SAKTHI COLLEGE OF ARTS AND SCIENCE FOR WOMEN, ODDANCHATRAM

(Recognized Under Section 2(f) and 12(B) of UGC Act 1956)

(Affiliated to Mother Teresa Women's University, Kodaikanal)

PG & RESEARCH DEPARTMENT OF PHYSICS

CURRICULUM FRAMEWORK AND SYLLABUS FOR

OUTCOME BASED EDUCATION IN

SYLLABUS FOR

M.Phil., Physics

FRAMED BY

MOTHER TERESA WOMEN'S UNIVERSITY,

KODAIKANAL

UNDER

CHOICE BASED CREDIT SYSTEM

2018-2021

REGULATIONS

Eligibility:

A candidate with postgraduate degree in Physics or any related discipline with minimum of 55% marks.

Duration:

One year

Medium of Instruction:

English only

Examinations:

The M.Phil, Programme in Physics comprises of Theory courses (3 in the 1st Semester and 1 in the 2nd Semester) and one Dissertation cum Viva – Voce. Paper I, II, III and IV are common for all the candidates.

Attendance:

- Normally a student must secure a minimum of 80% attendance to become eligible to take the End – Semester Examination (ESE) in a course. However, condonation of shortage of attendance may be granted on genuine medical grounds upto a maximum of 10% of the contact days. For this purpose, the student must, immediately upon returning to class after the period of illness, apply for the condonation, submitting valid medical certificate (s) from registered medical practitioner (s) through his/her advisor to the Head of the Department (HOD), who will decide upon the application for condonation of shortage of attendance. Medical certificates submitted on the eve of the ESE will not be accepted.
- If a student who has no genuine medical grounds and has earned 70% or more but less than 80% of attendance in a course in a semester that student will be debarred from the ESE in that course in that course in that semester. However the student may take the ESE when offered in later semester.
- If a student has earned less than 70% attendance, that student will be debarred from the ESE in the course and the statement of grades will read IA (Inadequate Attendance) against that course. Such a student must repeat that course when offered in a later semester. Attendance in a course will always be reckoned from the days of joining the course to the last day of the course.

Redoing of the Programme

A student who has been debarred from the ESE for lack of attendance must repeat the course at the later semester, paying the prescribed fees for the course. No student will be permitted to repeat a course or reappear for a CIA test or an ESE for improvement of Grade Points. A student, who has fulfilled all the course requirements but has not been able to take the ESE alone, can take the same at a later semester. A student who has failed in an ESE need take only the ESE in that course when it is next offered. Such students need take only the fee for ESE of the course.

Students interested in redoing of course(s) have to get prior official permission for the same by applying to the Registrar through the HOD on before 5th June (of redoing of old semester courses) or 5th November (for redoing Even Semester Courses) every year.

A student may be permitted to break his/her study on valid grounds. Such break of study is entertained only if the student has completed at least two semesters of student. For availing break of study, the student has to apply to the Registrar along with the recommendations of the Class Advisor and the HOD in the format prescribed enclosing documentary evidences(s) as a proof for his/her claim for break of study and after paying prescribed fee. Unauthorized break of study will not be permitted under any circumstance. Break of study will be permitted subject to the formalities of readmission as well as the availability of courses to be completed and the examination norms.

Assessment:

Assessment of the students will be two-fold consisting of Continuous Internal Assessment (CIA) and End Semester Examination (ESE). The ratio between CIA and ESE will normally be 40:60.

Continuous Internal Assessment (CIA)

The CIA marks shall be awarded based on the following:	Marks
Scores of Best two tests out of three tests	20
Assignment	10
Seminar/Quiz	10
Total	**40**

End Semester Examination (ESE):

Except in the case of Project-work Summer Placement Training and exclusively practical/ field placement courses, the ESE will consist of a written examination of three hours duration reckoned for a maximum 60 marks.

Part-A (5*12=60)

5 Questions out of 10

Time extension for submission of Dissertation:

Extension for submission of dissertation shall be granted as per the University norms and conditions.

Passing Minimum Marks:

There will be no minimum for internal assessment in papers I, II, and III. A candidate will be declared to have passed in a course if she gets a minimum of 50% marks in the University examination and 50% marks in total, putting together the continuous internal assessment marks and University examination marks in that course. A candidate should have secured 50% in Dissertation and Viva-Voce to get a pass.

Classification of Candidates

If a candidate secured 60% and above in both the parts put together, she is deemed to have passed in

First Class.

If a candidate secured 50% and above but less that 60% in both the parts put together, she is deemed to have passed in Second Class.

If a candidate secures less than 50% in both the parts put together, she is deemed to have failed in the course.

Failed Candidates:

A candidate who fails in any course/courses may appear again in those course/courses as per University rules.

Completion of the program:

The students have to complete their program within 3 years from the completion of the duration of program, failing which their registration will stand automatically cancelled and they have to register afresh, if they want to pursue the program.

