

# h Specifications



h : Nuclear Physics and Technology  
Department: Physics

**Faculty of Science and Humanities**  
**M. S. Ramaiah University of Applied Sciences**

University House, New BEL Road, MSR Nagar, Bangalore – 560 054

[www.msruas.ac.in](http://www.msruas.ac.in)

## Programme Specifications: M.Sc.(Nuclear Physics and Technology)

Faculty	Faculty of Science and Humanities (FSH)
Department	Physics
Programme	M.Sc. (Nuclear Physics and Technology)
Dean of Faculty	Prof. M. R. Srinivasan
HOD	Prof. M. R. Srinivasan

**1. Title of the Award**

M.Sc.(Nuclear Physics and Technology)

**2. Modes of Study**Full-Time **3. Awarding Institution /Body**

M S Ramaiah University of Applied Sciences-Bangalore, India

**4. Joint Award**

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**5. Teaching Institution**

Faculty of Science and Humanities (FSH)

M S Ramaiah University of Applied Sciences-Bangalore, India

**6. Date of h Specifications**

August 2014

**7. Date of h Approval by the Academic Council of MSRUAS**

August 2014

**8. Next Review Date**

June 2016

**9. ....h Approving Regulatory Body and Date of Approval**

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**10. ....h Accrediting Body and Date of Accreditation**

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**11. Grade Awarded by the Accreditation Body**

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**12. h Accreditation Validity**

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**13. h Benchmark**

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**14. Rationale for the h**

The energy consumption all over the world has been increasing and nuclear energy is still one of the best options as a viable source of energy. Though there are concerns about safety and nuclear waste management, nuclear energy is there to stay in the immediate future. Nuclear medicine has been successfully deployed especially in the treatment of cancer and this also opens up several job opportunities for nuclear physicists.

Indian nuclear power program, visualized by Dr. Bhabha in early fifties has been developed and successfully deployed with indigenous efforts. This has placed the country in an elite club of countries possessing advanced nuclear technology. The evolution and development of commercial nuclear technology in the country has passed through several technological revolutions. While developing and implementing the nuclear power program, the Indian industry capability in manufacturing and supply of high precision and specialized equipment has also been developed comparable to international standards. Nuclear power program is poised for a large expansion and there will be plenty of scope for physicists with a sound knowledge of reactor physics to play an important role in the years to come.

In our country, teaching/research in nuclear physics is being carried out in a number of universities and atomic energy establishments. Nuclear physics forms an important component of postgraduate physics courses in physics. After nearly two decades of IT revolution and its booming economic impact on the country, there is a positive trend and appreciation for the role and importance of basic sciences for further technological advancement. There is a need for qualified and competent post graduate students with sound knowledge in Physics in general and nuclear technology in particular. Although there are numerous institutions and universities which offer post graduate degree courses in Solid State Physics, vast majority of them offer more conventional content based academic curriculum which inherently lacks application oriented approach, which is essential to make the degree programme more fulfilling and professional from student career perspective.

The Faculty of Science and Humanities of MSRUAS offers the M.Sc.(Nuclear Physics and Technology) programme with an outcome based curriculum emphasizing the Critical, Analytical and Problem Solving skills to equip the students to pursue their scientific and research career with better preparedness and matured professional outlook. The presence of other allied Faculties of the University provides additional exposure to students the multi-disciplinary approach which is emerging as a key differentiator in the success of modern scientific and engineering endeavors.

**15. Aim**

The aim of the programme is to train postgraduates with advanced knowledge and understanding of nuclear physics and technology with higher order critical, analytical, problem solving and research skills; ability to think rigorously and independently to meet higher level expectations of academia and research with sufficient transferrable skills.

**16. Objectives**

The programme objectives of M. Sc. (Nuclear Physics and Technology) are to:

- Impart higher level knowledge and understanding of nuclear physics and technology
- Apply the theory of nuclear physics for newer applications
- Enable students to analyse mathematical models of physical systems for enhancement of system performance and arrive at limitations of physical systems
- Enhance students' ability to develop mathematical models of defined physical systems
- Prepare students to evaluate the soundness of concepts proposed
- Hone students' skills to pursue physics as a teaching and research career
- Train students in team work and in lifelong learning for continuous professional development

**17. Intended Learning Outcomes of the h**

The intended learning outcomes are listed under four headings:

1. Knowledge and Understanding, 2. Cognitive Skills 3. Practical Skills and 4. Capability/ Transferable Skills.

**17.1 Knowledge and Understanding**

After undergoing this programme, a student will be able to:

