RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Programme Specifications

M.Sc. Programme

Programme: Applied Solid State Physics	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 Applied Solid State Physics

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

1. Title of the Award

M.Sc. in Applied Solid State Physics

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 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

Solid State Physics has had tremendous impact on the technological changes in the past 70 years. With the discovery of transistor in the early 1950's, semiconductor industry has paved the way for the advent of microelectronics, minicomputers and information technology. Semiconductor lasers and laser amplifiers have revolutionized optical communication. Solid State Physics has also contributed to the design of important technological materials, which have found applications in sensor technology, MEMS and MOEMS. It has become imperative for physicists to get involved in solving the practical problems faced by engineers. A firm foundation of the basic principles of solid state physics and practical knowledge of the solid state devices has become an absolute necessity.

In our country, teaching/research in solid state physics is being carried out in a number of universities and CSIR/Defense laboratories. There are also plenty of opportunities for pursuing doctoral programs in US/Europe. Solid state physics forms an important component of undergraduate physics programmes both in engineering and basic sciences. 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 Solid state Physics in particular. Although there are numerous institutions and universities which offer post graduate degree programmes 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.(Applied Solid State Physics) 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. 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 Applied Solid State Physics look good.

15. Programme Aim

The aim of the programme is to train postgraduates with advanced knowledge and understanding of applied solid state 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 (Applied Solid State Physics)are to:

- Impart higher level knowledge and understanding of applied solid state physics
- Apply the theory of solid state 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 care er
- 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: Correlate the structure and physical properties (mechanical, electrical, optical & thermal) of materials

KU2: Analyse the function of basic semiconductor devices

KU3: Choose technologically suitable material for a specific application

KU4: Select the tools of nanoscience and nanotechnology for processing of materials

17.2 Cognitive Skills

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

CS1: Explore new materials for novel applications

CS2: Develop a strategy for the preparation and characterization of new materials

CS3: Design a material for a specific application

CS4: Apply the techniques for MEMS/NEMs in novel situations

17.3 Practical Skills

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

PS1: Measure the physical properties of materials

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

PS3: Design PC based instrumentation

PS4: Use MATLAB/MEMS 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. Programme Structure

The M.Sc. Physics with specialization in Applied Solid State Physics 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	19PHY551A	Solid State Physics-2	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	19PHY552A	Physics of Semiconductor Devices	3	2		100	4
2	19PHY553A	MEMS and Nanotechnology	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

Student 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	
19PHY551A			X		X	X	X	X	X	X	X	X
19PHY552A			X	X	X	X	X	X	X		X	X
19PHY553A			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
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	
19PHY551A		X	X	X	X	X		X	
19PHY552A		X	X	X	X	X		X	
19PHY553A		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									
19PHY524A									
19PHY525A									
19PHY534A									
19PHY600A									

25. Co-curricular Activities

Student 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.