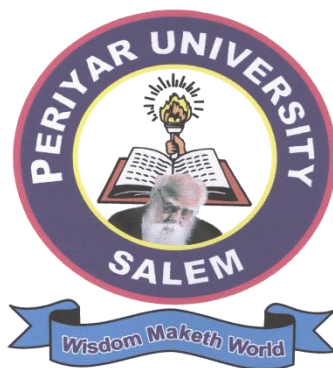# PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM-636 011

M.Phil. DEGREE
PHYSICS
(Choice Based Credit System (CBCS)

REGULATIONS AND SYLLABUS

(Effective from the academic year 2015-2016 and thereafter)

DEGREE OF MASTER OF PHILOSOPHY (M.Phil)
REGULATIONS
FULL-TIME

1. Eligibility:

Candidates who have qualified for post graduate degree of this University or any other University recognized by the Syndicate as equivalent thereto shall be eligible to register for the Degree of Master of Philosophy (M.Phil.) in their respective subject and undergo the prescribed course of study in an approved institution or department of this University.

Candidates who have qualified their postgraduate degree on or after 1st January 1991 shall be required to have obtained a minimum of 55 % of marks in their respective postgraduate degree to become eligible to register for the Degree of Master of Philosophy (M.Phil.) and undergo the prescribed course of study in an approved institution or department of this University.

In the case of teachers (or) others registering for part-time registration, the minimum percentage of marks for registration is 50 %.

For the candidates belonging to SC / ST community and those who have qualified for the Master's degree before 01.01.1991 the minimum eligibility marks shall be 50 % in their Master's Degree.

2. Duration:

The duration of the M.Phil Course shall extend over a period of one year from the commencement of the course.

3. Course of Study:

The course of study for the degree shall consist of (a) Part-I comprising three written papers according to the Syllabus prescribed from time to time; and (b) Part-II Dissertation.

Part-I shall consist of Paper-I Research Methodology and Paper-II an advanced paper in the main subject. There shall also be a third paper which shall be the background paper relating to the proposed Dissertation work carried out internally by the College/Departments.

4. Structure of the Course

Subject Code	Title of the Course	Crédits L T P C	Total Marks
	PART-I **Scientific Research** **and Methodology**	**4 0 0 4**	**100**
	Advanced Physics	**4 0 0 4**	**100**
	Optional Paper	**4 0 0 4**	**100**
	PART-II **Project and Viva-voce**	**12 0 0 12**	**200**

* 150 Project   50 Viva-voce

5. Scheme of Examinations

Part-I Written Examination: Paper I, II & III

The examination of papers I, II and III shall be held at the end of first semester. The duration for each paper shall be 3 hours carrying a maximum of 100 marks.

Paper - III examination will be conducted by the College / Departments and the marks obtained by the candidate along with the question paper and valued answer scripts shall be sent to the University at least 15 days before the commencement of the examinations of paper I and II.

The examiners will be appointed from the panel of four names of each paper (I and II) submitted by the College / Departments concerned. If one examiner awards a pass mark and the other fail mark the, paper will be valued by a third examiner whose award of marks will be final.

Part - II - Dissertation:

The exact title of the Dissertation shall an intimated within one month after the completion of the written examination. Candidates shall submit the Dissertation to the University through the Supervisor and Head of the Department at the end of the year from the commencement of the course which shall be valued by internal examiner (supervisor) and one external examiner appointed by the University from a panel of four names sent by the Supervisor through the Head of the Department / Principal at the time of submitting the dissertation.

The examiners who value the Dissertation shall report on the merit of candidates as "Highly Commended" (75 % and above) or "Commended" (50 % and above and below 75 %) or "Not Commended" (below 50 %).

If one examiner commends the Dissertation and the other examiner, does not commend, the Dissertation will be referred to a third examiner and the third valuation shall be final.

Submission or resubmission of the Dissertation will be allowed twice a year.

06. QUESTION PAPER PATTERN

Question paper pattern for University Examinations

Time   -   3 Hours

Maximum   -   100 marks

Passing Minimum   -   50 marks

Part - A (5x5=25 Marks)

Answer all questions

(Either or Type)

Part - B (5x10=50 Marks)

Answer all questions

(Either or Type)

7. Passing Minimum

A candidate shall be declared to have passed Part-I of the examination if he/ she secure not less than 50 5 of the marks in each paper including Paper-III for which examination is conducted internally. A candidate shall be declared to have passed Part-II of the examination if his/her dissertation is at least commended. All other candidates shall be declared to have failed in the examination.

