



CLINICAL MEDICINE 1

FOURTH YEAR

2023/2024.

**THERAPEUTIC APPLICATION OF IONIZING
RADIATION**

Subject:

THERAPEUTIC APPLICATION OF IONIZING RADIATION

The course is evaluated with 3 ECTS. There are 3 hours of active teaching per week (2 hour of lectures and 1 hour of work in a small group).

Teachers:

SB		e-mail address	Title
1.	Vladimir Vukomanovic	vukomanovic@gmail.com	Assistant professor
2.	Vesna Ignjatovic	vesnaivladaignjatovic@gmail.com	Assistant professor
3.	Marija Zivković Radojevic	makizivkovicmarija@gmail.com	Assistant professor
4.	Neda Milosavljevic	neda.milosavljevic@yahoo.com	Assistant professor
5.	Katarina Vuleta Nedic	kvuleta87@gmail.com	Teaching assistant

COURSE STRUCTURE:

Module	Name of the module	Weeks	Lectures weekly	Work in a small group per week	Teacher
1	Radionuclide therapy	8	2	1	Vesna Ignjatovic
2	Radiotherapy	7	2	1	Marija Zivković Radojevic
					$\Sigma 30+15=45$

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). Points are earned in the following ways:

ACTIVITY DURING THE LESSON:

In this way, the student can earn up to 30 points by answering 2 exam questions from that lecture week during the special part of the work in a small group and receiving 0-2 points in accordance with the demonstrated knowledge.

MODULE TESTS:

In this way, the student can earn up to 40 points according to the attached table.

FINAL EXAM

In this way, the student can earn up to 30 points according to the attached table.

MODULE		MAXIMUM NUMBER OF POINTS			
		Activity during the lesson	Module tests	Final exam	Σ
1	Basics use of ionizing radiation in nuclear medicine	16	20		36
2	Basics use of ionizing radiation in radiotherapy	14	20		34
				30	30
Σ		30	40	30	100

TEACHING CONSULTATIONS: Consultations can be scheduled with the head of the department, Asst. 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 activity during the lessons
2. pass the module test, with minimum 50% of correct answers

The final grade is formed as the sum of total number of points from the module and the final written test, 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 TEST

The test has 20 questions.
Each question is worth 1 points.

MODULE 2

MODULE 2 TEST **0-20 points**

EVALUATION OF TEST

The test has 20 questions.
Each question is worth 1 points.

The name of the textbook	Authors	Publisher
Nuclear Medicine: A Core Review. 2nd edition.	Shah C, Bradshaw M, Dalal I, editors	Philadelphia: Wolters Kluver Lippincott
Nuclear Medicine and Molecular Imaging: The Requisites.. 5th dition	O'Malley J, Ziessman H.	Elsevier Science; 2020.
Cancer, Principles and practice of Oncology	DeVita, Hellman, Rosenberg	J.B. Lippincott Company
Clinical Oncology Basic Principles and Practice, 5 th Ed	Peter Hoskin	CRC Press, Taylor&Francis Group
Perez & Brady's Principles and Practice of Radiation Oncology	Halperin EC, Wazer DE, Perez CA. Brady LW	LWW Lippincott Williams and Wilkins 7th ed, 2018.

PROGRAM:

MODULE 1: RADIONUCLIDE THERAPY

TEACHING UNIT 1 (FIRST WEEK)

BIOPHYSICAL BASIS OF THE USE OF IONIZING RADIATION IN MEDICINE

2 hours of lectures	1 hour of work in a small group
<ul style="list-style-type: none">• Biophysical basis of the use of ionizing radiation sources in medicine;• Devices for the production and detection of radionuclides	Biophysical basis of the use of ionizing radiation in medicine

TEACHING UNIT 2 (SECOND WEEK)

BASICS OF RADIOBIOLOGY AND RADIONUCLIDE THERAPY

2 hours of lectures	1 hour of work in a small group
<ul style="list-style-type: none">• Basics of radiobiology; Basic principles of radiation protection of exposed staff and population;• Basics of radionuclide therapy	Basics of radiobiology and radionuclide therapy

TEACHING UNIT 3 (THIRD WEEK)

APPLICATION OF RADIOACTIVE ISOTOPES IN THE THERAPY OF BENIGN DISEASES

2 hours of lectures	1 hour of work in a small group
<ul style="list-style-type: none">• Application of radioactive isotopes in the therapy of benign diseases of the endocrine and skeletal system	Application of radioactive isotopes in the therapy of benign diseases of the endocrine and skeletal system.

