# NUCLEAR MEDICINE

## CLINICAL MEDICINE 1

### FOURTH YEAR

2025/2026.

Subject:

# NUCLEAR MEDICINE

The course is evaluated with 4 ECTS. There are 3 hours of active teaching per week (1 hour of lecture, 1 hour of work in a small group, 1 hour of seminars).

## Teachers:

| | Name and surname | e-mail address | Title |
|---|---|---|---|
| 1. | Vladimir Vukomanović | vukomanovic@gmail.com | Associate professor |
| 2. | Vesna Ignjatović | vesnaivladaignjatovic@gmail.com | Assistant professor |
| 3. | Katarina Vuleta Nedić | kvuleta87@gmail.com | Teaching assistant |
| 4. | Jelena Đorđević | jeladj997@gmail.com | teaching assistant |

## COURSE STRUCTURE:

| Module | Name of the module | Weeks | Lectures weekly | Work in a small group per week | Teacher in charge |
|---|---|---|---|---|---|
| 1 | Biophysical basis and clinical application of nuclear medicine imaging | 7 | 1 | 1 | Assoc. Prof. Dr Vladimir Vukomanović |
| 2 | Clinical application of nuclear medicine imaging and therapy | 8 | 1 | 1 | Asst. Prof. Dr Vesna Ignjatović |
| | | | | | Σ 15+15=30 |

## EVALUATION:

In the points-based grading system, the grade is equivalent to a total number of points earned in a class and each activity (see tables):

**ACTIVITY DURING THE LESSON:**

Student can earn up to 30 points by answering questions and seminars from every lecture week. During the special part of the work in a small group the student can earn 0-2 points in accordance with the acquired knowledge.

**MODULE TESTS:**

Student can earn up to 40 points according to the attached table.

**FINAL EXAM**:

Students can earn up to 30 points, at final evaluation of acquired knowledge and skills. The final exam covers the overall knowledge throughout the entire lesson materials and curriculum. Examinations are performance assessments and can be carried out in written and/or oral form. The final examination is held before a committee. During the examination, the student's task is to respond to the 5 randomly drawn questions (each question is worth 0-6 points).

| MODULE | | MAXIMUM NUMBER OF POINTS | | | |
|---|---|---|---|---|---|
| | | Activity during the lesson | Module tests | Final exam | Σ |
| 1 | Fundamentals of biophysics and clinical application of diagnostic procedures in nuclear medicine | 14 | 20 | | 34 |
| 2 | Clinical application of nuclear medicine diagnostic and therapeutic procedures | 16 | 20 | | 36 |
| | | | | 30 | 30 |
| **Σ** | | **30** | **40** | **30** | **100** |

**TEACHING CONSULTATIONS:** Consultations can be scheduled with the head of the department. Prof. Dr Vladimir Vukomanović, vukomanovic@gmail.com

**The final grade is formed as follows:**

In order to pass the course, the student must obtain a minimum of 51 points, and pass all the modules.
In order to pass the module, the student must:
1. earn more than 50% of points from the module
2. earn more than 50% of points from activity during the lessons
3. pass the module test, with minimum 50% of correct answers

Passing all the modules, the student can gain the maximum of 70 points. Passing the final exam, the student can earn the maximum of 30 points in addition. The final grade is formed as the sum of total number of points from the module and the final exam, in accordance with the table.

| Number of points won | Grade |
|---|---|
| 0 - 50 | **5** |
| 51 - 60 | **6** |
| 61 - 70 | **7** |
| 71 - 80 | **8** |
| 81 - 90 | **9** |
| 91 - 100 | **10** |

