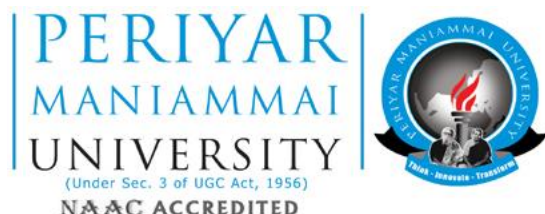


PERIYAR MANIAMMAI UNIVERSITY

School of Humanities, Sciences and Management

DEPARTMENT OF PHYSICS



M. Phil. - Physics (FT & PT)

(Regulation 2016)

24th ACM - 24.09.2016

BOS – 16.10.2015

CURRICULUM

PERIYAR MANIAMMAI UNIVERSITY

M.Phil. – PHYSICS (FT)

(One Year Programme)

**Curriculum
2016 – 17 onwards**

SEMESTER I

Code No	Course Title	L	T	P	C
ZPH101	Research Methodology	4	4	0	6
ZPH102	Advanced Physics	4	4	0	6
ZPH103	Spectrophysics	4	4	0	6

SEMESTER II

Code No	Course Title	L	T	P	C
ZPH 201	Guide paper	4	0	0	4
ZSW202	Teaching Learning Skills	1	2	0	2
ZPH 203	Thesis/Dissertation/Project work	0	0	0	16

Total credits: 40

PERIYAR MANIAMMAI UNIVERSITY

M.Phil. – PHYSICS (Part Time)

(Two Years Programme)

**Curriculum
2016 – 17 onwards**

SEMESTER I

Code No	Course Title	L	T	P	C
ZQPH101	Research Methodology	4	4	0	6
ZQPH102	Advanced Physics	4	4	0	6

SEMESTER II

Code No	Course Title	L	T	P	C
ZQPH201	Spectrophysics	4	4	0	6
ZQPH202	Guide paper	4	0	0	4

SEMESTER III

Code No	Course Title	L	T	P	C
ZQSW301	Teaching Learning Skills	1	2	0	2
ZQPH302	Thesis/Dissertation/Project work – Phase I	0	0	0	6

SEMESTER IV

Code No	Course Title	L	T	P	C
ZQPH401	Thesis/Dissertation/Project work – Phase II	0	0	0	10

Total credits: 40

M.Phil. (PHYSICS) SYLLABUS

RESEARCH METHODOLOGY

ZPH101/ZQPH101

4 4 0 6

Aim: The aim of this paper is to develop research skill in scholars and enable them to carry out research in the concerned branch of subject.

Objectives: (a) To give an advance exposure to the students about the research, (b) to develop acquaintance with intensive techniques and skills of research process, (c) to familiarize the art and style of writing a research report and (d) to know the recent developments in research protection internationally.

Unit – I: Introduction – Selection of Research Problem

Research : Objective, motivation, innovation types, approaches and significance research methods versus methodology, Research process.

Defining research problem, necessity of defining the problem, selecting a problem, study on the societal benefits, social importance, impact on local and global issues.

UNIT – II: Literature Survey and Report writing

Methods of literature survey, library and internet, search engines for literature survey availability of literature and databases on the topic of research. Significance of report writing, steps in writing report, layout of research report, types of reports, oral presentations, mechanics of writing research report, precautions of writing research reports.

UNIT – III: Data Analysis

Precision and accuracy – Determinate and accuracy – Determinate and random errors – Distribution of random errors – normal distribution curve – statistical treatment of finite samples – T – test and F-test criteria for rejection of an observation – the Q-test – Significant figures and computation rules – Data plotting – least square analysis – significance of correlation coefficient.

UNIT – IV Computer Applications

Basics of internet services – various sources of abstracts, articles and papers – browsing and downloading – TOC Registration –online journals – e-books, courseware and technical reports different file formats like DOC, PDS, PS, HTML – conversion of one file format to another-use of MS office suite-word, Excel, Power Point and Access for scientific and other applications free and open source software (FOSS) and e-learning materials.

Unit – V: IPR and other issues

TRIPS-Indian WTO patent laws, patent cooperation treaty convention, patenting, patent and IPR related agencies in India and abroad. Format of (UGC, CSIR) research proposals funding agencies for research..

Books for Reference

1. C.R. Kothari, Research methodology, Methods and Techniques, (New age International, New Delhi, 2006).
2. N. Gurumani, Research Methodology for Biological Science, MJP Publishers, Chennai (2006)
3. W.L. Cochran, “Statistical Methods”, Oxford and IBJ Publication, New Delhi (1976).
4. Anderson, Theses & Assignment writing, Prentice Hall (1998) K.V. Raman, Computer in Chemistry, Tata McGraw Hill, New Delhi (1993).