TEACHING UNIT 4 (FOURTH WEEK)

ROLE OF NUCLEAR MEDICINE IN THERAPY OF THYROID CANCER

2 hours of lectures	1 hour of work in a small group
<ul style="list-style-type: none">• Application of radioactive isotopes in the treatment of malignant diseases of thyroid gland.	Role of nuclear medicine in therapy of thyroid cancer

TEACHING UNIT 5 (FIFTH WEEK)

RADIONUCLIDE THERAPY OF NEUROENDOCRINE TUMORS

2 hours of lectures	1 hour of work in a small group
<ul style="list-style-type: none">• Radionuclide Therapy of Neuroendocrine Tumors.	Radionuclide Therapy of Neuroendocrine Tumors.

TEACHING UNIT 6 (SIXTH WEEK)

RADIONUCLIDE THERAPY OF PROSTATE CANCER

2 hours of lectures	1 hour of work in a small group
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Radionuclide therapy of prostate cancer

Radionuclide therapy of prostate cancer

TEACHING UNIT 7 (SEVENTH WEEK)

NUCLEAR MEDICINE THERAPY OF BONE METASTASIS AND LIVER METASTASIS

2 hours of lectures	1 hour of work in a small group
<ul style="list-style-type: none">Nuclear medicine therapy of bone metastasis and liver metastasis.	General principles of nuclear medicine therapy of bone metastasis and liver metastasis

TEACHING UNIT 8 (EIGHT WEEK)

SPECIAL TOPICS IN NUCLEAR MEDICINE THERAPY

2 hours of lectures	1 hour of work in a small group
Nuclear medicine therapy of hematological diseases. special topics in nuclear medicine therapy	Nuclear medicine therapy of hematological diseases. special topics in nuclear medicine therapy

SECOND MODULE: RADIOTHERAPY

TEACHING UNIT 9 (NINTH WEEK)

INTRODUCTION TO RADIATION ONCOLOGY

2 hours of lectures	1 hour of work in a small group
Basic principles of radiation oncology and radiobiology, indication for radiotherapy and techniques	Basic principles of radiation oncology and radiobiology, indication for radiotherapy and techniques

TEACHING UNIT 10 (TENTH WEEK)

**RADIOTHERAPY OF CENTRAL NERVOUS SYSTEM TUMORS
RADIOTHERAPY OF HEAD AND NECK MALIGNANCIES**

2 hours of lectures	1 hour of work in a small group
Radiotherapy of central nervous system tumors Radiotherapy of head and neck malignancies	Radiotherapy of central nervous system tumors Radiotherapy of head and neck malignancies

TEACHING UNIT 11 (ELEVENTH WEEK)

**RADIOTHERAPY OF THORACIC MALIGNANCIES
BREAST CANCER RADIOTHERAPY**

2 hours of lectures	1 hour of work in a small group
Radiotherapy of thoracic malignancies Breast cancer radiotherapy	Radiotherapy of thoracic malignancies Breast cancer radiotherapy

TEACHING UNIT 12 (TWELFTH WEEK)

**RADIOTHERAPY OF GYNECOLOGICAL MALIGNANCIES
SPECIAL CONSIDERATIONS FOR RADIOTHERAPY**

2 hours of lectures	1 hour of work in a small group
Radiotherapy of gynecological malignancies Special considerations for radiotherapy – vulnerable population – radiotherapy in pediatric population and elderly	Radiotherapy of gynecological malignancies Special considerations for radiotherapy – vulnerable population – radiotherapy in pediatric population and elderly

TEACHING UNIT 13 (THIRTEENTH WEEK)