KU1: Identify the basic constituents of matter and describe the interactions between them

KU2: Enumerate the various types of nuclear reactors and distinguish them

KU3: Explain the techniques of nuclear waste management

KU4: Discuss the use of radioisotopes in medicine

**17.2 Cognitive Skills**

After undergoing this programme, a student will be able to:

CS1: Decipher the various factors involved in the design of different types of nuclear reactors

CS2: Suggest practical steps to deal with nuclear waste management

CS3: Provide technical know-how to medical personnel in nuclear radiation therapy

CS4: Design and simulate electronic circuits for measuring instruments used in nuclear physics

**17.3 Practical Skills**

After undergoing this programme, a student will be able to:

PS1: Perform measurements related to nuclear physics

PS2: Conduct experiments with a variety of scientific equipment with minimum guidance

PS3: Design PC based instrumentation

PS4: Use MATLAB and other Software

**17.4 Capability /Transferable Skills**

After undergoing the programme, a student will be able to

TS1: Manage information, develop technical reports and make presentations

TS2: Build, Manage and Lead a team to successfully complete a project and communicate across teams and organizations to achieve professional objectives

TS3: Work under various constraints to meet project targets

TS4: Adopt to the chosen profession by continuously upgrading his/her knowledge and understanding through Life-long Learning philosophy

**18. Structure**

The following are the modules a student is required to successfully complete for the award of the degree. The programme is delivered as per the Time-Table for every batch.

<b>h : M.Sc.(Nuclear Physics and Technology)</b>			
<b>Module Code</b>	<b>Modules</b>	<b>Credits</b>	<b>Duration Weeks</b>
<b>Department- Common Modules</b>			
PHY501	1. Classical Mechanics	5	5
PHY502	2. Quantum Mechanics	5	5
PHY503	3. Statistical Physics	5	5
PHY504	4. Electrodynamics	5	5
PHY505	5. Instrumentation & Measurement Techniques	5	5
<b>h - Specialisation Modules</b>			
NPT501	1. Nuclear Physics I	5	5
NPT502	2. Nuclear Physics II	5	5
NPT503	3. Modelling & Simulation of Nuclear Reactors	5	5
NPT504	4. Reactor Safety and Nuclear Waste Management	5	5
NPT505	5. Nuclear Medicine and Nuclear Electronics	5	5
<b>Faculty-Common Modules</b>			
FSH501	1. Research Methodology	4	4
FSH 502	2. History of Science and Technology	3	3
FSH 503	3. Soft Skills	3	3
<b>Elective Modules</b>			
FSH 504	1. Teaching	5	5
FSH505	2. Seminar/Internship		
NPT600	<b>1. Dissertation</b>	25	25
<b>Mandatory Module</b>			
FSH506	1. Conference/Journal Publication	5	5
		<b>100</b>	<b>100</b>

Note:

1. The Vacations and other activities shall be as per the Time-Table for the corresponding batch.

**19. Module Delivery Structure- Full-Time**

A module is delivered from Monday to Friday of the week. The lecture classes will be normally held from 9.30 AM to 1.00 PM with 30 minutes of break. The laboratory classes will be held in the afternoon from 2.00PM to 5.00 PM during the first two weeks of the module.

Module 1 to Module 10				
Week-1	Week-2	Week-3	Week-4	Week-5
Module Delivery	Module Delivery	Study Work	Examination	Assignment submission & Presentation

## 20. Teaching and Learning Methods

The module delivery comprises of combination of few or all of the following:

1. Face to Face Lectures using Audio-Visuals
2. Workshops, Group Discussions, Debates, Presentations
3. Demonstrations
4. Guest Lectures
5. Laboratory/Field work
6. Industry Visit
7. Seminars/Conferences
8. Group Exercises
9. Project Exhibitions
10. Management Festivals

## 21. Elective Module

**FSH504 Teaching**  
A student can teach a module in his / her area of specialisation in any institute approved by the department. The student must submit the teaching notes and also make a presentation to a team of examiners. Internship

**FSH505 Seminar/Internship**  
**Seminar**  
A student can deliver a seminar of one hour duration of his/her original study on a contemporary topic. Topic of the seminar should be registered at the beginning of the elective module. At the end, seminar must be delivered to a team of examiners and also a word processed report must be submitted for assessment.

### Internship

Internship is to be done with a research organization for a period of 5 weeks. The student is required to submit a report for assessment and also make a presentation to a team of examiners. The internship should be related to the programme. A student is required to find internship on his/her own but the student placement office may assist in getting internship.

