, normal anatomy and physiology of the cardiovascular, respiratory, urinary, nervous, and endocrine systems. The format includes class discussion, and a high degree of student participation on the major pathologies of each organ system presented. Emphasis is placed on the physiologic principles underlying the disease processes which the Cardiovascular Technologist is likely to encounter in a clinical environment. Presents the concepts of basic human behavior with emphasis on effective communication with the patient and family, physicians, and staff. Student will be able to identify styles and types of verbal and non-verbal communication and differentiate between adaptive and non-adaptive coping mechanisms. Student will recognize the role of patient advocacy as it applies to their scope of practice. Focus is placed on active listening skills and increasing awareness of how a message is received and the formation of a professional response. Communication skills incorporate respect for cultural diversity and sensitivity. HIPAA guidelines and how they pertain to the role of the allied health professional are also presented.

C101a: Physics I - Basic Ultrasound
Student learns the physical properties of ultrasound. Topics include the piezoelectric effect, the parameters of a sound wave, acoustic variables and the concept of direct and inverse relationships among variables. The student performs calculations of frequency, period, wavelength, velocity, amplitude, power, and intensity.

C115a: Pharmacology
A study of the major categories of medications prescribed for cardiac patients. The student learns the indications, contraindications, and mechanisms of action of drugs used for the control of angina, dysrhythmias, heart failure and hypertension. Adrenergics and anticoagulants are covered. Selected ancillary medications for sedation, analgesia, diuresis, and cardiopulmonary emergencies are also examined.

C118a1: ECG I - Theory
A study of the basic levels of electrocardiology and electrocardiography. Focus is placed on waveform morphology with emphasis on Einthoven's theory and lead derivation. Student learns to perform ECG measurements of significant diagnostic value. Ancillary ECG methods such as telemetry monitoring and stress testing are also presented. ECG I is a prerequisite for the study of advanced principles offered in ECG II.

C118a2: ECG I – Practical – Telemetry & Exercise Stress Testing
Hands-on ECG testing procedures and placement of chest electrodes. Principles of machine operations and troubleshooting to maintain quality of ECG tracing is thoroughly covered. Technical skills are performed under the supervision of credentialed specialists to ensure quality control and professional skill development.

C100b: Anatomy & Physiology / Pathophysiology
This course is designed to continue the principles of human anatomy and physiology introduced in C100a Anatomy & Physiology/Pathophysiology which have a direct relationship to the function of cardiac activity and blood flow. Focus is placed on feedback mechanisms underlying circulatory physiology. Anatomy and physiology of the heart is discussed with focus placed on myocycte contraction, cardiodynamics, and basic cardiovascular pathology. Discussion also includes nervous, endocrine, respiratory and renal function as it relates to the cardiovascular system.

C101b: Physics II - Pulsed Ultrasound
Student learns the principles of pulsed ultrasound and the behavior of sound as it propagates through the body. Topics include pulsed ultrasound, attenuation, impedance reflection and refraction. The student performs calculations of pulse repetition frequency, pulse repetition period, spatial pulse length, pulse duration, duty factor, attenuation coefficient, intensity reflection coefficient and Snell's Law of Refraction.

C115b: Pharmacology
This course is designed to continue the principles of Pharmacology introduced in C115a.This course involves the study of adrenergics, antiarrhythmics, antihypertensives & nitrates. The student will also learn the medications used for each of the above referenced modules, including the mechanism of action, indications, side effects, contraindications and/or interactions.

C110: Vital Signs: Theory & Practical / IV Administration: Theory & Practical
Prepares student to perform blood pressure, pulse, and respiration procedures. Hands-on practice is supervised by credentialed subject specialists to ensure quality control and successful development of clinical skills. Trains the student in the proper procedural techniques for IV administration. Special attention is given to sites and equipment which may be used for IV infusion. Supervised hands-on training (1-1 ratio) for all intravenous procedures is closely monitored by certified subject specialists to ensure quality control and to instill professional confidence. IV administration labs are limited in size for the successful development of IV administration skills. Focus is placed on OSHA guidelines and how this pertains to the role of the allied health professional.

C128b1: ECG II - Theory
Builds on the basic principles of waveform morphology presented in ECG I. The student develops the ability to recognize and interpret cardiac arrhythmias, heart blocks, chamber enlargement, and 12-lead interpretation as it relates to myocardial infarction, and pacemaker analysis.

C128b2: ECG II Practical – 12-Lead Analysis, Arrhythmia Interpretation
Student develops expertise in the recognition and interpretation of cardiac arrhythmias, heart blocks, and chamber enlargement. Special attention is also given to the recognition of pacemaker patterns and ECG changes caused by a myocardial infarction. The student is required to interpret and analyze numerous rhythm strips for each cardiac anomaly.

C129 Healthcare Provider Basic Life Support
This is a programmed course designed and supported by the American Heart Association. Student learns to accurately identify an emergency and provide appropriate care for the adult, child, and infant. Emphasis is placed on skill development in CPR, AED and rescue breathing. In addition, the Healthcare Provider Basic Life Support training is designed and supported by the American Heart Association. Student learns to accurately identify an emergency and provide appropriate care for the adult, child, and infant. Emphasis is placed on skill development in CPR, AED and rescue breathing.

