

**MOTHER TERESA WOMEN'S UNIVERSITY  
KODAIKANAL – 624 101**

**M.PHIL PHYSICS**

**(For candidates admitted from the academic year 2021-2022 onwards)**



**DEPARTMENT OF PHYSICS**

**MOTHER TERESA WOMEN'S UNIVERSITY, KODAIKANAL**

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KODAIKANAL**

**M.Phil. PHYSICS - SYLLABUS  
(for candidates admitted from 2021 onwards)**

**COURSE NAME:** M.Phil. PHYSICS

**ELIGIBILITY:** M.Sc. Physics with any specialization.

University will conduct a Common Entrance Test for M.Phil. Admission

**MEDIUM:** English

Course Code	Course	Hours	Credits	Continuous Internal Assessment (CIS)	End Semester Exam (ESE)	Total
<b>Semester I</b>						
M21PHT11	Research Methodology	10	4	40	60	100
M21PHT12	Advanced Experimental Techniques	10	4	40	60	100
M21PST13	Professional Skills	10	4	40	60	100
	<b>Total</b>	<b>30</b>	<b>12</b>			<b>300</b>
<b>Semester II</b>						
M21PHT21	Special paper related to project	10	4	40	60	100
M21PHD21	Dissertation +Viva Voce	20	14 (12+2)	120	80	200
		<b>30</b>	<b>18</b>			<b>300</b>
<b>TOTAL CREDITS</b>			<b>30</b>	<b>Total Marks</b>		<b>600</b>

Special Paper related to project

S.No	Course
1	Materials Science
2	Synthesis and Characterization of Nanomaterials
3	Computational Material Science
4	Solar Cells
5	Surface Enhanced Raman Spectroscopy
6	Directed study*

\*Any new course can be added as a special paper by getting permission from BoS and Academic Council.

The M.Phil. course consists of four theory papers. M21PST13 is common for all the courses. Special paper (M21PHT21) is pertaining to the area of specialization chosen by

the candidate under a guide. It is purely internal (framing syllabus, question setting and evaluation).

Each candidate will submit a dissertation on a topic in Physics after carrying out the project work under the supervision of a guide. The project may be theoretical or experimental. The duration of the project will be for six months or more as per the discretion of the department. The dissertation will be evaluated by an external examiner and viva-voce examination will be conducted by a committee consisting of the guide and the department faculty. The examination will be for 100 marks in each of the theory papers. The question paper will cover the entire syllabus. The duration of the examination is 3 hours.

**M21PHT11 - RESEARCH METHODOLOGY****CORE-1****SEMESTER-1****Objective:**

- To expose the student with various mathematical methods for numerical analysis and use of computation tools.
- To impart the knowledge on systems of equation, probability statistics and error analysis

**UNIT I: WORKING ON A RESEARCH PROBLEM**

Scientific research –An introductory approach-Research methods and techniques— Selection and formulation of research problem and Hypothesis - Research design - methods of collection of literature-access using internet web tools - e-journals-preparation of PPT and poster presentations - Style and format of thesis writing: Format for Table, Figure and footnotes - Use of Appendix and Bibliography.

**UNIT II: STATISTICAL METHODS**

Measures of central tendency: meaning, characteristics, measures of central tendency, arithmetic mean, Median, mode, geometric mean ,harmonic mean, skewness - Distributions : Student's t –test ,F-test, Chi-square test-Correlation and Regression analysis-Graphical representation and curve fitting of data :Method of least squares: linear and non-linear curve fitting.

**UNIT III: SOLUTIONS OF EQUATIONS**

Determination of zeros of polynomials – Roots of nonlinear algebraic equations and transcendental equations – Bisection and Newton - Raphson methods – Convergence of solutions.

**UNIT IV: LINEAR SYSTEMS**

Solution of simultaneous linear equations – Gaussian elimination – Matrix inversion - Eigenvalues and eigenvectors of matrices – Power and Jacobi Methods.

**UNIT V: INTERPOLATION AND CURVE FITTING**

Interpolation with equally spaced and unevenly spaced points (Newton forward and backward interpolations, Lagrange interpolation) – Curve fitting – Polynomial least-squares fitting – Cubic spline fitting.

**TEXT BOOKS :**

1. Santosh Gupta, Research Methodology and Statistical techniques, Deep and deep publications, 2005.

2. J.Anderson, B.H Durston, M.Poole, Thesis and Assignment Writing, Wiley Eastern university 1998.
3. Santosh Gupta, Research Methodology & Statistical techniques, Deep and Deep Publication 2005.
4. B.C.Nakra, K K.Chaudhry, Instrumentation, Measurement and Analysis, 2<sup>nd</sup> edition, Tata McGraw-Hill publishing Company Ltd, 2004.
5. John R.Tayore, An Introduction to Error Analysis, University Science Books, 1982.
6. Sastry, Introductory Methods of Numerical Analysis 2021
7. V. Rajaraman, Computer oriented Numerical Methods, 3<sup>rd</sup> Ed. Prentice-Hall, New Delhi 1993,
8. M.K. Jain, S.R. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 3<sup>rd</sup> Ed. New Age International, New Delhi 2014
9. F. Scheild, Numerical Analysis, 2<sup>nd</sup> Edition, Schaum's Series McGraw-Hill, NY,1988

## M21PHT12 - ADVANCED EXPERIMENTAL TECHNIQUES

### Objectives:

- To introduce various methods available for characterizing the materials.
- To expose the student with thermal, microscopic, X-ray and spectroscopic methods of characterization.