8. Restriction in number of chances:

No candidate shall be permitted to reappear for the written examination in any paper on more than two occasions or to resubmit a Dissertation more than once. Candidates shall have to qualify for the degree passing all the written papers and dissertation within a period of three years from the date of commencement of the course.

9. Conferment of Degree

No candidate shall be eligible for conferment of the M.Phil degree unless he/she is declared to have passed both the parts of the examinations as per the Regulations.

Paper – I - Scientific Research and Methodology

UNIT – I
Method of Research: Identification of the problem – Literature Survey – Reference Collection – Internet Browsing – Assessing the current status – Mode of approach actual investigation – Results and Discussion – Conclusion – Presenting a Scientific Seminar – Synopsis writing - Art of Writing a Research Paper and Thesis – Multimedia techniques in papers presentation - Power point – presentation and Chart.

UNIT – II
Computer Oriented Numerical Methods: Solution of equations – Simple interative method – Newton – Raphson method – Numerical integration – Simpson's rule – Runge-Kutta Method - Gaussian quadrature - Solution of simultaneous equations – Gauss – Jordon elimination method – Eigen values and eigen vectors by matrix diagonalisation (Jacobian method)

UNIT – III
Statistical Methods: Interpolation – Lagrange and Newton interpolation – Linear interpolation – Higher order interpolation – Finite difference operators – Interpolating polynomials using finite differences – Least square approximation – curve fitting – Multivarient technique for data analysis.

UNIT – IV
Introduction to C: Basic structure of C programming – Character set – constants – keywords and identifiers – variables – data declaration of variables – assigning values to variables – defining symbolic constants.
Operators (Arithmetic, relational, logical, assignment, increment, decrement, conditional and special) type conversion in expressions.

UNIT- V
Functions of C: Arrays (One, two, multi dimensional arrays) - initiating two - dimensional arrays declaring and initialing string variables - reading and writing strings on the screen - arithmetic operations on strings. User defined functions-their needs – multiplication programme - the form of C function - return values and their types – calling functions – category of functions - no arguments and no return value – Sample programs: Matrix multiplication, diagonalisation and inversion – solution to simultaneous equation – differential equations.

REFERENCES:

1. Jerry D.Gibson- Multimedia Communications – Directions & Innovation — Academic Press

2. John F.Koegel Buford— Multimedia Systems Twelfth Edition – Pearson Education

3. J.Anderson, B.H.Durston and M.Poole- Thesis and assignment writing –Wiley Eastern

4. Berry - How to write a research paper

5. W. G.Campbell - Form and style in the thesis writing

6. Rajammal P.Devadas, - A handbook of Methodology of Research – R.M.M. Vidyalaya Press

7. V.Rajaraman- Computer Oriented Numerical Methods – Prentice – Hill

8. P.A.Stark- Introduction to Numerical Methods -Macmillan

9. E.Balagurusamy - Programming in C – Tata McGraw.Hill Publishing Company.

10. Schaum's Series – Programming in C - Tata Mc Graw Hill Publishing Company.

11. - N.K.Jain, S.R.K.Iyengar and R.K.Jain - Numerical methods for scientific and Engineering Computation– New Age International Publisher

12. E.Balagurusamy– Numerical methods- Tata Mc Graw Hill Publishing Company.

Paper – II – Advanced Physics

Unit- I
Vibrational Spectroscopy:
Infrared Spectroscopy-Vibrational study of diatomic molecules – IR rotation – Vibrational spectra of gaseous diatomic molecules – simple gaseous polyatomic molecules –vibrational frequencies and qualitative analysis – Quantitative IR analysis – determination of bond length and bond moment – determination of interstellar atoms and molecules – FT technique in IR spectroscopy – Non-linear phenomena in Raman Spectroscopy - SERS – CARS – FT technique in Raman spectroscopy - Application of vibrational Spectroscopy in structural elucidations.

