



Mangalore University  
Medical Physics Division

**M. Sc. in Medical Physics Programme**  
Revised Syllabus

[Prepared as per new Regulations governing the Choice Based Credit (CBCS)  
System for Two Years (Four Semester) post-graduation programme]



---

University Science Instrumentation Centre  
Mangalore University  
Mangalagangothri-574 199  
2019-20

**MANGALORE UNIVERSITY  
MEDICAL PHYSICS DIVISION**

**REGULATIONS AND SCHEME OF EXAMINATIONS FOR TWO – YEAR (FOUR SEMESTERS) MASTER’S DEGREE PROGRAMME IN MEDICAL PHYSICS FOR CHOICE BASED CREDIT SYSTEM (CBCS)**

**Title and Commencement of the programme:**

The programme shall be called **Master of Science in Medical Physics(M. Sc. in Medical Physics)**.

**Learning objectives of the programme:**

- To provide Medical Physics support with the goal of improving the effectiveness and safety in the use of physics and technologies in medicine, especially in low-to-middle income countries.
- To advise, guide, support and/or participate in training through(i) the development of training programs,(ii) participation in training programs,(iii) exchanges of staff and/or students, and/or(iv) facilitation of e-learning.
- To advise, guide, support and/or participate in activities associated with medical physics-related technologies, especially those related to radiation medicine, including:(i) the design of such technologies and related facilities,(ii) the acquisition/purchase of such technologies,(iii) the commissioning of such technologies,(iv) the development and/or review of quality assurance/quality control programs, and(v) the development and/or review of safety-related activities, especially those related to ionizing radiation.
- To build a database of qualified medical physicists with a keen interest in supporting the Vision, Mission and Objectives of Medical Physics for World Benefit. These individuals would generally be members of Medical Physics for World Benefit.

**Programme Outcomes:**

- Acquaint with and understand about the basic theories and concepts of physics applied in medical physics discipline.
- Capable of designing, developing and conducting teaching and training programmes related to medical physics discipline.
- Work as medical physicist and practice consultancy.
- Ensure radiation protection and safety to both general public and patients.
- Augmenting national and international radiation emergencies.

**Programme Specific Outcomes:**

- Understand the role of nuclear and radiation physics in health applications.
- Learn about radiation sources, detectors and radiation generators.

- Acquaint with various instruments used in diagnosis and therapy using nuclear radiations and radioisotopes.
- Install, operate, maintain the equipment used in diagnosis and therapy and provide quality assurance.
- Learn about nuclear medicine, its practice and protocols of different applications.
- Equip with knowledge to provide and practice radiation protection and safety.
- Practice as Medical Physicists and Radiological Safety Officers in hospitals, medical colleges and radiation installations.
- Teach and train the students on various aspects of medical physics and conduct research.

### **Eligibility for Admission:**

Candidates who have passed the three year B.Sc. degree examination of Mangalore University or any other University considered as equivalent thereto with Physics as major / optional / special subject are eligible for the programme provided they have studied Mathematics as major / optional / special / minor / subsidiary subject for at least two years and secured a minimum of 65% (60% for SC/ST/Category-1 candidates) marks in Physics.

### **Duration of the Course:**

- i. Duration:** The duration of Master Degree Programmes shall extend over 4 semesters each of a minimum of 16 weeks (90 actual working days) of instruction and 2 to 3 weeks for preparation and examination.
- ii. Maximum period for the completion of the programme:** The candidate shall complete the programme within five years from the date of admission. The term completing the programme means passing all the prescribed examinations after the prescribed period for completing the programme.
- iii. Internship:**
  - a.** Internship is an option and not a part of the course work.
  - b.** Mangalore University will assist the students those who complete their M. Sc. in Medical Physics course in doing their internship in well-equipped radiation therapy departments or oncology centres/hospitals.
  - c.** The candidate would be eligible to work as Medical Physicist and becomes eligible to appear for Radiological Safety Officer (RSO) qualifying examination conducted by Atomic Energy Regulatory Board (AERB) in coordination with Radiological Physics & Advisory Division (RP&AD), Bhabha Atomic Research Centre (BARC) only on completion of one year internship.
  - d.** The institute/hospital/Centre where student(s) undergo 12 months internship and the supervising personnel will be certifying the completion of internship.

