## Semester Wise Lay-out of Course

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spring-I</strong></td>
<td>MS-501</td>
<td>Introduction to Nuclear Physics</td>
<td>3</td>
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<tr>
<td>(18 weeks)</td>
<td>MS-502</td>
<td>Mathematics and Statistics</td>
<td>3</td>
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<tr>
<td></td>
<td>MS-503</td>
<td>Radiation Detection and Instrumentation</td>
<td>3</td>
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<tr>
<td></td>
<td>MS-504</td>
<td>Radiation Protection and Radiation Biology</td>
<td>3</td>
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<tr>
<td></td>
<td>MS-506</td>
<td>Clinical Radiology</td>
<td>3</td>
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<tr>
<td></td>
<td>CMS-501</td>
<td>Communication Skills</td>
<td>1</td>
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<tr>
<td></td>
<td>CMS-111</td>
<td>Grooming &amp; Sprucing - I</td>
<td>NC+IR</td>
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| **Summer-I**   | MS-601        | Diagnostic Imaging in Nuclear Medicine                                        | 3       |
| (18 weeks)     | Ms-604        | Functional Techniques & Therapeutics in Nuclear Medicine                      | 2+1     |
|                | MS-605        | Hybrid Imaging and Theranostics                                               | 3       |
|                | MS-512        | Quantitative Analysis and Data Processing in Nuclear Medicine                 | 3       |
|                | MS-505        | Radiochemistry and Radiopharmaceutical                                         | NC+IR   |
|                | MS-510        | Introduction to Nuclear Technology                                           | NC+IR   |
|                | CMS-211       | Grooming & Sprucing - II                                                     | NC+IR   |

| **Fall-II**    | MS-697        | Thesis Project                                                               | 15      |
| (18 weeks)     |               |                                                                              |         |

| **Spring-II**  | MS-690        | Intensive Clinical Training in Nuclear Medicine                              | 15      |
| (10 weeks)     |               |                                                                              |         |
| **and Summer-II** | MS-690 | Intensive Clinical Training in Nuclear Medicine                              |         |
| (18 weeks)     |               |                                                                              |         |

NC = Non-Credit, IR = Institutional Requirement  
**Total credits** 61
Detailed Course Contents of the MSc Nuclear Medicine

Title of course: MS-501: Introduction to Nuclear Physics

Course Details:

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<tr>
<td>Prerequisite</td>
<td>Nil</td>
</tr>
<tr>
<td>Course Format</td>
<td>Three hours of lectures per week</td>
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</table>

Course Objectives:

The course provides general nuclear physics, atomic structure, and radiation concepts with emphasis on nuclear structure, origin and properties of radiation emitted by unstable nuclei radioactive substances. This course explains basic properties of atomic nuclei, the forces that bind them and common types of nuclear reactions and radioactive decay. It also provides comprehensive introduction of how the physical properties of the atomic nucleus are used in modern nuclear medicine practice both for diagnostics and therapeutic purpose.

Course Contents:

Atomic and nuclear structure; Artificial and natural radioactivity; Modes of radioactive decay; Exponential decay and; Half-life and mean life of radio nuclides; Radioactive decay series and equilibrium including Positron emission & decay; Nuclear reactions and reaction cross-sections; Nuclear fission; Nuclear reactors and cyclotrons.

Teaching Methodology:

- Lectures (Power point presentations)
- Written Assignments/ Quizzes: There will be assignments /quizzes during session. Late submission and copied assignments will not be accepted

Assessments:

- Written coursework/project assignments, two written sessional exams completed during term-time worth 50% of the total course mark.
• Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total course mark.

References


MS-502 Mathematics and Statistics

Course Details:

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<tr>
<td>Prerequisite</td>
<td>Nil</td>
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<tr>
<td>Course Format</td>
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Course Objectives:

This course aims to enhance basic mathematical skills needed for interpretation of nuclear medicine equations and the utilization of partial differential equations in image processing and reconstruction. Moreover this course is also designed to familiarize the students with significance of biostatistics and its practical utility in clinical research work.

Course Contents:

Significance of statistics in Nuclear Medicine; Standard deviation; Poison and Gaussian distribution; Applications of statistical analysis; Chi-square test; Confidence Intervals Elementary concepts of probability; Tests of significance; Statistical criteria for the selection and adjustment of counters
Introduction to statistical software (Prism Graph Pad) and its Clinical utility for research purpose

Second degree algebraic equations and inequalities; Trigonometric identities; Sequences and series; Binomial expansion; Differentiation and integration; First order and second order differential equations; Fourier Transform.