**RADIOTHERAPY OF GASTROINTESTINAL MALIGNANCIES
BENIGN CONDITIONS – INDICATIONS FOR RADIOTHERAPY**

2 hours of lectures	1 hour of work in a small group
Radiotherapy of gastrointestinal malignancies Benign conditions – indications for radiotherapy	Radiotherapy of gastrointestinal malignancies Benign conditions – indications for radiotherapy

TEACHING UNIT 14 (FOURTEENTH WEEK)

**RADIOTHERAPY OF UROGENITAL MALIGNANCIES
SPECIAL CONSIDERATIONS FOR RADIOTHERAPY**

2 hours of lectures	1 hour of work in a small group
Radiotherapy of urogenital malignancies Special considerations for radiotherapy – palliative radiotherapy; radiotherapy of cancers with unknown primary origin	Radiotherapy of urogenital malignancies Special considerations for radiotherapy – palliative radiotherapy; radiotherapy of cancers with unknown primary origin

TEACHING UNIT 15 (FIFTEENTH WEEK)

**RADIOTHERAPY OF HEMATOLOGIC MALIGNANCIES
RADIOTHERAPY OF BONE, SOFT TISSUE AND SKIN MALIGNANCIES**

2 hours of lectures	1 hour of work in a small group
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Radiotherapy of hematologic malignancies
Radiotherapy of bone, soft tissue and skin malignancies

Radiotherapy of hematologic malignancies
Radiotherapy of bone, soft tissue and skin malignancies

WEEKLY COURSE SCHEDULE

Schedule of practice:

Department for nuclear medicine, University clinical center
Kragujevac

Department for radiotherapy, University clinical center
Kragujevac

COURSE	MONDAY	TUESDAY	WEDNESDAY
THERAPEUTIC APPLICATION OF IONIZING RADIATION (2+1)	LECTURES 11:30 - 13:00 (H1) PRACTICE* 15:30 - 17:45 (Centre for NM UCCK) clinical group I,II,III	PRACTICE* 16:15 - 18:30 (Centre for NM UCCK) clinical group IV,V,VI	PRACTICE 15:30 - 17:45 (Centre for NM UCCK) clinical group VII,VIII

module	week	place	type	method unit name
1	1	L	BIOPHYSICAL BASIS OF THE USE OF IONIZING RADIATION IN MEDICINE.	Vladimir Vukomanovic
1	1	P	BIOPHYSICAL BASIS OF THE USE OF IONIZING RADIATION IN MEDICINE	Vladimir Vukomanovic Vesna Ignjatovic Katarina Vuleta Nedic
1	2	L	BASICS OF RADIOBIOLOGY AND RADIONUCLIDE THERAPY	Vesna Ignjatovic
1	2	P	BASICS OF RADIOBIOLOGY AND RADIONUCLIDE THERAPY	Vladimir Vukomanovic Vesna Ignjatovic Katarina Vuleta Nedic
1	3	L	APPLICATION OF RADIOACTIVE ISOTOPES IN THE THERAPY OF BENIGN DISEASES	Vesna Ignjatovic
1	3	P	APPLICATION OF RADIOACTIVE ISOTOPES IN THE THERAPY OF BENIGN DISEASES	Vladimir Vukomanovic Vesna Ignjatovic Katarina Vuleta Nedic
1	4	L	NUCLEAR MEDICINE THERAPY OF THYROID CANCER	Vladimir Vukomanovic
1	4	P	NUCLEAR MEDICINE THERAPY OF THYROID CANCER	Vladimir Vukomanovic Vesna Ignjatovic Katarina Vuleta Nedic
1	5	L	NUCLEAR MEDICINE THERAPY OF NEUROENDOCRINE TUMORS	Vesna Ignjatovic
1	5	P	NUCLEAR MEDICINE THERAPY OF NEUROENDOCRINE TUMORS.	Vladimir Vukomanovic Vesna Ignjatovic Katarina Vuleta Nedic
1	6	L	NUCLEAR MEDICINE THERAPY OF PROSTATE CANCER	Vladimir Vukomanovic
1	6	P	NUCLEAR MEDICINE THERAPY OF PROSTATE CANCER	Vladimir Vukomanovic Vesna Ignjatovic Katarina Vuleta Nedic

