



Programme Specifications

M.Sc. Programme

Programme:
Optoelectronics

Department:
Physics

Faculty of Mathematical & Physical Sciences
M.S. Ramaiah University of Applied Sciences

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

www.msruas.ac.in

Programme Specifications: M.Sc. in Optoelectronics

Faculty	Faculty of Mathematical and Physical Sciences (FMPS)
Department	Physics
Programme	M.Sc. in Optoelectronics
Dean of Faculty	Prof. Deepak A.S.
HOD	Dr. Vikas M. Shelar

1. Title of the Award

M.Sc. in Optoelectronics

2. Modes of StudyFull-Time ☒**3. Awarding Institution /Body**

M.S. Ramaiah University of Applied Sciences – Bangalore, India

4. Joint Award

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5. Teaching InstitutionFaculty of Mathematical and Physical Sciences
M S Ramaiah University of Applied Sciences - Bangalore, India**6. Date of Programme Specifications**

August 2019

7. Date of Programme Approval by the Academic Council of MSRUAS

August 2019

8. Next Review Date

August 2021

9. Programme Approving Regulatory Body and Date of Approval

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10. Programme Accrediting Body and Date of Accreditation

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11. Grade Awarded by the Accreditation Body

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12. Programme Accreditation Validity

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13. Programme Benchmark

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14. Rationale for the Programme

Optoelectronics has been a buoyant area for careers for the last 30 years, and there are signs of this increasing, rather than diminishing. It is at the heart of our world's most exciting technologies. It is a technology of the future. Optoelectronics, fiber optic communication and optical networks have revolutionized global communication. Apart from global communication, optical technologies are widely used for system development in the areas distributed sensing, biomedical applications, industrial manufacturing, display and lighting, defence environments, etc. India has a gigantic consumer market for these optical components and systems. The government is also encouraging photovoltaic as an alternative for generating energy. Biomedical optics including microscopy, endoscopy and skin treatment is another major application area of optoelectronics. The study of physics and technology of optoelectronics devices, fiber optic communication and optical networks for efficient transmission of information across the globe has become very important and presents exciting job opportunities. This interdisciplinary field is ideal for creative and versatile physicists to play their crucial role in technology development.

In our country, teaching/research in optoelectronics is being carried out in a number of universities and CSIR/Defence laboratories. There are also plenty of opportunities for pursuing doctoral programs in US/Europe. In a majority of Indian universities, topics in optoelectronics are taught as a part of the course in solid state physics. Consequently, postgraduate students opting for solid state physics do not get in-depth knowledge of optoelectronics. Also these courses lack application oriented approach, which is essential to make the degree programme more fulfilling and professional from student career perspective.

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 postgraduate students with sound knowledge in Physics in general and Optoelectronics.

The Faculty of Mathematical & Physical Sciences of MSRUAS offers the M.Sc. Physics with specialization in Optoelectronics course 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.

In the coming years, the government intends to boost up funds for basic sciences. There is an acute shortage of qualified teaching staff. The job prospects for candidates with M.Sc. Physics with specialization in Optoelectronics looks good.

15. Programme Aim

The aim of the programme is to train postgraduates with advanced knowledge and understanding of applied solidstate physics 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. Programme Objectives

The Programme objectives of M.Sc. Physics with specialization in Optoelectronics are to:

- Impart higher level knowledge and understanding of Optoelectronics
- Apply the theory of optoelectronics 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 Programme

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: Describe the functioning of lasers and optoelectronic devices
- KU2: Explain working of a fiber optic communication system
- KU3: Acquire a knowledge of optical networks
- KU4: Select appropriate tools of nano-optics for desired applications

17.2 Cognitive Skills

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

- CS1: Explore new materials for optoelectronic applications
- CS2: Design and simulate fiber optic communication systems
- CS3: Design and characterize optical networks
- CS4: Apply the techniques for optical engineering to fabricate novel devices