**Teaching Methodology:**

- Lectures (Power point presentations)
- Written Assignments/ Quizzes: There will be assignments /quizzes during session. Late submission and copied assignments will not be accepted.

**Assessments:**

- Written coursework/project assignments, two written sessional exams completed during term-time worth 50% of the total course mark.
- Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total course mark.

**References:**


**MS-503 Radiation Detection and Instrumentation**

**Course Details:**

<table>
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<td>Nil</td>
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<tr>
<td>Course Format</td>
<td>Three hours of lectures per week</td>
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</table>
**Course Objectives:**

The course is designed to familiarize the students with various aspects of radiation interaction mechanism in matter. This course also encompasses the basics of the radiation detection and working of the radiation detectors. It provides knowledge of the function, design, and quality control practices for various gas-filled and scintillation detectors, pulse-height analyzers, spectrometers, and counting systems. Radiation instrumentation part covers the knowledge of imaging instrumentation principles in nuclear medicine. This part of course focuses on the design and basic working of equipments used in nuclear medicine and radiology like Gamma Camera, CT, PET and MRI including quality control procedures of SPECT/CT gamma cameras and PET?CT cameras.

**Course Contents**

Interaction of charged particles with matter; Interaction of X- and gamma-rays with matter; Attenuation and absorption coefficients; Interaction of neutrons with matter; Basic principles of radiation detectors and their common properties, Gas-filled detectors and their application, Scintillation detectors and radiation spectroscopy; Nuclear electronics; Photographic emulsions; Thermo luminescent dosimeters; Chemical dosimeters.

Radiation detectors, Non imaging probes, Scintillation counters; Dose calibrator; principles of operation of gamma camera, SPECT, PET, CZT cameras, CT, and hybrid SPECT/CT and PET/CT cameras, including collimators, associated electronic equipment, Computer acquisition, Image processing, count statistics, reconstruction and filtering and display, Quality of single photon and positron emission images, Quality control, Camera quality assurance, routine quality control checks. Principles of SPECT and PET quantification (SUV), attenuation correction. Hardware (physical) phantoms Acceptance testing.

**Teaching Methodology:**

- Lectures (Power point presentations)
- Written Assignments/ Quizzes if required: There will be assignments /quizzes during session. Late submission and copied assignments will not be accepted.

**Assessments:**
• Written coursework/project assignments, two written sessional exams completed during
term-time worth 50% of the total course mark.
• Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total
course mark.

References

• Cherry SR, Sorenson JA, Phelps ME. "Physics in Nuclear Medicine", 4th Edition, Saunder,
s, 2012.
• Powsner RA, Palmer MR. “Essentials of Nuclear Medicine Physics and Instrumentation”,
• Powsner RA, Powsner ER, Palmer Matthew. “Essentials of Nuclear Medicine Physics,
• D.L. Bailey J.L. Humm A. Todd-Pikropek A. van Aswegen. “Nuclear Medicine Physics: A
Handbook for Teachers and Students”, IAEA, 2014

MS-504 Radiation Protection and Radiation Biology

Course Details:

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<td>Course Format</td>
<td>Three hours of lectures per week</td>
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Course Objective:

This course is designed to give a thorough introduction to practical radiation protection and in-
depth knowledge of the principles of safe radiation protection. It covers the methods of radiation
protection, measuring and monitoring internal and external radiation exposure for personnel and
patients. Students are given knowledge regarding the medical radioactive waste categorization
and its disposal according to regulatory policies guidelines. Second part of the course covers
basic knowledge on immediate and late biological effects of radiation at cellular level and the factors affecting the relationship between dose and biological effects.

**Course Contents:**

Radiation Protection: Introduction; Radiation History, Radiation quantities and units; International organizations setting standards; Radiation protection standards; ALARA Principles, Absorbed dose estimation from external and internal exposure; Dose Assessment, Decontamination Radiation protection principles & procedures in patients receiving radioiodine therapy, Radiation protection in Medicine: Health physics instrumentation, principles of control of external and internal exposure hazards. Disposal of medical radioactive waste.

Internal radiation dosimetry Analysis: MIRD, Introduction to MIRD Committee, Basic need for dosimetric analysis in nuclear medicine, Basic concepts of radiation absorbed doses, equivalent and effective dose, half-lives of radiopharmaceuticals, clinical dosimetric analysis steps, concept of cumulative doses and S factors, Calculation of cumulative doses using SPECT, PET/CT, blood and urine sample analysis, Calculation of maximum permissible activities of therapeutic radionuclides using radiation absorbed doses.