# MODULE TESTS

## MODULE 1.

**MODULE 1. TEST**
**0-20 POINTS**

**EVALUATION OF MODULE 1.**
The test has 20 questions.
Each question is worth 1 point.

## MODULE 2.

**MODULE 2. TEST**
**0-20 POINTS**

**EVALUATION OF MODULE 2.**
The test has 20 questions.
Each question is worth 1 point.

## LITERATURE:

| Module | The name of the textbook | Authors | Publisher |
|---|---|---|---|
| Fundamentals of biophysics and clinical application of diagnostic procedures in nuclear medicine | Nuclear Medicine: A Core Review. 2nd edition | Shah C, Bradshaw M, Dalal I. | Philadelphia: Wolters Kluver Lippincott Williams&Wilkins; 2021. |
| Clinical application of nuclear medicine diagnostic and therapeutic procedures | Nuclear Medicine and Molecular Imaging: The Requisites. | O'Malley J, Ziessman H. 5th edition. | Elsevier Science; 2020. |
| | Nuclear Medicine Physics. 8th edition. | Chandra R, Rahmim A. | Philadelphia: Wolters Kluwer; 2018. |

**The presentations can be found on the website of the Faculty of Medical Sciences :www.medf.kg.ac.rs**

# PROGRAM:

## MODULE 1: BIOPHYSICAL BASIS AND CLINICAL APPLICATION OF NUCLEAR MEDICINE IMAGING

TEACHING UNIT 1 (FIRST WEEK):

### A BIOPHYSICAL BASIS OF DIAGNOSTIC AND THERAPEUTIC PROCEDURES

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Biophysical basis of diagnostic and therapeutic procedures in nuclear medicine<br><br>**Goals:**<br>• Refresh your understanding of atomic and nuclear structure<br>• Comprehend the biological and physical principles underlying radionuclide techniques<br>• Understand the physical basis of radioactive isotopes<br>• Adopt the basic principles of the interaction of radiation with matter | • Biophysics for nuclear medicine<br><br>**Goals:**<br>• Understand and adopt the biophysical basis of nuclear medicine |

TEACHING UNIT 2 (SECOND WEEK):

### IMAGING SYSTEMS IN NUCLEAR MEDICINE

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Imaging systems in nuclear medicine<br><br>**Goals:**<br>• Nuclear medicine instrumentation<br>• The gamma scintillation camera<br>• Positron emission tomography - PET<br>• Hybrid imaging systems - SPECT/CT, PET/CT | • Imaging systems in nuclear medicine<br><br>**Goals:**<br>• Understand and adopt the working principles of the detectors used in nuclear medicine |

TEACHING UNIT 3 (THIRD WEEK):

### RADIOPHARMACOLOGY

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Radiopharmaceuticals<br>• Radionuclide generators<br>• Biophysical basis of radionuclide application in medicine<br><br>**Goals:**<br>• Radionuclides production<br>• 99Mo-99mTc generator<br>• radiopharmaceutical chemistry<br>• mechanisms of biodistribution of radiopharmaceuticals<br>• RIA (radioimmuno assay) | • Radionuclide generators<br>• The process of radiopharmaceutical labeling<br><br>**Goals:**<br>• Perform elution the test generator<br>• Understand the principles of preparation of radiopharmaceuticals<br>• Understand the basic principles of RIA analyses |

TEACHING UNIT 4 (FOURTH WEEK):

## RADIOBIOLOGY AND RADIATION PROTECTION

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Sources and types of ionizing radiation<br>• The biological effects of radiation exposure<br>• Mechanisms of cell damage<br>• Stochastic and deterministic radiation effects. Doses<br>• Radiation protection (professionally exposed personnel, patients, other persons).<br><br>**Goals:**<br>• The impact of ionizing radiation on cells and the entire organism.<br>• Deterministic and stochastic effects of radiation<br>• Etiology and pathogenesis of acute and chronic radiation syndrome | • Radiation protection<br><br>**Goals:**<br>• Understand and adopt the principles of protecting personnel, patients and third parties from ionizing radiation |

TEACHING UNIT 5 (FIFTH WEEK):