C130: Clinical Preparation Skills
Introduces the student to the practical application of aseptic and sterile technique. Student develops proficiency in performing surgical hand scrub, sterile table prep, surgical gowning & gloving and patient sterile prep. Demonstration and practical application of standard equipment used during diagnostic and interventional catheterization and EP cases is presented. ECG review, using a patient monitor and ECG simulator, are utilized to develop proficiency in practical dysrhythmia recognition. Patient assessment skills are also included. Field trips to area hospitals provide student the opportunity to observe clinical skills performed by the technologist in the Cath and EP Lab environment.

C140: Invasive Cardiac Diagnostics, Diagnostic Catheterization Techniques, Cardiac Pathology, Basic Hemodynamics, Advanced ECG

Invasive Cardiac Diagnostics
Includes a brief history of catheterization, radiation safety and patient safety measures, vascular access and catheter and related equipment used by the cardiologist.

Diagnostic Catheterization Techniques
This section of the program describes the different features of Left and Right heart catheterization procedures. The student is familiarized with common arterial and venous catheters used for angiography, pressure sampling and cardiac output measurement. Ancillary equipment including power injectors, oximeters and anticoagulation monitoring devices are introduced.

Cardiac Pathology
Addresses the major cardiac pathologies, both congenital and acquired, which are encountered in an invasive cardiac setting. Emphasis is on coronary artery disease and valvular abnormalities, with special attention to acute myocardial infarction.

Basic Hemodynamics
Introduces the fundamentals of pressure monitoring, waveform recognition and interpretation, basic measurements and derived parameters.

Advanced ECG
Focuses on advanced 12-lead ECG interpretation. Thorough review of various rhythms including sinus, atrial, junctional, and ventricular is conducted. In addition, heart blocks and reentry mechanisms are presented with special emphasis on myocardial infarction criteria.

C150: Advanced Cardiovascular Life Support (ACLS)
This course is designed and supported by the guidelines of the American Heart Association. It provides the knowledge and skills needed to evaluate and manage a potentially life- threatening situation. Providers are required to learn algorithms for bradycardia, tachycardia, cardiac arrest, acute coronary syndrome and stroke. The course consists of a combination of lectures and hands on skills. Practical skills are evaluated through case scenarios and a written exam is required.

C220a: Principles of Cardiac Electrophysiology I
This course presents the concepts of electrophysiology, equipment and safety. A thorough review of the cardiac electrical system and relevant cardiac anatomy is included. Normal and abnormal rhythm interpretation continues with rhythm strip interpretation. Focus is placed on catheter placement, and measurement of intervals during a basic EP study. Supraventricular intracardiac

recognition and ablation techniques for these rhythms is presented. Pharmacology related to EP studies is also provided.

C220b: Principles of Cardiac Electrophysiology II
This course builds on the Cardiac EP I material with continued interpretation of supraventricular and ablation of SVTs. Ventricular arrhythmias, intracardiac recognition and ablation of these rhythms is included. Studies in mapping systems are provided by manufacturer-specific Clinical Application Specialists. Hospital field trips provide the student with varied exposure of technical applications including tilt table testing.

C270: Principles of Device Technology - Pacemakers, Implantable Cardioverter Defibrillator (ICD), Cardiac Resynchronization Therapy (CRT)

Pacemaker Technology
Basic concepts are presented including history, indications, pacing components, implant/explant procedures, stimulation, capture, sensing, pacing modes, timing cycles for single and dual chamber pacing, upper rate behavior and rate responsive pacing. Loop recorder technology is also presented. A review of basic hemodynamics is provided to help student understand the effects of pacing.

ICD/CRT Technology
Basic concepts are presented including history, indications, ICD components, implant/explant procedures, capacitance, sensing, detection, shock therapy, antitachycardia pacing and bradycardia pacing. Cardiac Resynchronization Therapy is covered. Introduction to basic programming techniques is provided by vendor Clinical Application Specialists.

C260a – C260d: Externship
Externship can take place when the student reaches eligibility and continues until externship requirement is completed. Externship is an opportunity for a learning experience outside school facilities. The off-campus externship is an integral part of the program. The student is assigned to a school-approved facility. Written and verbal contact with externship preceptor is maintained throughout externship experience and communication is routinely performed by the school to monitor student progress.

Maximum number of students in a classroom and laboratory:

Delivery	Faculty	Students
Classroom (Theory) Core Courses	1	25

Laboratory (Practical) Core Courses	2	12
General Education Courses	1	25

Requirements For Graduation:

An Associate of Occupational Science degree, designating the graduate as a Cardiac Electrophysiology Technologist is conferred on those students meeting the following requirements:

Satisfactory completion of the course requirements which include stipulated externship hours at a school approved site and an externship evaluation from the medical supervisor.

- A combined average grade of not less than 80%.
- A Minimum Cumulative Completion Rate of 67%.
- Recommendation of the faculty.
- Satisfaction of all indebtedness to the school.
- A satisfactory record of attendance