NMED-1100: COMPUTERS IN NUCLEAR MEDICINE

Cuyahoga Community College

Viewing: NMED-1100: Computers in Nuclear Medicine

Board of Trustees:
2014-06-19

Academic Term:
2014-08-23

Subject Code
NMED - Nuclear Medicine Technology

Course Number:
1100

Title:
Computers in Nuclear Medicine

Catalog Description:
Study of computer systems used in the field of nuclear medicine. Topics include the gamma camera computer system interface, data acquisition, image processing software and techniques, quality control, tomography, and radiopharmacy record keeping. Teleradiography and medical informatics is included.

Credit Hour(s):
1

Lecture Hour(s):
.5

Lab Hour(s):
1

Requisites

Prerequisite and Corequisite
Departmental approval: admission to specified program.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.

For specific information pertaining to ADA accommodation, please contact your campus SAS office or visit online at http://www.tri-c.edu/accessprograms/. Blackboard accessibility information is available at http://access.blackboard.com.

Eastern (216) 987-2052 - Voice
III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

- For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
- For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College’s Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student's grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available athttp://www.tri-c.edu/student-resources/documents/studenthandbook.pdf You must also comply with the College’s Zero Tolerance for Violence on College Property available athttp://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf

Outcomes

Course Outcome(s):
Discuss the components of nuclear medicine computer systems

Objective(s):
1. Explain the components of nuclear medicine computer systems and how they are used to collect, process, and store data
Course Outcome(s):
Apply effective data processing techniques for various nuclear medicine exams

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):
1. 2. Understand data processing programs used in the field of nuclear medicine.

Course Outcome(s):
Explain medical informatics applications as it applies to nuclear medicine.

Objective(s):
1. 3. Understand medical informatics technologies and techniques.

Methods of Evaluation:
1. Quizzes
2. Exams
3. Projects
4. Worksheets

Course Content Outline:
1. Nuclear Medicine Computer Systems
   a. Gamma camera/computer interface
      i. Analog-to-digital converters
      ii. Buffer
      iii. Zoom
         1. Magnification versus resolution
         2. Interpolation
      iv. Acquisition modes
         1. Frame
         2. List
         3. Multiple gated
         4. Tomographic
         5. Whole body
      v. Matrix types and sizes
         1. Byte versus word
         2. Number and size of pixel
         3. Voxel
      vi. Memory requirements
      vii. Video display systems
   b. Single-photon emission computed tomography (SPECT)
      i. Orientation
      ii. Back projection
      iii. Fourier reconstruction
      iv. Iterative reconstruction
      v. Slice-thickness selection
      vi. Reorientation
      vii. SPECT filters
         1. Filter design
         2. Selection criteria
         3. Types
         4. Cutoff
5. Frequency
6. Nyquist frequency
7. Multicamera head reconstruction techniques
c. Data processing programs
   i. Field uniformity correction
   ii. Background and foreground correction
   iii. Attenuation correction
   iv. Motion correction
   v. Contrast enhancement
   vi. Scaling and normalization
   vii. Image arithmetic
   viii. Display manipulations
   ix. Dead time corrections
   x. Center of rotation error corrections
   xi. Regions of interest
      1. Effects of poorly drawn regions of interest
   xii. Curve generation and image manipulation
      1. Image profiles
      2. Time-activity curves
      3. Harmonic analysis
      4. Color scales
      5. Image registration and co-registration
      6. Three-dimensional reconstruction
      7. Polar map generation
      8. Standard uptake values

2. Use of computers in quality control programs
   a. Linearity
   b. Sensitivity
   c. Gain
   d. Analog versus digital conversion
   e. Resolution
   f. Spatial distortion
   g. Integration with imaging systems
   h. Validation of software
      i. Center of rotation
      j. Test patterns
   k. Pixel sizing (x, y gain setting)

3. Radiopharmacy/hot lab computers
   a. Radiopharmacy management systems
   b. Hot lab and patient management
   c. Health physics
   d. Pharmacy management

4. Processing of Nuclear Medicine Exams
   a. Skeletal Exams
   b. Endocrine
   c. Gastric
   d. Respiratory
   e. Lymphatic/abscess/infection
   f. Neurological
   g. Cardiac
   h. Genitourinary
      i. Tumor
      j. SPECT
   k. Positron Emission Tomography
   l. Fusion imaging

5. Picture Archiving and Communication System (PACS)
a. Acquisition device
b. Types of system interfaces
c. Digital Imaging and Communication in Medicine (DICOM)
d. Networking and servers
   i. Centralized servers
   ii. Distribution servers
   iii. Hybrids
   iv. Virtual private network
e. Imaging display
f. Printers
   i. Formatter, multi-imager
   ii. Laser printer
   iii. Dry film
   iv. Video systems
g. Teleradiology
h. Archiving
   i. Internet safety within a hospital regarding PACS
j. Integration with other systems
   i. Radiology information systems (RIS)
   ii. Hospital information systems

Resources

Bernier, Christian Langan. "Nuclear Medicine Technology and Techniques"

Early, Paul J. and Sodee, D. Bruce. "Principles and Practices of Nuclear Medicine"

Mettler Guiberteau. "Essentials of Nuclear Medicine Imaging"

Thrall Ziessman. "Nuclear Medicine The Requisites"

Mettler, Fred A. and Guiberteau, Milton J. "Essentials of Nuclear Medicine Imaging"