Radiation Biology: Radiation Chemistry, Biological Effects of Radiation (Direct & Indirect Effects), Radiation induced chromosomal damage and repair, Target theory and cell survival curves, Acute radiation syndrome, Late effects of radiation: Radiation Carcinogenesis, Heritable Effects of Radiation, Effects of Radiation on the Embryo & Fetus.

Doses & Risks in Diagnostic Radiology, Intervention Radiology, Cardiology and Nuclear Medicine

**Teaching Methodology:**

- Lectures (Power point presentations)
- Written Assignments/ Quizzes if required: There will be assignments /quizzes during session. Late submission and copied assignments will not be accepted

**Assessments:**
Written coursework/project assignments, two written sessional exams completed during term-time worth 50% of the total course mark.

Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total course mark.

References:

- EANM and SNMMI dosimetric guidelines.

MS-506: Clinical Radiology

Course Details:

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<tr>
<td>Prerequisite</td>
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<tr>
<td>Course Format</td>
<td>Three hours of lectures per week</td>
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Course Objective:

This course main objective is to familiarize the students with the basic principles of radiological imaging with emphasis on CT. This course is designed to familiarize the students with basic principles of radiological imaging with emphasis on CT. This course teaches the underlying principles behind conventional radiography, computerized axial tomography (CT), magnetic res-
onance imaging (MRI), and ultrasound including contrast enhancement and basic MRI sequenc-
es. Main objective of the course is to develop the abilities of the students to recognize the nor-
mal anatomical structures of brain, head & neck, abdomen & pelvis and bones using X-Ray plain
films, CT and MRI (brain & pelvis) and to apply this knowledge to recognize potential pathology
in areas affecting the normal anatomy. This course equips the students with the abilities to inter-
pret imaging studies especially cross sectional imaging in various diseases with emphasis on the
radiological appearance of various common tumors and to develop interpretative skill when read-
ing CT performed in conjunction with PET and SPECT. One part of this course is to provide
hands on training in ultrasound with emphasis on ultrasound of thyroid.

**Course Contents:**

Introduction of the physical principles of radiography (x-ray), computed tomography (CT), mag-
netic resonance (MR) and ultrasound imaging. Basics of CT protocols (contrast enhanced CT,
dynamic CT), Basics of MRI (T1, T2 and other).

**Plain films:**
- Chest x-ray
- Abdomen & pelvis
- Spine
- Long bones

**Mammography**

**CT:** Location and identification of structures and organs, major lymphatic groups, relevant vas-
cular anatomy and pathological correlation on CT images of the following regions.
- Brain
- Head & Neck
- Chest
- Abdomen & pelvis
- Bones

**MR:** Location and identification of normal structures and organs on MR images and recognition
of pelvic tumors of the following regions
- Brain
• Pelvis

**Ultrasound:** Hands on training on Ultrasound abdomen/pelvis and thyroid

Common pathological Conditions: Appearances of benign and malignant processes on plain X-Rays CT and MRI.

**Teaching Methodology:**

• Lectures (Power point presentations)/ Board Interactive sessions
• Hands on training sessions.

**Assessments:**

• Two written /OSCE based sessional exams completed during term-time worth 50% of the total course mark.
• Unseen written Final examination comprising of OSCE, ESQs worth 50% of the total course mark.

**References**


**CMS- 501 Communication Skills**

This course is designed to develop communication and interpersonal skills of the students for effective verbal and nonverbal communication.
Instructor:
Guest Speaker

Course Details:

<table>
<thead>
<tr>
<th>Compulsory</th>
<th>Credits</th>
<th>1+0</th>
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<tbody>
<tr>
<td>Prerequisite</td>
<td>Nil</td>
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<tr>
<td>Course Format</td>
<td>1 hour of lecture per week</td>
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Course Contents:

Writing Module: Preparation of a project proposal or technical report, Writing letters, Mission statements, Office memos etc. Speaking Module: Presentation of the project proposal or technical report. Listening Module: Simulations of interviews, lectures and question-answer sessions. Reading Module: Reading of a suitable fiction novel (approximately 30-50 pages a week) with the use of vocabulary support, completion of assigned tasks and discussions.