module	week	place	type	method unit name
1	7	L	NUCLEAR MEDICINE THERAPY OF BONE METASTASIS AND LIVER METASTASIS	Vesna Ignjatovic
1	7	P	NUCLEAR MEDICINE THERAPY OF BONE METASTASIS AND LIVER METASTASIS	Vladimir Vukomanovic Vesna Ignjatovic Katarina Vuleta Nedic
2	8	L	NUCLEAR MEDICINE THERAPY OF HEMATOLOGICAL DISEASES. SPECIAL TOPICS IN NUCLEAR MEDICINE THERAPY	Vladimir Vukomanovic
2	8	P	NUCLEAR MEDICINE THERAPY OF HEMATOLOGICAL DISEASES.SPECIAL TOPICS IN NUCLEAR MEDICINE THERAPY	Vladimir Vukomanovic Vesna Ignjatovic Katarina Vuleta Nedic
2	9	L	INTRODUCTION TO RADIATION ONCOLOGY	Neda Milosavljevic
2	9	P	INTRODUCTION TO RADIATION ONCOLOGY	Marija Zivkovic Radojevic Neda Milosavljevic
2	10	L	RADIOTHERAPY OF TUMORS OF CENTRAL NERVOUS SYSTEM RADIOTHERAPY OF HEAD AND NECK MALIGNANCIES	Marija Živkovic Radojevic Neda Milosavljevic
2	10	P	RADIOTHERAPY OF TUMORS OF CENTRAL NERVOUS SYSTEM RADIOTHERAPY OF HEAD AND NECK MALIGNANCIES	Marija Zivkovic Radojevic Neda Milosavljevic
2	11	L	RADIOTHERAPY OF THORACIC MALIGNANCIES BREAST CANCER RADIOTHERAPY	Neda Milosavljevic
2	11	P	RADIOTHERAPY OF THORACIC MALIGNANCIES BREAST CANCER RADIOTHERAPY	Marija Zivkovic Radojevic Neda Milosavljevic
2	12	L	RADIOTHERAPY OF GYNECOLOGICAL MALIGNANCIES SPECIAL CONSIDERATIONS FOR RADIOTHERAPY	Marija Živkovic Radojevic
2	12	P	RADIOTHERAPY OF GYNECOLOGICAL MALIGNANCIES SPECIAL CONSIDERATIONS FOR RADIOTHERAPY	Marija Zivkovic Radojevic Neda Milosavljevic
2	13	L	RADIOTHERAPY OF GASTROINTESTINAL MALIGNANCIES BENIGN CONDITIONS – INDICATIONS FOR RADIOTHERAPY	Marija Živkovic Radojevic

module	week	place	type	method unit name
2	13	P	RADIOTHERAPY OF GASTROINTESTINAL MALIGNANCIES BENIGN CONDITIONS – INDICATIONS FOR RADIOTHERAPY	Marija Zivkovic Radojevic Neda Milosavljevic
2	14	L	RADIOTHERAPY OF UROGENITAL MALIGNANCIES SPECIAL CONSIDERATIONS FOR RADIOTHERAPY	Neda Milosavljevic
2	14	P	RADIOTHERAPY OF UROGENITAL MALIGNANCIES SPECIAL CONSIDERATIONS FOR RADIOTHERAPY	Marija Zivkovic Radojevic Neda Milosavljevic
2	15	L	RADIOTHERAPY OF HEMATOLOGIC MALIGNANCIES RADIOTHERAPY OF BONE, SOFT TISSUE AND SKIN MALIGNANCIES	Marija Živkovic Radojevic
2	15	P	RADIOTHERAPY OF HEMATOLOGIC MALIGNANCIES RADIOTHERAPY OF BONE, SOFT TISSUE AND SKIN MALIGNANCIES	Marija Zivkovic Radojevic Neda Milosavljevic
			Exam	