ADVANCED PHYSICS

ZPH102/ZQPH102

4 4 0 6

UNIT 1: Energy Sources

Solar energy Energy sources and their availability – Prospects of renewable energy sources. Solar cells: Solar cells for direct conversion of solar energy to electric powers- solar cell parameters – solar cell electrical characteristics – Efficiency – Single crystal silicon solar cells- Polycrystalline silicon solar cells- cadmium sulphide solar cells – Applications of solar energy: water heating – photo voltaics -Wind energy: Wind power – Principle – Generation – Distribution – Efficiency.

Unit – II: Crystal structure and Growth technique

Crystals – Lattice planes – Miller indices – Space lattice – X-ray diffraction reciprocal lattice – relation between direct and reciprocal space – Bragg's law in reciprocal lattice – X-ray powder diffraction method. Growth: Nucleation – Spherical and cylindrical nucleation – Solution growth methods : Slow cooling and temperature gradient methods - Melt growth : Bridgman method – Czochralski method –

Unit – III: Nano-materials

Introduction to nano technology - Importance of nanomaterials – Types of nanostructures (1D, 2D, 0D) - Self-assembled monolayers (SAM) – Vapour Liquid Solid (VLS) – Chemical Vapour Deposition(CVD) – Carbon nanotubes (CNT) – Metals (Ag, Au) – metal oxides (TiO₂, ZnO) - Semi-conductors (CdS, ZnSe)

UNIT III: Synthesis of Nanomaterials

Gas phase condensation – Vacuum deposition -Physical vapor deposition (PVD) - chemical vapor deposition (CVD) – laser ablation- Sol-Gel- Ball milling –Electro deposition- electro less deposition – spray pyrolysis – plasma based synthesis process (PSP) - hydrothermal synthesis

Unit – V: Nonlinear Dynamics

Non-Linear Optics Harmonic generation- Second and higher order harmonics generation- Regular and Chaotic motions – Linear and nonlinear oscillators – Phase trajectories – Fixed points and limit cycles – Period doubling phenomenon and onset of chaos in Logistic map. Linear and nonlinear waves – Solitary waves – Numerical experiments of Kruskal and Zabusky – Solutions – KdV equation (no derivation) – one solution by Hirota's direct method.

Books for Reference

1. Kreith and Kreider, Principles of solar Engineering, Tata McGraw Hill Publication.
2. A.B. Meinel and A.P. Meinel, Applied Solar Energy.
3. M.P. Agarwal, Solar Energy, S. Chand & co.
4. S.P. Sukhatme, Solar Energy, Tata McGraw Hill Edition.
5. G.D. Rai, Non-Conventional Energy sources, Khauna publications, New Delhi.
6. X-ray Structure Determination (2nd Edition) – Stout and Jensen – John Wiley (1989).
7. Fundamentals of Crystallography - (2nd Edition)- C. Giacovazzo- Oxford press.
8. Structure determination of X-ray Crystallography (2nd Edition)- Ladd and Palmer.
9. “Nanotechnology” G. Timp. Editor, AIP press, Springer-Verlag, New York, 1999
10. “Nanostructured materials and Nanotechnology”, Concise Edition, Editor:- Hari Singh Nalwa; Academic Press, USA (2002).
11. “Hand book of Nanostructured Materials and Technology”, Vol.1-5, Editor:- Hari Singh Nalwa; Academic Press, USA (2000).
12. “Hand book of Nanoscience, Engineering and Technology (The Electrical Engineering handbook series), Kluwer Publishers, 2002
13. Nanoscale characterization of surfaces & interfaces, N John Dinardo, Weinheim Cambridge: Wiley-VCH, 2nd ed., 2000.
14. J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York (1986).
15. P. Santhana Raghavan and P.Ramasamy, ‘Crystal Growth Processes and Methods’, KRU Publications Kumbakonam (2000).
16. G. Cao, Nanostructures and Nanomaterials : Synthesis, properties and applications, Imperical College Press, 2004.

SPECTROPHYSICS

ZPH103/ZQPH201

4 4 0 6

UNIT I: Spectral analysis of Crystal

Vibrational spectroscopy Infrared spectroscopy – Vibrational study of diatomic molecules – IR rotation – Vibrational spectra of gaseous diatomic molecules – simple gaseous polyatomic molecules – Correlations of Infra Red Spectra with Molecular Structure - Instrumentation - Sample handling - quantitative Analysis - Sample Handling and Analysis.

Unit II: Normal coordinate analysis

Introduction-secular equation- internal coordinates - potential energy matrix symmetry coordinates-band assignments-potential energy constants-normal coordinate analysis of H₂O molecule- quantum chemical methods.

