

**MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL**

M.Phil. PHYSICS - SYLLABUS (for candidates admitted from 2018 onwards)

COURSE NAME: M.Phil. PHYSICS

ELIGIBILITY: M.Sc. Physics with any specialization.

MEDIUM: English

Subject Code	Subject	Hours/ Week	Credit	Formative	Summative	Total
First Semester						
MPHT11	Research Methodology	10	4	40	60	100
MPHT12	Advanced experimental techniques	10	4	40	60	100
MPST13	General Skills	10	4	40	60	100
Second Semester						
MPHT21	Area paper related to thesis	10	4	40	60	100
MPHD21	Dissertation	20	14 (12+2)	-	200	200
TOTAL		60	30			600

The M.Phil. course consists of four theory papers. PHY13 is common for all the courses. Special paper (PHY14) 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 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.

MPHT11: RESEARCH METHODOLOGY

6HRS/4CREDIT

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
- knowledge on interpolation and curve fitting
- explains the concepts of research problems

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.

(15 hrs)

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 BOOK:

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. B.C.Nakra, K K.Chaudhry, Instrumentation, Measurement and Analysis, 2nd edition, Tata McGraw-Hill publishing Company Ltd, 2004.
4. John R.Tayore, An Introduction to Error Analysis, University Science Books, 1982.

Book for References

5. Sastry, Introductory Methods of Numerical Analysis. 5th Edn, PHI, 2012
6. V. Rajaraman, Computer oriented Numerical Methods, 3rd Ed. Prentice-Hall, New Delhi. 1993
7. M.K. Jain, S.R. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 3rd Ed. New Age International, New Delhi. 2012
8. F. Scheid, Numerical Analysis, 2nd Edition, Schaum's Series McGraw-Hill, NY. 1988

MPHT12: ADVANCED EXPERIMENTAL TECHNIQUES

6HRS/4CREDIT

Objectives:

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

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. (15 hrs.)

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) (10 hrs.)

UNIT III

ULTRAVIOLET AND VISIBLE SPECTROMETRY

Instrumentation- Radiation sources- Wavelength selection- cells and sampling devices- detectors- readout modules- Instruments for absorption photometry. (9 hrs.)

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.1989
2. Skoog, Holler, Niemann, Principles of Instrumental Analysis, Thomson, 2005.

Book for References

1. J.A.Belk, Electron Microscopy and microanalysis of crystalline materials, Applied Science Publishers, London, 1979.
2. J.W. Gardner, H.T. Hingle, From Instrumentation to Nanotechnology, Gordon and Breach Science Publishers, 1990.

Core III - (Theory)
PROFESSIONAL SKILLS (Common Paper)

Objectives:

After completing the course, the scholars will be able to

- Develop skills to ICT and apply them in teaching, learning contexts and research.
- Acquire the knowledge of communication skills with special reference to its elements, types, development and styles.
- Understand the terms: Communication technology, Computer Mediated Teaching and develop Multimedia/E-contents in their respective subjects.
- Develop different teaching skills for putting the content across to targeted audience.

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 - வெளிப்பாட்டுத் திறன் - ஆய்வுத்திட்டம் - 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

- Micael D. and William (2000). Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York.
- Information and Communication Technology in Education: A Curriculum for Schools and Programme of Teacher development. Jonathan Anderson
- Pandey S.K.(2005). Teaching communication. Commonwealth publisher, Delhi
- Sharma. R.A.(2006), Fundamentals of education technology, Surya publication, Meerut
- Kum Babu A. and Dandapani S. (2006), Microteaching, Neelkamal Publications, Hyderabad
- Vanaja M and Rajasekhar S. (2006), Computer Education, Neelkamal Publications, Hyderabad