CMS-111 Grooming & Sprucing – I (Self Awareness)

Course Contents:

Student home town, School education, Performance in school, College Education, Performance in college, University Education, Religious tolerance ,Extra –Curricular Activites,Favourite Subjects, Something special done for family, Personal impressions about studying in PIEAS,University dress code, Basic Conversation skills including a brief self-introduction ,tolerance and emission control in discussion, responsible behavior on social media ,nonverbal communication
**MS-601 Diagnostic Imaging in Nuclear Medicine**

**Instructor:**

**Course Details:**

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<th>Compulsory</th>
<th>Credits</th>
<th>Prerequisite</th>
<th>Course Format</th>
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<td>3</td>
<td>Nil</td>
<td>Three hours of lectures per week</td>
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**Course Objective:**

This course teaches the students about the underlying principles behind the diagnostic imaging based on radiopharmaceuticals. This course is designed to enable students to acquire conceptual, factual, and interpretive knowledge of radionuclide imaging, its practical utility in clinical scenario, interpretation and quantification of different diagnostic scans. This relevant course will ultimately help out future practicing clinician with a problem-oriented approach.

**Course Contents:**

Diagnostic imaging in-vivo studies; Radiopharmaceuticals, their bio distribution, elimination, and kinetics; Major indications and interpretation of imaging for different body functions and organs; Different methods and techniques of imaging and their quantitation; The use of single and multidetector systems for equilibrium and time dependent studies; Medical decision making; Differential evaluation of nuclear medical imaging in light of other imaging modalities.

**Teaching Methodology:**

- Lectures (Power point presentations), Interactive White board sessions
- Interactive Nuclear Medicine Scan Interpretation
- Virtual seminars
- Guest speakers talk from prestigious Nuclear Medicine and Oncology Setups

**Assessments:**

- Written coursework/project assignments, two written sessional exams completed during term-time worth 50% of the total course mark.
- Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total course mark

References


MS-605: Hybrid Imaging and Theranostics

Course Details:

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<th>Compulsory</th>
<th>Credits</th>
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<th>Course Format</th>
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<td>3</td>
<td>Nil</td>
<td>Three hours of lectures per week</td>
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Course Objective:

This course is designed to provide in depth knowledge to the students regarding the basics and clinical application of hybrid molecular imaging like SPECT/CT, PET/CT and PET/MRI for the multi-parametric assessment of the diseases. It provides necessary tools to the students to hone their skills in the interpretation and reporting of the scans. This course is also designed to acquaint students with the theranostic approach that has gained importance in parallel to the growth in molecular imaging. This course will help students to learn the latest theranostics techniques and how to provide theranostic services in the management for various diseases.

Course Content:

History and Principles of Hybrid Imaging, PET/CT Imaging with 18F-Fluorodeoxyglucose, Normal 18F-FDG , Distribution and Physiologic Variants, Pitfalls and Artifacts on 18F-FDG Imaging, Benign processes accumulating 18F-FDG, Physiologic Distribution of other PET Tracers, Clinical Applications of Hybrid Imaging in Oncology, Pediatric Applications for PET/CT and SPECT/CT, Cardiac Hybrid Imaging (PET/CT and SPECT/CT): Assessment of CAD, Hybrid Imaging of Benign Skeletal Diseases, Infectious and Inflammatory Diseases. Ga-68 labeled new theranostic imaging agents for Prostate cancer, Neuroendocrine Tumors and Metastatic Skeletal Disease, New Beta emitting Lu-177 and Y-90 and Alpha emitting Ac-225 based therapy for Prostate Carcinoma, Neuroendocrine Tumors, Lymphomas and Metastatic Skeletal Disease, SIRT therapy with use of intra-arterial Lu-177 and Y-90 based microspheres as well as new therapeutic radionuclides complementing the new theranostic imaging radionuclides, Use of various Beta and Alpha radionuclides based therapy for radiosynoviorthesis, metastatic skeletal disease, Polycythemia Vera, Malignant Ascites and Pleural Effusion.

Teaching Methodology:

- Lectures (Power point presentations) , Interactive White board sessions
- Interactive Nuclear Medicine Scan Interpretation
- Virtual seminars
- Guest speakers talk from prestigious Nuclear Medicine and Oncology Setups

Assessments:
• Written coursework/project assignments, two written sessional exams completed during term-time worth 50% of the total course mark.
• Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total course mark

**References:**

• Eugene C. Lin, and Abass Alavi, "PET and PET/CT: A Clinical Guide”, 3rd Edition by Thieme Medical Publishers ,2019
• E. Bombardieri, E. Seregni, L.Evangelista. "Clinical Applications of Nuclear Medicine Targeted Therapy”.Springer,2018
• Hybrid PET/CT and SPECT/CT Imaging—A Teaching File by Dominique D & Ora Israel, Springer(2011)
MS-604: Functional Techniques & Therapeutics in Nuclear Medicine

Course Details:

<table>
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<td>Course Format</td>
<td>Two lectures /week + one hour lab per week</td>
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Course Objective:

This course consists of a taught portion and a practical lab work course. This course provides an opportunity to the students to attain advanced knowledge; procedural skills and practical competencies in the functional techniques. It also help the students to increase their knowledge, skills and attitudes to prescribe, administer and monitor the use of radiopharmaceuticals for therapy with special emphasis on Radioiodine therapy for hyperthyroidism and CA thyroid.