Unit III : Infrared spectroscopy

Electromagnetic spectrum-basic principles of vibrational spectroscopy-energy levels and spectral transitions-introduction-instrumentation-sampling technique- Infra Red Spectroscopy - Correlations of Infra Red Spectra with Molecular Structure - Instrumentation - Sample handling - quantitative Analysis - FTIR spectroscopy- applications.

Unit IV: Raman spectroscopy

Introduction- Raman Spectroscopy - Theory - Instrumentation -difference between Raman and infrared spectra-quantum mechanical description of the Raman effect-selection rules-depolarisation ratio-resonance Raman effect-FT Raman- instrumentation- sample handling techniques-applications.

Unit V: UV-Visible spectroscopy

Introduction - Beer's law – chromophores – instrumentation - sampling techniquesapplications in pharmaceutical field.

Books for Reference

1. Sathyanarayana D N, Vibrational Spectroscopy- Theory and Applications, New Age International Publishers, New Delhi.
2. Chatwal Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, New Delhi.
3. Jag Mohan, Organic Spectroscopy Principles and Applications, Narosa Publishing House, New Delhi.
4. Colin N Banwell and Elaine M Mccash, Fundamentals of molecular spectroscopy, Tata McGraw Hill, New Delhi.
5. Molecular Structure and Spectroscopy, G. Aruldas, Prentice Hall India, New Delhi.
6. C.N. Banwell, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill (1972).
7. D.N. Sathyanarayana, Vibrational spectroscopy, New Age international (2004).

Teaching Learning Skills

ZSW202/ZQSW203

1 2 0 2

Objective: On completion of the course the student will be able to

- Demonstrate his/her understanding of the role of a teacher in different phases of teaching
- Acquire the knowledge in various micro teaching skills
- Appropriate the different models of teaching
- Learn the different methods of teaching
- Understand the importance of teaching devices and techniques
- Acquire knowledge in the affective use of SPSS package

Unit I : Concept of Teaching

Teaching – an art or a science? – Relationship between teaching and learning. Analysis of the concept of Teaching – Teaching as a deliberately – planned process : Analysis in terms of teaching skills – General Model of instruction – Pre active, Interactive and Post active – Phases and teachers role in them.

Unit II : Skills in Teaching

Microteaching skills – need, procedure, cycle of operations and uses – set induction, stimulus variation, reinforcement, questioning, illustrating, explaining demonstrating, using black board, link lesson and closure.

Unit III : Concepts of Learning

Nature and importance of learning – Individual differences in learning – Learning Curves – Factors influencing the learning- theories of learning – Transfer of Learning - :earning – Learning by limitation.

Unit IV: Techniques of teaching-learning – Large group

Lecturing – Place in Higher Education – Purposes served – Basic skills – Evaluation of effectiveness. Demonstration – Video conferencing – Method of organizing – Advantages and disadvantages as a teaching learning process. Use of Audio Visual Aids – Importance – General Principles of use – Advantages and disadvantages.

Techniques of teaching – learning – small group

Importance, skills of using, Evaluation of Effectiveness of the following:

Group discussion – Collaborative learning – Seminar – Debate – Group investigation – Role play.

Unit V : Introduction to SPSS

Introduction to SPSS – Data analysis with SPSS general aspects , workflow, critical issues, - SPSS general description, functions, menus, commands – SPSS file management.

Books for Reference :

1. Davis, Irok (1971), The management of learning, McGraw Hill, London.
2. Judith, I.n(2008) Learners, learning and educational activity, London: Routledge.
3. Graham, R. (2008) Psychology, The key concepts, London : Routledge.
4. Samuel, W. (2007) The intellectual and moral development of the present age U.S : Kessinger Pub Co.
5. Chobra, R.K. (2006) Elements of educational psychology, New Delhi: Arise publishers.
6. Langer J. and Applebee A.N. (1987) How writing shapes thinking : A study of teaching and learning, National Council of teachers of English.
7. Lindfors, J (1984) How children learn or how teachers teach? A Profound confusion: Language Arts, 61(6), 600-606.
8. Vygotsky L.S. Thought and Language, Cambridge, MA: MIT Press, 1962.
9. Field A. Discovering Statistics Using SPSS, Fourth Edition, SAGE, 2013.

Resource Websites:

<http://www.thirteen.org/edonline/concept2clasas/constructiveism/index/html>.

www.ipn.unilkiel.de/projekte/esera/book/b001-cha.pdf

<http://www.ericdigests.org/1999-3/theory.html>

<http://www.ncrel.org/sdrs/areas/issues/students/atrisk/at6lk.36.html>

<http://www.vathena.arc.nasa.gov/project/document/teacher.html>