Unit-II
X-ray – Diffraction: X-rays - X-ray sources – conventional generators - construction and geometry - sealed tube – rotating anode generators – choice of radiation - Synchrotron radiation – X-ray optics: filters– monochromators – collimators – mirrors - safety. 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.

Unit- III
Lasers and Non-linear Optics:
Lasers: Basic principles of Lasers - Nd: YAG Laser – He-Ne Laser – Semi-conductor diode Laser – Dye Laser – Co-Chemical Laser – Tunable Laser – Colour center Lasers. Applications of Lasers in medicine – industry – communication and Holography.

Non-linear Optics: Harmonic generation – Second and higher order harmonics generation – phase matching - Optical Mixing – Optical parametric oscillations - Multi-photon processing.

Unit-IV
Superconductivity: Occurrence of superconductivity- destruction of superconductivity by magnetic fields- Meissner effects- Type I and Type II superconductors-Heat capacity-electron-phonon interaction- Cooper pairs and BCS theory- London equation- Coherence length- Flux quantization in superconducting ring- duration of persistent currents-Quantum interference- Josephson effect and applications- SQUIDS- High temperature superconductivity-Theory of high T_c superconductors-Layered structures (High Superconductors)-comparison between conventional and High T_c superconductors.

Unit- V
Solar Energy: Solar Radiation-Measurements of solar Radiation and sunshine-Solar Thermal Collectors-Flat Plate and Concentrating Collectors-solar Applications-fundamentals of photovoltaic conversion-solar cells-PV systems-PV Applications.
Wind Energy: Wind data and Energy estimation-Wind energy conversion systems-Wind energy generators and its performance-Wind energy storage-applications-Hybrid systems.

Bio-energy: Biomass, Biogas, Source, Composition, Technology for utilization-Biomass direct combustion-Biomass gasifier-Biogas plant-Digesters-Ethonal production-Biodiesel production and economics.

OTEC, TIDAL, Geothermal and Hydel Energy: Tdal energy-Wave energy-Data, Technology options-Open and closed OTEC Cycles-Small hydro, Turbines-Geothermal energy sources, Power plant and environmental issues.

New Energy Sources: Hydrogen, generation, storage, transport and utilization, applications: power generation, transport-Fuel cells-technologies, types-economics and the power generation.

References

1. D.N.Sathyanarayana, Vibrational Spectroscopy, New Age International
2. B.P.Straughan and Walkar.S, Spectroscopy Vol.2, Chapman & Hall
3. C.N.Banwell, Fundamentals of Molecular Spectroscopy, Tata Mc Graw Hill
4. Stout and Jensen- X-ray Structure Determination (2nd Edition)– John Wiley Publications.
5. C. Giacovazzo- Fundamentals of Crystallography(2nd Edition) - Oxford Press
6. Ladd and Palmer - Structure Determination by X-ray Crystallography (2nd Edition)
7. Ajoy Ghatak, Optics – (2nd Edition) Tata Mc Graw Hill Publishing Company.
8. William Silfvast, Laser Fundamentals, Cambridge University Press.
9. B. B. Laud, Lasers and Non-linear Optics (Second Edition), New Age International (P) Ltd.
10. Demtrodes, Laser – Spectroscopy Basic concepts and Instrumentations (Third Edition) – Springer – International Edition.
11. C. Kittel, Introduction to Solid State Physics, Wiley Eastern.
12. A.J. Dekker, Solid State Physics, Macmillan, India.
13. B.S. Saxena, R.C. Gupta & P.N. Saxena, Solid State Physics, Pragati Prakashan.
14. P.M.Chaikin, T.C. Lubensky, Principle of Condensed Matter Physics, Cambridge University Press.
15. Leonard M. Sender, Advanced Condensed Matter Physics, Cambridge University Press
16. Rita John, Solid State Physics, Tata Mc Graw Hill.
17. John Twidell & Tony Weir Renewable energy resources (Second Edition) - Taylor & Francis.
18. G.D. Rai, Non conventional sources of energy, Kanna publications.

Paper – III – Optional Papers

(a) Materials Science

(b) Crystallography and Molecular Biophysics

(c) Laser Physics

(d) Spectroscopy

(e) Energy Physics

(f) Quantum Theory of Atoms in Molecules

(g) Non Linear Optics