### Course Pattern Highlights:

- i. The M.Sc. in Medical Physics programme shall comprise “Core” and “Elective” courses. The “Core” courses shall further consists of “Hard” and “Soft” core courses. Hard core courses shall have 4 credits and soft core courses shall also have 4 credits. Further, there shall be two Open Electives carrying 3 credits each. Total credit for the programme shall be 91 including open electives.
- ii. Core courses are related to the discipline of the M.Sc. in Medical Physics programme. Hard core papers are compulsorily studied by a student as a core requirement to complete the programme of M.Sc. in Medical Physics. Soft core papers are elective but are related to the discipline of the programme. Two open elective papers of 3 credits each shall be offered in the II and III semester by the department and they will be chosen from the students unrelated to the programme within the faculty or across the faculty.
- iii. Total credit for the M.Sc. in Medical Physics programme is 91. Out of the total 91 credits of the programme, the hard core (H) shall make up 62 % of the total credits; soft core (S) is 38 % while the open electives (OE) will have a fixed 6 credits (2 courses with 3 credits each).

### Distribution of Credits

Semester	Hard Core (4 Credits)/ Project (5 Credits)			Total Credits	Soft Core (4 Credits)		Total Credits	Open Elective (3 Credits)		Total Credits
	No. of courses				No. of courses			No. of courses	Total Credits	
	T	P	Proj.	T	P					
I	3	1	---	16	2	---	8	---		24
II	2	1	---	12	1	1	8	1	3	23
III	2	1	---	12	2		8	1	3	23
IV	2	---	1	13	2		8			21
<b>Total</b>	<b>9</b>	<b>3</b>	<b>1</b>	<b>53</b>	<b>7</b>	<b>1</b>	<b>32</b>	<b>2</b>	<b>6</b>	<b>91</b>

**T – Theory; P – Practical ;Proj. - Project**

### Distribution of Teaching/Practical Time and Credits

Semester	Theory/ Practical	Hard Core (4 Credits)			Soft Core (4 Credits)			Open Elective (3 Credits)			Total Credits
		No. Cs	Hrs	Total Cr	No. Cs	Hrs	Total Cr	No. Cs	Hrs	Total Cr	
I	Theory	3	3X4=12	16	2	2X4=8	08				24
	Practical	1	2X4=08								
II	Theory	2	2X4=08	12	1	1X2=4	08	1	1X3=3	3	23
	Practical	1	2X4=08		1	2X4=8					
III	Theory	2	2X4=08	12	2	2X4=8	08	1	1X3=3	3	23
	Practical	1	2X4=08								
IV	Theory	2	2X4=08	13	2	2X4=8	08				21
	Practical				2	2X4=8					
	Project	1	1X5=05								
<b>Total Cr</b>				<b>53</b>			<b>32</b>			<b>6</b>	<b>91</b>

Cs – Course; Cr/s – Credit/s; Hrs - Hours

### Details of Courses & Credits for Four Semesters

Hard Core (H)					Soft Core (S)				Total Credits	Total Cr for Practical			Open Elective (OE)	Total Credits
T	P	Proj	Total Cr	%	T	P	Total	%		H	S	Total		
9	3	1	53	62	7	1	32	38	85	12	4	16	6	91

**T – Theory; P – Practical; Proj. – Project; H – Hard Core; S – Soft Core;  
OE – Open Elective; Cr - Credit**

#### NOTE:

**FIRST SEMESTER:** The first semester consists of five theory courses, out of which three are hard core and two are soft core (4 hours per week for each paper and shall carry 4 credits for each paper) and two practical (hard core, each practical is of 4 hours duration per week and carries 2 credits). The students have to come twice a week for each of the practical paper.