17.3 Practical Skills

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

- PS1: Perform measurements related to lasers and fiber optic communication system
- PS2: Conduct experiments with a variety of scientific equipment with minimum guidance
- PS3: Design PC based instrumentation
- PS4: Use MATLAB /MOEMS Software

17.4 Capability /Transferable Skills

After undergoing the programme, a student will be able to

- TS1: Communicate and present ideas clearly and concisely
- TS2: Perform under constraints to meet the desired objectives
- TS3: Build, work and lead teams effectively
- TS4: Adopt a reflective approach to personal development and embrace the philosophy of continual professional development

18. Programme Structure

The M.Sc. Physics with specialization in Optoelectronics programme will be delivered in semester scheme.

Semester 1

Sl. No.	Course Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Max. Marks	Total Credits
1	19PHY511A	Mathematical Methods of Physics	3	2		100	4
2	19PHY512A	Classical Mechanics	3	2		100	4
3	19PHY513A	Quantum Mechanics	3	2		100	4
4	19PHY514A	General Physics Laboratory-1			4	50	2
5	19PHY515A	Computer Laboratory			4	50	2
6	19PHY516A	Seminar			4	50	2
Total			9	6	12	450	18

Semester 2

Sl. No.	Course Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Max. Marks	Total Credits
1	19PHY521A	Electronics and devices	3	2		100	4
2	19PHY522A	Electrodynamics	3	2		100	4
3	19PHY523A	Statistical Mechanics and Thermodynamics	3	2		100	4
5	19PHY524A	Electronics Laboratory			4	50	2
6	19PHY525A	General Physics Laboratory -2			4	50	2
7	19PHY526A	Seminar			4	50	2
Total			9	6	12	450	18

Semester 3

Sl. No.	Course Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Max. Marks	Total Credits
1	19PHY531A	Atomic and Molecular Physics	3	2		100	4
2	19PHY532A	Nuclear and Particle Physics	3	2		100	4
3	19PHY533A	Solid State Physics-1	3	2		100	4
4	19PHY561A	Physics of Optoelectronic Devices	3	2		100	4
5	19PHY590A	Research Methodology	2			50	2
6	19PHY534A	Advanced Physics Laboratory			4	50	2
Total			14	8	4	500	20

Semester 4

Sl. No.	Course Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Max. Marks	Total Credits
1	19PHY562A	Lasers and Fiber-Optic Communication	3	2		100	4
2	19PHY563A	Nonlinear Optics	3	2		100	4
3	19PHY598A	Internship*			8	100	4
	19PHY599A	Seminar					
4	19PHY600A	Dissertation			24	300	12
Total			6	4	32	600	24

* Internship can be done during the vacation period for a maximum period of 8 weeks

19. Assessment and Grading

Performance in every theory course will be assessed on the following two components:

Theory Courses with 4 and 3 credits**Component - 1: 50 Marks**

Part A: Two term tests will be conducted. Average of 2 tests will be considered (25% weightage).

Part B: A student needs to submit assignment/s (25% weightage).

Component - 2: 50 Marks

A Written Examination for 100 marks will be conducted. Obtained marks out of 100 are scaled down to 50 marks.

Theory Courses with 3 or 4 credits with laboratory component integrated**Component - 1: 50 Marks**

Part A: Two term tests will be conducted. Average of 2 tests will be considered (25% weightage).

Part B: A student needs to submit assignment/s (15% weightage) and perform laboratory examination (10% weightage).

Component - 2: 50 Marks

A Written Examination for 100 marks will be conducted. Obtained marks out of 100 are scaled down to 50 marks.

Theory Courses with 2 credits**Component - 1: 25 Marks**

A student needs to submit assignment/s (50% weightage).

Component - 2: 25 Marks

A Written Examination for 50 marks will be conducted. Obtained marks out of 50 are scaled down to 25 marks.

Seminars with 2 credits**Component - 1: 25 Marks**

A student needs to submit a report on the seminar topic given (50% weightage).