**FSH506 Conference/Journal Publication**  
Conference Publication

A student can submit a paper and make a presentation in a conference which is approved by the department. The same paper shall be presented for assessment and the student is required to make a presentation to a team of examiners.

#### Journal Publication

A student can publish a paper in an Indian or International journal. The proof of submission to the journal publication and a copy of the paper shall be submitted followed by a presentation for assessment.

### **24. Assessment and Grading**

A module assessment will have two components:

Component - 1

Assignment 50% weight

Component - 2

Examination 50% weight

(Note: For more details on the break-ups, please refer to the Module Specifications)

A student is required to score a minimum of 40% in each of the components and an overall 40% for successful completion of a module and earning the credits.

Note: Final marks awarded in each of the modules will be confirmed only after SAB/PAB as explained in Academic Regulations of M.Sc. Programme.

### **25. Failure and Re-registration**

If a student fails in a module, he/she is required to re-attend the module when offered next time by re-registering to the module.

### **26. Attendance**

A student is required to have a minimum of 85% attendance to be eligible to write the examination and assignment submission. Less than 85% attendance is considered to be FAIL; such a student is required to follow the same procedure as that of a failed student.

Any condoning of shortfall of the attendance is as per the Academic Regulations for M.Sc. Programme.

### **27. Award of Class**

As per the Academic Regulations for M.Sc. Programme.

### **28. Student Support for Learning**

Students are given the following support:



1. Module Notes
2. Reference Books in the Library
3. Magazines and Journals
4. Internet Facility
5. Computing Facility
6. Laboratory Facility
7. Workshop Facility
8. Staff Support
9. Lounges for Discussions
10. Any other support that enhances their learning

## **29. Quality Control Measures**

The following are the Quality Control Measures:

1. Review of Module Notes
2. Review of Question Papers and Assignment Questions
3. Student Feedback
4. Moderation of Assessed work
5. Opportunities for the students to see their assessed work
6. Review by External Examiners and External Examiners Reports
7. Staff Student Consultative Committee Meetings
8. Student Exit Feedback
9. Subject Assessment Board
10. Programme Assessment Board

## 30. Curriculum Map

Module Code	Intended Learning Outcomes											
	Knowledge and Understanding				Cognitive (Thinking) Skills (Critical, Analytical, Problem Solving, Innovation)				Practical skills			
	KU1	KU2	KU3	KU4	CS1	CS2	CS3	CS4	PS1	PS2	PS3	PS4
PHY501											X	X
PHY502	X	X		X	X						X	X
PHY503	X	X					X				X	X
PHY504		X							X	X	X	X
PHY505		X			X				X			
NPT501	X	X		X	X				X			
NPT502		X	X			X				X		X
NPT503			X	X	X	X	X	X			X	
NPT504	X	X	X		X	X	X	X	X	X	X	X
NPT505				X	X	X	X	X	X		X	X
FSH501											X	X
FSH502	X	X	X	X	X	X	X	X	X	X	X	X
FSH503	X	X	X	X	X	X	X	X	X	X	X	X
FSH504	X	X	X	X	X	X	X	X	X			
FSH505												
FSH506												
NPT600	X	X	X	X	X	X	X	X	X	X	X	X

**31. Capability/ Transferable Skills Map**

Module Code	Group work	Self learning	Research Skills	Written Communication Skills	Verbal Communication Skills	Presentation Skills	Behavioral Skills	Information Management	Personal management / Leadership Skills
PHY501		X	X	X	X	X		X	
PHY502		X	X	X	X	X		X	
PHY503		X	X	X		X		X	
PHY504		X	X	X	X	X	X	X	
PHY505		X		X		X			
NPT501		X	X	X	X	X		X	
NPT502		X	X	X	X	X		X	
NPT503		X	X	X	X	X		X	
NPT504		X	X	X	X	X		X	
NPT505		X	X	X	X	X		X	
FSH501		X		X	X	X		X	
FSH502	X	X	X	X	X	X		X	
FSH503	X	X	X	X	X	X	X	X	X
FSH504	X	X	X	X	X	X	X	X	X
FSH505		X	X	X	X	X		X	
FSH506		X	X	X	X	X		X	
NPT600	X	X	X	X	X	X	X	X	X

**32. Co-curricular Activities**

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposium, paper writing, attending industry exhibitions, project competitions and related activities for them to enhance their knowledge and network.

**33. Cultural and Literary Activities**

To remind and ignite the creative endeavors annual cultural festivals are held and the students are made to plan and organise the activities.

**34. Sports and Athletics**

Students are encouraged to develop a habit of taking part in outdoor and indoor games on daily basis.