**SECOND SEMESTER:** The second semester consists of three theory courses, out of which two are hard core and one is soft core (4 hours per week and carry 4 credits for each course); and four practical (one hard core and one soft core) of 4 hours duration each (totally 16 hours per week and each practical carries 2 credits). The students have to come four times a week for each of the practical paper. In addition there shall be an open elective course to be opted by the student from other departments (3 hours per week and shall carry 3 credits).

**THIRD SEMESTER:** The third semester consists of four theory courses, out of which two are hard core and two are soft core courses (each course is of 4 hours per week for a paper and shall carry 4 credits) and two practical (one hard core, 8 hours per week and each practical course carries 2 credits). The students have to come twice a week for each of the

practical papers. In addition there shall be an open elective course to be opted by the students from other departments (3 hours per week and shall carry 3 credits).

**FOURTH SEMESTER:** The fourth semester consists of four theory courses, out of which two are hard core and two are soft core (each course is of 4 hours per week and carry 4 credits) and two practical (one soft core, each practical is of 4 hours per week and carries 2 credits). The students have to come twice a week for each of the practical papers. There shall be a compulsory project work which has to be under taken by all the students of the fourth semester. The project work is a hard core having duration of 10 hours per week and carries 5 credits.

#### Scheme of Examination, Credits and Marks

SEMESTER	Theory/practical	Exam. hours	Marks (Theory + Internal Assessment)	Credits	Total
I Semester	5 Theory courses (3 hard core + 2 soft core)	3 hrs each	70 + 30 each	5 x 4 = 20	500
	2 Practicals (hard core)	4 hrs each	70 + 30 each	2 x 2 = 4	200
II Semester	3 Theory courses (2 hard core + soft core)	3 hrs each	70 + 30 each	3 x 4 = 12	300
	1 Theory course (open elective)	3 hrs	70 + 30 each	1 x 3 = 3	100
	4 practical (1 hard core + 1 soft core)	4 hrs each	70 + 30 each	4 x 2 = 8	400
III Semester	5 Theory courses (2 hard core + 2 soft core)	3 hrs each	70 + 30 each	4 x 4 = 16	400
	1 Theory course (open elective)	3 hrs	70 + 30 each	1 x 3 = 3	100
	2 practical (hard core)	4 hrs each	70 + 30 each	2 x 2 = 4	200
IV Semester	4 Theory courses (2 hard core + 2 soft core)	3 hrs each	70 + 30 each	4 x 4 = 16	400
	Project (hard core)		70 + 30 (Viva-voce)	1 x 5 = 5	100
<b>Grand Total</b>				<b>91</b>	<b>2700</b>

**Internal assessment:**

- i. Theory:** Marks for internal assessment shall be based on 2 compulsory tests. Tests will be conducted for 30 marks and time duration will be 90 min. Average marks from both the tests will be considered as final internal assessment marks. Test papers shall be set and evaluated by concerned teachers.
- ii. Practical:** Practical internal assessment marks is based on viva-voce and practical records in the semesters and carries 30 marks for each practical course.

**Project Report:**

There shall be a project in the fourth semester for 100 marks and carries 5 credits. The project will be submitted in the form of a project report/dissertation and shall be evaluated for 70 marks by two examiners, one external and one internal from out of the panel of examiners prepared by the BoS, and approved by the University. Remaining 30 marks shall be for internal assessment and will be based on seminars and continuous assessment of the project work.

**Theory Examination:****i. Hard Core and Soft Core:**

Each theory course shall carry a maximum of 100 marks out of which 30 marks shall be for internal assessment. The remaining 70 marks shall be for University examination. University examination shall be conducted as per the rules and regulations prescribed by the University. Question paper for the University examination is of three hours duration shall be set as per the model given below:

- a. Part-I:** Six questions (at least one question from each unit) carrying 4 marks each of which five questions have to be answered ( $5 \times 4 = 20$  marks).
- b. Part-II:** One question from each unit (internal choice) of the syllabus (there are 5 units) carrying 10 marks ( $5 \times 10 = 50$  marks). A question may have not more than 3 subdivisions [eg. Question 1 (a) (b) (c)]