## DIAGNOSTIC PROCEDURES IN CARDIOLOGY

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • First Pass technique -Radionuclide angiocardiography<br>• Radionuclide ventriculography (equilibrium ECG-gated technique)<br>• Myocardial perfusion imaging<br>• Visualization of acute myocardial infarction<br>• Evaluation of myocardial metabolism<br>• Determination of blood volume, plasma volume and red blood cell volume<br>• Determination of erythrocytes and platelets lifespan<br><br>**Goals:**<br>• Indications, basic principles for nuclear angiocardiography and ventriculography (equilibrium ECG-gated)<br>• Indications, basic principles for myocardial perfusion imaging<br>• Indications, basic principles for acute myocardial infarction imaging<br>• Indications, basic principles for myocardial viability<br>• Positron emission tomography and hybrid visualization systems in cardiology | • Nuclear cardiology<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion of clinical cases in nuclear cardiology |

TEACHING UNIT 6 (SIXTH WEEK):

## DIAGNOSTIC PROCEDURES IN THYROIDOLOGY

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Morphological and functional assessment of the thyroid gland<br>• Functional and morphological in vivo tests<br>• Functional in vitro tests<br>• The role of nuclear medicine in the diagnosis and therapy of benign diseases of the thyroid gland. Treatment of hyperthyroidism.<br><br>**Goals:**<br>• Indications, basic principles for thyroid gland assessment<br>• Clinical significance of radionuclide therapy of benign thyroid disorders | • Nuclear endocrinology<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion of clinical cases in nuclear endocrinology and radioiodine treatment of hyperthyroidism (Graves' disease and toxic goiter) |

TEACHING UNIT 7 (SEVENTH WEEK):

**DIAGNOSTIC PROCEDURES IN ENDOCRINOLOGY**

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Imaging and functional assessment of the parathyroid glands<br>• Imaging and functional assessment of the cortex and medulla of the adrenal glands, as well as pituitary gland.<br>• Somatostatin receptor scintigraphy (imaging of NET's)<br><br>**Goals:**<br>• Indications, basic principles for endocrine glands disordres (parathyroid glands, cortex and medulla of the adrenal glands and pituitary gland) | • Nuclear endocrinology<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion of clinical cases in nuclear endocrinology |

# MODULE 2: CLINICAL APPLICATION OF NUCLEAR MEDICINE IMAGING AND THERAPY

TEACHING UNIT 8 (EIGHT WEEK):

**DIAGNOSTIC PROCEDURES IN NEUROLOGY AND PSYCHIATRY**

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Cerebral radionuclide angiography<br>• Standard brain scintigraphy<br>• Cisternography. The determination of regional cerebral blood flow.<br>• Brain perfusion scan<br>• Imaging of brain metabolism. Functional brain receptor imaging<br>• Imaging of brain tumors<br><br>**Goals:**<br>• Indications, basic principles for: standard brain scintigraphy, cisternography of regional cerebral blood flow, brain perfusion scan, metabolic and functional brain imaging<br>• Indications, basic principles for neuroimaging in psychiatric disorders | • Nuclear neurology and psychiatry<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion of clinical cases in neurology and psychiatry |

TEACHING UNIT 9 (NINTH WEEK):

**DIAGNOSTIC PROCEDURES IN GASTROENTEROLOGY**

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Salivary gland scintigraphy<br>• Esophageal transit scintigraphy and gastroesophageal reflux scintigraphy. Gastric emptying scintigraphy. Enterogastric reflux detection<br>• Nuclear medicine breath tests<br>• Intestinal absorption tests in gastroenterology<br>• Imaging of intestinal bleeding. Imaging of Meckel's diverticulum.<br><br>**Goals:**<br>• Indications, basic principles for salivary gland scintigraphy, esophageal transit scintigraphy, gastroesophageal, gastric emptying, enterogastric reflux and breath tests in nuclear medicine | • Nuclear gastroenterology<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion of clinical cases in nuclear gastroenterology |

TEACHING UNIT 10 (TENTH WEEK):

## DIAGNOSTIC PROCEDURES IN HEPATOLOGY

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Hepatobiliary scintigraphy<br>• Liver blood pool scan<br>• Liver and spleen scintigraphy<br><br>**Goals:**<br>• Indications, basic principles for liver diseases | • Nuclear hepatology<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion of clinical cases in nuclear hepatology |

TEACHING UNIT 11 (ELEVENTH WEEK):