The lab work is intended to develop the skills of the students in various practical aspects of nuclear medicine, which they will be facing in their professional practical life in future.

Course Contents:

Basic chemical concepts; Labelling methods; Separation procedures; Data handling and quality control; Therapeutic uses of radionuclides: indications, patient selection and radiopharmaceuticals used; Calculation of activity to be administered; Absorbed dose estimation; Health physics considerations and precautions in handling patients containing therapeutic quantities of radio nuclides.

Laboratory

Radiation Detection and Measurement:

1. Characteristics of scintillation detectors and determination of pulse height spectra of gamma sources.

2. Measurement of half-lives of a single and a mixture of radio nuclides.
3. Measurement of Co-60 source strength using gamma-gamma or beta-gamma coincidence method.

*Health Physics*

1. Contamination survey and decontamination procedures.

2. Verification of inverse square law and source strength measurement.

*Clinical Laboratory*

1. Elution of Mo-Tc generator system, calculation of dose and preparation of radiopharmaceuticals.


3. Quality control tests for gamma camera and routine operational tests for SPECT.

**Teaching Methodology:**

- Lectures (Power point presentations)
- Written Assignments/ Quizzes if required: There will be assignments /quizzes during session. Late submission and copied assignments will not be accepted

**Assessments:**

- Written coursework/project assignments, two written sessional exams and lab test completed during term-time worth 50% of the total course mark.
- Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total course mark

**References**

MS-505 Radiochemistry and Radiopharmaceuticals

Course Details:

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<tr>
<td>Prerequisite</td>
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<tr>
<td>Course Format</td>
<td>Three hours of lectures per week</td>
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Course Objective:

This course is designed to enable students of MSc NM to acquire basic knowledge of radiochemistry and radiopharmaceuticals. This course gives a comprehensive overview of the radiochemistry and radiopharmaceutical including the production of radioisotopes, detailed knowledge of radionuclide generators especially Moly-Tech generator and cyclotron. The course also covers central topics of synthesis and application of imaging agents in nuclear medicine and molecular imaging, synthesis of radiolabeled compounds, radiolabeling techniques, development and evaluation of radiopharmaceuticals, quality control process of radiopharmaceuticals for research and clinical use. It also incorporates the basic principles and licensing considerations. PET and therapeutic radiopharmaceuticals have also been included in the course.

Course Contents:

Introduction; Radiopharmaceuticals; Radiopharmaceuticals used for different scintigraphic studies; Basic principles and licensing considerations; Production of radioisotopes; Radioisotope generators; Dosage control techniques; Formulation of radiopharmaceuticals for different organs; Quality control and quality assurance of radiopharmaceuticals; Pharmacology of radiopharmaceuticals; Good Radio pharmacy practice for special radiopharmaceutical procedures; Hot laboratory and dispensing operations; Chemical toxicity of radio nuclides. Theranostics radionuclides, PET radiotracer production, quality control & quality assurance.

Teaching Methodology:

- Lectures (Power point presentations)
• Written Assignments/ Quizzes if required: There will be assignments /quizzes during session. Late submission and copied assignments will not be accepted.

Assessments:

• Written coursework/project assignments, two written sessional exams completed during term-time worth 50% of the total course mark.
• Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total course mark

References:

• Kowalsky and Steven W. Falen, American Pharmacists Association (APhA) (2011)

MS-512 Quantitative Analysis and Data Processing In Nuclear Medicine

Course Details:

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<td>Nil</td>
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Course Objective:

This course is designed to teach basic principles of quantitative analysis and data processing in nuclear medicine including various steps required for obtaining quantitatively accurate data from nuclear medicine images. It includes an overview of issues that are closely related to quantitative nuclear imaging and its potential role in diagnostic and therapeutic applications.