Component - 2: 25 Marks

A student is required to give a presentation on the topic given (50% weightage).

Seminars with 4 credits**Component - 1: 50 Marks**

A student needs to submit a report on the seminar topic given (50% weightage).

Component - 2: 50 Marks

A student is required to give a presentation on the topic given (50% weightage).

Laboratories with 1 or 2 credits**Component - 1: 25 Marks**

A student needs to submit a record for the experiments conducted (50% weightage).

Component - 2: 25 Marks

Laboratory examination will be conducted at the end of semester (50% weightage).

Dissertation**Component - 1: 100 Marks**

Part A: A student is required to give a pre-project presentation (40% weightage).

Part B: A student is required to give a mid-term project presentation (60% weightage).

Component - 2: 200 Marks

Part A: A student is required to give a final project presentation (50 Marks) and is required to submit a report on the work carried out (100 Marks)

Part B: A student is required to submit a journal article in the given format from the work carried out (50 marks)

Pass Criteria

A student is required to score a minimum of 40% marks in Semester end examination and 40% marks overall in each course for successful completion of a course and for earning the corresponding credit(s).

20. Teaching and Learning Methods

The course 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

21. Student Support for Learning

Students are given the following support:

1. Course 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

22. Quality Control Measures

The following are the Quality Control Measures:

1. Review of Course 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

23. 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
19PHY511A	X				X						X	X
19PHY512A	X				X						X	X
19PHY513A	X				X						X	X
19PHY521A	X										X	X
19PHY522A		X									X	X
19PHY523A		X		X			X		X	X	X	X
19PHY531A	X	X	X	X	X	X	X	X	X	X	X	X
19PHY532A	X	X	X	X	X	X	X	X	X	X	X	X
19PHY533A	X	X	X	X	X	X	X	X	X	X	X	
19PHY561A			X		X	X	X	X	X	X	X	X
19PHY562A			X	X	X	X	X	X	X		X	X
19PHY563A			X	X	X	X	X	X	X		X	X
19PHY590A	X	X	X	X	X	X	X	X				
19PHY598A	X	X	X	X	X	X	X	X	X			
19PHY599A	X	X	X	X	X	X	X	X				
19PHY516A	X	X	X	X	X	X	X	X				
19PHY526A	X	X	X	X	X	X	X	X				
19PHY514A				X	X	X	X	X				
19PHY515A								X	X	X	X	X
19PHY524A								X	X	X	X	X
19PHY525A								X	X	X	X	X
19PHY534A								X	X	X	X	X
19PHY600A	X	X	X	X	X	X	X	X	X	X	X	X

24. 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
19PHY511A		X	X	X	X	X		X	
19PHY512A		X	X	X	X	X		X	
19PHY513A		X	X	X		X		X	
19PHY521A		X	X	X	X	X		X	
19PHY522A		X	X	X	X	X		X	
19PHY523A		X	X			X			
19PHY531A		X	X	X	X	X		X	
19PHY532A		X	X	X	X	X		X	
19PHY533A		X	X	X	X	X		X	
19PHY561A		X	X	X	X	X		X	
19PHY562A		X	X	X	X	X		X	
19PHY563A		X	X	X	X	X		X	X
19PHY590A		X	X	X	X	X		X	X
19PHY598A		X					X	X	X
19PHY599A	X	X			X	X	X	X	X
19PHY516A	X	X	X		X	X	X		X
19PHY526A	X	X	X	X	X	X	X	X	X
19PHY514A		X	X	X	X	X	X	X	X
19PHY515A	X	X			X	X	X	X	X
19PHY524A	X	X	X		X	X	X		X
19PHY525A	X	X			X	X	X	X	X
19PHY534A	X	X	X		X	X	X		X
19PHY600A		X	X	X	X	X	X	X	X

25. 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.

26. Cultural and Literary Activities

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

27. Sports and Athletics

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