## DIAGNOSTIC PROCEDURES IN PULMONOLOGY

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Lung perfusion scan<br>• Ventilation lung scan<br>• Aerosols ventilation scintigraphy<br>• Imaging of malignant tumors<br><br>**Goals:**<br>• Indications, basic principles for lung perfusion and ventilation scintigraphy<br>• Indications, basic principles for lung tumors imaging | • Nuclear pulmonology<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion of clinical cases in nuclear pulmonology |

TEACHING UNIT 12 (TWELFTH WEEK):

## DIAGNOSTIC PROCEDURES IN NEPHROUROLOGY

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Radiorenography. Diuretic radiorenography.<br>• Static and dynamic kidney scintigraphy.<br>• GRF and ERPF measurement.<br><br>**Goals:**<br>• Radiopharmaceuticals for kidney function evaluation.<br>• Indications, basic principles for radiorenography<br>• Indications, basic principles for renal scintigraphy | • Nuclear nephrourology<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion of clinical cases in nuclear nephrourology |

TEACHING UNIT 13 (THIRTEENTH WEEK):

## DIAGNOSTIC PROCEDURES IN ONCOLOGY 1

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Tumor-seeking radiopharmaceuticals<br>• Imagin of solid tumors<br>• Imaging metastatic disease<br>• Somatostatin receptor scintigraphy | • Nuclear oncology<br>• Clinical application |

- Lymphoscintigraphy - intraoperative detection of sentinel lymph nodes
- Bone scintigraphy in primary and secondary bone tumors
- Immunoscintigraphy.

**Goals:**
- Radiopharmaceuticals for the of malignant tumors imaging
- Indications, basic principles for malignant tumors imaging
- Indications, basic principles for somatostatin receptor scintigraphy
- Indications, basic principles for intraoperative detection of tumors and sentinel lymph nodes
- Indications, basic principles for bone scintigraphy
- Indications, basic principles for immunoscintigraphy

**Goals:**
- Demonstration and discussion on different cases in nuclear oncology

TEACHING UNIT 14 (FOURTEENTH WEEK):

## DIAGNOSTIC PROCEDURES IN ONCOLOGY 2

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Positron emission tomography PET/CT<br>• Pharmacokinetics and application of $^{18}$FDG<br>• The role of PET in the diagnostic algorithm<br>• The role of PET in TNM tumor classification (staging, restaging, follow up)<br>• The role of PET in the therapeutic response (PERCIST vs RECIST)<br>• The role of PET in radiation therapy planning<br><br>**Goals:**<br>• PET radiopharmaceuticals malignant tumors imaging<br>• Understand the $^{18}$FDG biokinetics in malignant tumors<br>• Indications, basic principles for PET imaging, therapeutic response of malignant and radiotherapy planning. | • Nuclear oncology<br>• Clinical application<br><br>**Goals:**<br>• Demonstration and discussion on different cases in nuclear oncology |

TEACHING UNIT 15 (FIFTEENTH WEEK):

## RADIONUCLIDE THERAPY

| 1 hour of lecture | 1 hour of work in small group |
|---|---|
| • Radiopharmaceuticals for radionuclide therapy<br>• Radionuclide therapy of malignant tumors of the thyroid gland, neuroendocrine tumors, liver cancers, painful bone metastases.<br>• Radioimmunotherapy<br>• New directions in Cancer Treatment using radionuclide therapy<br><br>**Goals:**<br>• Radionuclides for the treatment of malignant tumors<br>• Indications, basic principles for radionuclide therapy of the thyroid gland cancer, liver cancer, neuroendocrine tumors, painful bone metastases<br>• Indications, basic principles for radioimmunotherapy | • Nuclear medicine in therapy<br>• Clinical application<br><br>**Goals:**<br>• Indications for radionuclide therapy |