**ii. Open Elective:**

Each open elective course shall carry a maximum of 100 marks out of which 30 marks shall be for internal assessment. The remaining 70 marks shall be for University examination. University examination shall be conducted as per the rules and regulations prescribed by the University. Question paper for the University examination is of three hours duration shall be set as per the model given below:

- a. Part-I:** Seven questions (at least two questions from each unit) carrying 4 marks each of which five questions have to be answered ( $5 \times 4 = 20$  marks).
- b. Part-II:** Eight questions (at least two questions from each unit) carrying 10 marks each of five questions have to be answered ( $5 \times 10 = 50$  marks). A question may have not more than 3 subdivisions [eg. Question 1 (a) (b) (c)]

**Practical Examination:**

Each practical course shall carry a maximum of 100 marks out of which 30 marks shall be for internal assessment and remaining 70 marks shall be for final practical examination. The marks shall be awarded in the examination based on the procedure, conduct of the practical, results and viva voce related to the practical.



**MANGALORE UNIVERSITY**  
**M. SC. DEGREE PROGRAMME IN MEDICAL PHYSICS: CBCS**  
 (Effective from the Academic year 2020- 2021)  
**COURSE PATTERN AND SCHEME OF EXAMINATION**

Course Code	Description of the Papers	Teaching Hrs/ week	Credit	Max Marks: (Exam + IA )
<b>I Semester</b>				
MPH 401	Fundamentals of Physics	4	4	70 + 30
MPH 402	Nuclear and Radiation Physics	4	4	70 + 30
MPH 403	Radiological Mathematics	4	4	70 + 30
MPS 404	Human Anatomy and Physiology	4	4	70 + 30
MPS 405	Basic Electronics and Biomedical Instrumentation	4	4	70 + 30
MPS 406	Biophysics	4	4	70 + 30
MPP 407	Medical Physics Practical – I	4	2	70 + 30
MPP 408	Medical Physics Practical – II	4	2	70 + 30
<b>II Semester</b>				
MPH 451	Radiation Detection and Measurement	4	4	70 + 30
MPH 452	Radiation Dosimetry and Standardization	4	4	70 + 30
MPS 453	Fundamentals of Cancer Biology	4	4	70 + 30
MPS 454	Biostatistics	4	4	70 + 30
MPE 455	Industrial Application of Radiation and Radioisotopes	3	3	70 + 30
MPP 456	Medical Physics Practical – III	4	2	70 + 30
MPP 457	Medical Physics Practical – IV	4	2	70 + 30
MPP 458	Medical Physics Practical – V	4	2	70 + 30
MPP 459	Medical Physics Practical – VI	4	2	70 + 30

<b>III Semester</b>				
MPH 501	Clinical Radiation Biology	4	4	70 + 30
MPH 502	Physics of Medical Imaging	4	4	70 + 30
MPS 503	Physics of Nuclear Medicine	4	4	70 + 30
MPS 504	Clinical Aspects of Radiation Therapy	4	4	70 + 30
MPS 505	D3 - IPR, Biosafety & Bioethics	4	4	70 + 30
MPE 506	Applications of Radiation and Radioisotopes in Health and Agriculture	3	3	70 + 30
MPP 507	Medical Physics Practical – VII	4	2	70 + 30
MPP 508	Medical Physics Practical –VIII	4	2	70 + 30
<b>IV Semester</b>				
MPH 551	Physics of Radiotherapy (Radiotherapy – I)	4	4	70 + 30
MPH 552	Radiation Protection Standards and Safety	4	4	70 + 30
MPS 553	Modern Trends in Radiotherapy (Radiotherapy – II)	4	4	70 + 30
MPS 554	Nuclear Reactors, Particle Accelerators, Industrial Applications of Radiation and Environmental Radioactivity	4	4	70 + 30
MPS 555	Research Methodology & Communication	4	4	70 + 30
MPP 556	Project	10	5	70 + 30

**Summary of the course patterns:**

Summary of the course patterns, hours of instructions per course/paper per week, marks and credits assigned to different courses/papers in different subjects of study in the M. Sc. in Medical Physics Degree programmes is as follows:

**I Semester**

Sl. No.	Course Code	Course Title	No. of Hrs	Credits				Total Credits
				L	P	T	S	
<b>Hard Core – Compulsory component</b>								
1	MPH 401	Fundamentals of Physics	4	4			4	
2	MPH 402	Nuclear and Radiation Physics	4	4			4	
3	MPH 403	Radiological Mathematics	4	4			4	
<b>Soft Core – Elective component (Select any 2 courses)</b>								
4	MPS 404	Human Anatomy and Physiology	4	4			8	
5	MPS 405	Basic Electronics and Biomedical Instrumentation	4	4				
6	MPS 406	Biophysics	4	4				
<b>Practical (compulsory)</b>								
7	MPP 407	Medical Physics Practical – I	4		2		2	
8	MPP 408	Medical Physics Practical – II	4		2		2	
<b>Total Credits for I Semester</b>							<b>24</b>	

HC – Hard Core; SC – Soft Core; L – Lecture; P – Practical; T – Tutorial; S - Seminar

**II Semester**

Sl. No.	Course Code	Course Title	No. of Hrs	Credits				Total Credits
				L	P	T	S	
<b>Hard Core – Compulsory component</b>								
1	MPH 451	Radiation Detection and Measurement	4	4			4	
2	MPH 452	Radiation Dosimetry and Standardization	4	4			4	
<b>Soft Core – Elective component (Select any 1 course)</b>								
3	MPS 453	Fundamentals of Cancer Biology	4	4			4	
4	MPS 454	Biostatistics	4	4				
Open Elective for other discipline students								
5	MPE 455	Industrial Application of Radiation and Radioisotopes	3	3			3	
<b>Practical (compulsory)</b>								
6	MPP 456	Medical Physics Practical – III	4		2		2	
7	MPP 457	Medical Physics Practical – IV	4		2		2	
8	MPP 458	Medical Physics Practical – V	4		2		2	
9	MPP 459	Medical Physics Practical – VI	4		2		2	
<b>Total Credits for II Semester</b>							<b>23</b>	

### III Semester

Sl. No.	Course Code	Course Title	No. of Hrs	Credits				Total Credits
				L	P	T	S	
<b>Hard Core – Compulsory component</b>								
1	MPH 501	Clinical Radiation Biology	4	4				4
2	MPH 502	Physics of Medical Imaging	4	4				4
<b>Soft Core – Elective component (Select any 2 courses)</b>								
3	MPS 503	Physics of Nuclear Medicine	4	4				8
4	MPS 504	Clinical Aspects of Radiation Therapy	4	4				
5	MPS 505	D3 - IPR, Biosafety & Bioethics	4	4				
Open Elective for students of other discipline								
6	MPE 506	Applications of Radiation and Radioisotopes in Health and Agriculture	3	3				3
<b>Practical (compulsory)</b>								
7	MPP 507	Medical Physics Practical – VII	4		2			2
8	MPP 508	Medical Physics Practical –VIII	4		2			2
<b>Total Credits for III Semester</b>							<b>23</b>	

### IV Semester

Sl. No.	Course Code	Course Title	No. of Hrs	Credits				Total Credits
				L	P	T	S	
<b>Hard Core – Compulsory component</b>								
1	MPH 551	Physics of Radiotherapy (Radiotherapy – I)	4	4				4
2	MPH 552	Radiation Protection Standards and Safety	4	4				4
<b>Soft Core – Elective component (Select any 2 courses)</b>								
3	MPS 553	Modern Trends in Radiotherapy (Radiotherapy – II)	4	4				8
4	MPS 554	Nuclear Reactors, Particle Accelerators, Industrial Applications of Radiation and Environmental Radioactivity	4	4				
5	MPS 555	Research Methodology & Communication	4	4				
<b>Project – Compulsory component</b>								
6	MPP 556	Project	10	5				5
<b>Total Credits for IV Semester</b>							<b>21</b>	

### Details of Courses & Credits for Four Semesters

Credits					Total Credits
Hard Core	Soft Core	Total	Open Elective	Project	
53 (62%)	32 (38%)	85	6	5(Included in HC)	91