### UNIT I: THERMAL ANALYSIS

Differential Scanning Calorimetry and Differential Analysis- Thermogravimetry- Evolved gas detection and analysis- methodology of thermogravimetry, differential scanning calorimetry and differential thermal analysis- Thermochemical analysis- dynamic mechanical analysis.

### UNIT II: X-RAY METHOD

Production of X-rays and X-ray spectra- Instrumentation- Direct X-ray method- X-ray absorption method- x-ray fluorescence method- X-ray diffraction – Auger Emission Spectroscopy (AES)- Electron spectroscopy for Chemical Analysis (ESCA)

### UNIT III: ULTRAVIOLET AND VISIBLE SPECTROMETRY & PHOTOLUMINESCENCE

Instrumentation- Radiation sources- Wavelength selection- cells and sampling devices- detectors- readout modules- Photoluminescence – Different types – instrumentation - Application

### UNIT IV: INFRARED AND RAMAN SPECTROSCOPY

#### Infra Red Spectrometry

Correlation of Infrared spectra with molecular structure- Instrumentation- Sample Handling- Quantitative Analysis.

#### Raman Spectroscopy

Theory- Instrumentation- Sample Handling and illumination- Structural analysis- polarization measurements- quantitative analysis- comparison of Raman with Infrared spectroscopy.

### UNIT V: ELECTRON MICROSCOPY

Principles of SEM, TEM, EDAX, AFM- instrumentation-sample preparation and analysis of material.

### TEXT BOOKS:

1. Willard, Merritt, Dean, Settle, Instrumental Methods of Analysis, CBS publishers, New Delhi, 1988
2. Skoog, Holler, Niemann, Principles of Instrumental Analysis, Thomson, 2005.

## M21PST13 PROFESSIONAL SKILLS (Common Paper)

### Objectives:

1. To develop skills on ICT and apply them in teaching, learning and research.
2. To acquire knowledge on communication skills with special reference to its elements, types, development and styles.
3. To understand the concepts on Communication technology, Computer Mediated Teaching.
4. To develop different teaching skills and to develop Multimedia /E-contents in their respective subjects.

### Unit I - Computer Application Skills

Fundamentals of Computers and windows, Operating System – **MS – Office** Components; **Word**: Equation editor, Table Manipulation – Formatting Features – organizational Chart. **MS – EXCEL**: Statistical Functions – Number Manipulation – Chart Preparation with various types of graphs. **MS Powerpoint**: Powerpoint presentation with multimedia features. **Internet and its applications**: E-mail and attachments – working with search engines.

### Unit II - Communication Skills (English/Tamil/Both)

**English**: Skills of Communication: Listening, Speaking, reading and Writing – Writing Synopsis, Abstract and proposals. Developing good language abilities – Public speaking – Writing Skills.

**Tamil**: பயிற்றுவிக்கும் திறன் - பேச்சுத்திறன் - வெளிப்பாட்டுத்திறன் - ஆய்வுத்திறன் - ஆய்வுச்சுருக்கம் தயாரித்தல்.

### Unit III - Communication technology

Computer Mediated Teaching: Multimedia, E – Content, Satellite Based Communication – EDUSAT and ETV channels. Web: Internet I Education.

#### **Unit IV - Pedagogical Skills**

Micro teaching Skills: Skill of Induction, Skill of Stimulus Variation. Skill of Explaining, Skill of Probing Questions, Skill of Blackboard, Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills – Research Extension and Consultancy.

#### **Unit V - Industrial Technology**

Lecture Techniques: Steps, Planning of a lecture, Lecture Notes, Updating, Delivery of Lecture. Teaching – Learning Techniques: Team teaching, Group Discussion. Seminar, Workshops, Symposium and Panel Discussion – Games and Simulations – Web Based Instructions.

#### **References**

1. Michael D. and William, Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York, (2000).
2. Pandey S.K.(2005). Teaching communication. Commonwealth publisher, Delhi
3. Sharma. R.A.(2006), Fundamentals of education technology, Surya publication, Meerut
4. Kum Babu A. and Dandapani S., Microteaching, Neelkamal Publications, Hyderabad, (2006).
5. Vanaja M and Rajasekhar S., Computer Education, Neelkamal Publications, Hyderabad, (2006)

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