Course Contents:
Tracer techniques; Static and kinetic studies; Dilution principle; Measurement of volumes and spaces; Kinetic theory; Flow studies; Compartmental analysis; Transit times; Convolution and deconvolution; Fourier analysis; Ferro kinetic studies; Regional blood flow measurement; General principles of data processing; Scintillation camera data collection; Static image processing; Image correction, Selective enhancement; Interpretation; Thresholding; Contours; Data bounding and fitting; Dynamic data collection; Modes and methods of analysis; Quantitative functional analysis in cardiac, pulmonary and renal systems.

**Teaching Methodology:**

- Lectures (Power point presentations)
- Written Assignments/ Quizzes if required: There will be assignments /quizzes during session. Late submission and copied assignments will not be accepted

**Assessments:**

- Written coursework/project assignments, two written sessional exams completed during term-time worth 50% of the total course mark.
- Unseen written Final examination comprising of MCQs, ESQs worth 50% of the total course mark

**References:**


**CMS-211 Grooming & Sprucing – II (Personality Development)**

Personal impressions about life at PIEAS: Academic progress achieved, extracurricular activities, Difficulties /problems faced by students, any observation and /or suggestion, Social etiquette comprising of dress code, ethical behavior of dress code, eating manners, stress management.

Habits of effective people, be proactive ,begin with the end in mind ,put first things first ,think win-win, seek first to understand then be understood ,synergize and keep improving, power point presentation on topic of choice.

**References:**
• Stephen R. Covey, The 7 habits of highly effective people powerful lessons in personal change, Simon and Schuster, 2004.

**MS- 510 Introduction to Nuclear Technology**

**Course Details:**

<table>
<thead>
<tr>
<th>Compulsory</th>
<th>Institutional Requirement</th>
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<tr>
<td>Credits</td>
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<td>Prerequisite</td>
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<td>Course Format</td>
<td>One hour of lecture per week</td>
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**Course Objectives:**

This noncredit hour course is designed to give basic concepts of nuclear technology including nuclear reactor working. It also give a comprehensive overview of the developments and milestones achieved by PAEC in field of nuclear technology.

**Course Contents:**

Developments in physics leading to the discovery of nuclear fission; Development of nuclear technology; Review of nuclear reactors and fuel cycle facilities; Present status of nuclear power in Pakistan and in the world; Current problems and future prospects of nuclear power.


**MS-697 Thesis Project**

In collaboration with a project supervisor each fellow/student arranges a clinical project for the MS thesis.
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Course Objective:

The purpose of the project is to acquaint the fellow\student with the techniques of research in nuclear medicine, particularly as it relates to developing or evaluating instrumentation and radiopharmaceuticals, and the utility of new radio-nuclides or radiopharmaceuticals. This project does not necessarily have to be a completely original study but should exhibit a thorough knowledge of the subject and should be an exhaustive review of the literature on that particular topic. The area covered by the project should include nuclear physics, instrumentation, nuclear medicine statistics, dosimetry, etc. The aim of the project is to train the fellows in planning and conducting research projects and writing scientific papers. Finally the fellows/students have to present and defend the research work in front of a panel of experts.

Assessments:

Project theses are sent to national and international experts in field of nuclear medicine for final assessment.

- Final defense presentation and VIVA VOCE worth 50% of the total course mark.
- Written evaluation report and grading collected from panel of examiners worth 50% of the total course mark

MS-690 Intensive Clinical Training in Nuclear Medicine

For clinical training, each fellow\student is attached to a specialist at a nuclear medical centre, who is responsible for providing guidance and supervision in clinical procedures.

Course Details:

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**Prerequisite** | **Nil**

**Course Objectives:**

The purpose of the training program includes the diagnostic, therapeutic and investigational uses of radio-nuclides. It is of sufficient breadth to ensure that student is thoroughly acquainted with the techniques and methods of major nuclear medicine diagnostic and therapeutic applications. The training program is designed to give fellows\students ample opportunity to attain competence in correlating the patient’s problems with optimum selection of nuclear medicine studies, performing these studies, interpreting the information obtained, correlating this information with other diagnostic studies and following up patients receiving radionuclide therapy. Fellows are encouraged to perform a wide variety of studies so that the methods of investigation are fully assimilated. During the training Fellows have to take histories, do physical examination, handle the gamma camera, work on computers and they are also encouraged to interpret the scans and to write provisional reports.

**Assessments:**

At the end of the training period (4th semester) a comprehensive examination including OSCE, TOACs and viva is conducted in which the acquired level of competence of the fellows in terms of theoretical knowledge and ability of image interpretation is evaluated by the examiners.