| module | week | type | method unit name | teacher |
|---|---|---|---|---|
| 1 | 1 | **L** | A BIOPHYSICAL BASIS OF DIAGNOSTIC AND THERAPEUTIC PROCEDURES | Asst. Prof. Dr Vladimir Vukomanović (replacement Asst. Prof. Dr Vesna Ignjatović) |
| 1 | 1 | **P** | A BIOPHYSICAL BASIS OF DIAGNOSTIC AND THERAPEUTIC PROCEDURES | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 1 | 2 | **L** | IMAGING SYSTEMS IN NUCLEAR MEDICINE | Asst. Prof. Dr Vladimir Vukomanović (replacement Asst. Prof. Dr Vesna Ignjatović) |
| 1 | 2 | **P** | IMAGING SYSTEMS IN NUCLEAR MEDICINE | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 1 | 3 | **L** | RADIOPHARMACOLOGY | Asst. Prof. Dr Vesna Ignjatović (replacement Asst. Prof. Dr Vladimir Vukomanović) |
| 1 | 3 | **P** | RADIOPHARMACOLOGY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 1 | 4 | **L** | RADIOBIOLOGY AND RADIATION PROTECTION | Asst. Prof. Dr Vesna Ignjatović (replacement Asst. Prof. Dr Vladimir Vukomanović) |
| 1 | 4 | **P** | RADIOBIOLOGY AND RADIATION PROTECTION | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 1 | 5 | **L** | DIAGNOSTIC PROCEDURES IN CARDIOLOGY | Asst. Prof. Dr Vesna Ignjatović (replacement Asst. Prof. Dr Vladimir Vukomanović) |
| 1 | 5 | **P** | DIAGNOSTIC PROCEDURES IN CARDIOLOGY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 1 | 6 | **L** | DIAGNOSTIC PROCEDURES IN THYROIDOLOGY | Asst. Prof. Dr Vesna Ignjatović (replacement Asst. Prof. Dr Vladimir Vukomanović) |

| module | week | type | method unit name | teacher |
|---|---|---|---|---|
| 1 | 6 | **P** | DIAGNOSTIC PROCEDURES IN THYROIDOLOGY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 2 | 7 | **L** | DIAGNOSTIC PROCEDURES IN ENDOCRINOLOGY | Asst. Prof. Dr Vladimir Vukomanović (replacement Asst. Prof. Dr Vesna Ignjatović) |
| 2 | 7 | **P** | DIAGNOSTIC PROCEDURES IN ENDOCRINOLOGY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 2 | 8 | **L** | DIAGNOSTIC PROCEDURES IN NEUROLOGY AND PSYCHIATRY | Asst. Prof. Dr Vesna Ignjatović (replacement Asst. Prof. Dr Vladimir Vukomanović) |
| 2 | 8 | **P** | DIAGNOSTIC PROCEDURES IN NEUROLOGY AND PSYCHIATRY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 2 | 9 | **L** | DIAGNOSTIC PROCEDURES IN GASTROENTEROLOGY | Asst. Prof. Dr Vladimir Vukomanović (replacement Asst. Prof. Dr Vesna Ignjatović) |
| 2 | 9 | **P** | DIAGNOSTIC PROCEDURES IN GASTROENTEROLOGY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 2 | 10 | **L** | DIAGNOSTIC PROCEDURES IN HEPATOLOGY | Asst. Prof. Dr Vesna Ignjatović (replacement Asst. Prof. Dr Vladimir Vukomanović) |
| 2 | 10 | **P** | DIAGNOSTIC PROCEDURES IN HEPATOLOGY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 2 | 11 | **L** | DIAGNOSTIC PROCEDURES IN PULMONOLOGY | Asst. Prof. Dr Vladimir Vukomanović (replacement Asst. Prof. Dr Vesna Ignjatović) |
| 2 | 11 | **P** | DIAGNOSTIC PROCEDURES IN PULMONOLOGY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |

| module | week | type | method unit name | teacher |
|---|---|---|---|---|
| 2 | 12 | **L** | DIAGNOSTIC PROCEDURES IN NEPHROUROLOGY | Asst. Prof. Dr Vladimir Vukomanović (replacement Asst. Prof. Dr Vesna Ignjatović) |
| 2 | 12 | **P** | DIAGNOSTIC PROCEDURES IN NEPHROUROLOGY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 2 | 13 | **L** | DIAGNOSTIC PROCEDURES IN ONCOLOGY 1 | Asst. Prof. Dr Vladimir Vukomanović (replacement Asst. Prof. Dr Vesna Ignjatović) |
| 2 | 13 | **P** | DIAGNOSTIC PROCEDURES IN ONCOLOGY 1 | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 2 | 14 | **L** | DIAGNOSTIC PROCEDURES IN ONCOLOGY 2 | Asst. Prof. Dr Vladimir Vukomanović (replacement Asst. Prof. Dr Vesna Ignjatović) |
| 2 | 14 | **P** | DIAGNOSTIC PROCEDURES IN ONCOLOGY 2 | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |
| 2 | 15 | **L** | RADIONUCLIDE THERAPY | Asst. Prof. Dr Vesna Ignjatović (replacement Asst. Prof. Dr Vladimir Vukomanović) |
| 2 | 15 | **P** | RADIONUCLIDE THERAPY | Asst. Prof. Dr Vesna Ignjatović Asst. Prof. Dr Vladimir Vukomanović TA Katarina Vuleta Nedić |

QUESTIONS FOR THE FINAL EXAM

1. Interactions of gamma radiation with matter;
2. Ionization detectors;
3. Gamma scintillation camera-basic characteristics;
4. Positron emission tomography-PET;
5. Machines for production of radionuclides;
6. Radiopharmaceuticals (characteristics, biodistribution);
7. $^{99}$Mo-$^{99m}$Tc generator;
8. Use of radiolabeled compounds in metabolic assessment;
9. Biological effects of radiation;
10. Radiation protection of professionally exposed staff and patients;
11. Functional assessment of the thyroid gland;
12. Thyroid scintigraphy;
13. Adrenal cortical scintigraphy;
14. Parathyroid scintigraphy;
15. Nuclear angiocardiography - NAC and radionuclide ventriculography - RVG;
16. Myocardial perfusion scan;
17. Novel radiopharmaceuticals and methods of functional and morphological assessment in nuclear cardiology;
18. Lung perfusion scan;
19. Ventilation lung scintigraphy;
20. Salivary gland scintigraphy;
21. Esophageal transit scintigraphy, gastroesophageal reflux scintigraphy and enterogastric reflux detection;
22. Detection of intestinal bleeding;
23. Detection of Meckel's diverticulum;
24. Colloid and blood pool liver scintigraphy;
25. Spleen scintigraphy;
26. Hepatobiliary scintigraphy;
27. Diuretic radiorenography;
28. Dynamic kidney scintigraphy;
29. Static kidney scintigraphy;
30. Measurement of red cell lifespan and determining the place of their destruction;
31. Ferrokinetics;
32. Bone marrow scintigraphy;
33. Measurement of vitamin B12 absorption - Schilling's test
34. Standard brain scintigraphy;
35. Brain perfusion scan;
36. Imaging brain metabolism;
37. The principle of visualizing pathological entities with tumorotropic radiopharmaceuticals in nuclear oncology?
38. The principle and clinical significance of scintigraphy with radiolabeled somatostatin analogs?
39. The principle and clinical significance of scintigraphy with radiolabeled mIBG?
40. Clinical significance of lymphoscintigraphy in oncological surgery?
41. Principle and clinical significance of bone scintigraphy?
42. Immunoscintigraphy;
43. Radiopharmaceuticals for PET diagnostics in oncology;
44. The role of $^{18}$FDG-PET in diagnostic oncology?
45. Therapeutic use of radionuclides and radiopharmaceuticals in the treatment of malignant tumors;
46. The principle of radioiodine treatment of differentiated thyroid carcinomas;
47. The principle of treatment of neuroendocrine tumors with radiolabelled somatostatin analogues?
48. Therapy of pheochromocytoma and other neuroectodermal tumors with $^{131}$MIBG;
49. Therapy of painful bone metastases;
50. Therapy of hyperthyroidism with radioactive iodine