Award of degree:

A student will be declared to be eligible for the award of a degree if she has:

- Registered for and undergone all the courses under the different parts of the curriculum of her program.
- No dues to the University, hostel, NSS, Library, Clubs, Associations etc., and
- No disciplinary action pending against her.

Other regulations:

Besides the above, the common regulations of the University shall also be applicable to this program.

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Preamble:

Physics, a core discipline, is the fundamental and foremost to all natural sciences. It has been significant and influential through advances in its understanding that have translated in to new technologies. The Department of Physics has been launched in the academic year 2009, with the introduction of B.Sc., (Physics) Degree Programme. It has met with the vertical growth by the introduction of M.Sc., (Physics) in 2010 and M.Phil., (Physics) in 2014.

The Department has highly qualified faculty members and support staff and is committed towards the development of innovative and handy ways of teaching at graduate, post graduate and research level and carrying out cutting edge research in various research fields. The department strives to nurture the young minds towards embracing various scientific challenges. Project work and problem sessions are encouraged to develop innovative and analytical approach to physics learning.

Fixing the Learning Objectives:

Since the Academic year 2018 – 2019, the learning objectives and outcomes of the programmes B.Sc., (Physics), M.Sc., (Physics) and M.Phil., (Physics) have been set, following the Bloom's Taxonomy Cognitive Domain. Accordingly, it is broken into six levels of learning objectives of each course. They are -

K1 / Knowledge = Remember

K2 / Comprehension = Understand

K3 / Application = Apply

K4 / Analysis = Analyze

K5 / Evaluation = Evaluate

K6 / Synthesis = Create

Mapping COs with POs:

For each programme, the Educational objectives and the Specific objectives are specified. The programme outcomes are designed according to the curriculum, teaching, learning and evaluation process. For each course, the definite outcomes are set, giving challenge to the cognitive domain. The course outcomes are mapped with the programme outcomes. The performance of the stakeholders is assessed and the attainment rate is fixed, by using the measurements 'high', 'medium' and 'low'. The restructuring of the curriculum is done based on the rate of attainment.

Institutional Objectives:

The institution has certain definite Institutional Objectives to be attained.

- Skill Development & Capacity Building
- Women Empowerment
- Self-reliance

- Gender Equity & Integrity

Programme Educational Objectives:

The Programmes B.Sc., M.Sc., and M.Phil., (Physics) are offered with certain Specific Objectives.

- To identify the fundamental laws for the study of various areas of physics and define and describe them with clarity.
- To know the application of principles and concepts of Physics with necessary practical background and assess their consequences
- To explain the basic foundation of the underlying principles and laws of Physics.
- To discuss, formulate and analyze problems in Physics and identify the key concepts and principles to solve them.
- To execute an experiment through careful observations, precise measurements, analyses, interpretation and effectively present the results.

Mapping PEOs with IOs:

Programme Educational Objectives	**Institutional Objectives**			
B.Sc. / M.Sc. / M.Phil., (Physics)	**1**	**2**	**3**	**4**
PEO1: To identify the fundamental laws for the study of various areas of physics and define and describe them with clarity.	*			
PEO2: To know the application of principles and concepts of Physics with necessary practical background and assess their consequences		*		
PEO3: To explain the basic foundation of the underlying principles and laws of Physics.			*	
PEO4: To discuss, formulate and analyze problems in Physics and identify the key concepts and principles to solve them.				*
PEO5: To execute an experiment through careful observations, precise measurements, analyses, interpretation and effectively present the results.			*	

Measuring: H – High; M – Medium; L – Low

M.Phil., PHYSICS

Programme Outcomes: (POs)

On completion of the .M.Phil., (Physics) Programme, certain outcomes are expected from the learners.

- **PO1:** Gaining a broad knowledge of the physical principles of the universe
- **PO2:** Comprehending the fundamental laws for the study of various areas of physics and define and describe them with clarity.
- **PO3:** Knowing the application of principles and concepts of Physics with necessary practical background and assess their consequences
- **PO4:** Discussing, formulating and analyzing the problems and identifying the key concepts and principles to solve them.
- **PO5:** Evaluating the basic foundation of the underlying principles and laws of Physics.
- **PO6:** Developing critical thinking and quantitative reasoning skills,
- **PO7:** Analyzing the scientific problems and experiments creatively and critically

COMMON ACADEMIC STRUCTURE / M.Phil., PHYSICS / 2018 - 2021

SEM	Sub. Code	Title of the course	Hrs	Credits	Marks		
					CIA	CA	Total
I	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
		Total	**30**	**12**	**--**	**--**	**300**
II	MPHT21	Area Paper related to thesis	10	4	40	60	100
	MPHD21	Dissertation	20	14	--	200	200
		Total	**30**	**18**	**--**	**--**	**300**
		Total	**60**	**30**	**--**	**--**	**600**

For each course other than the Dissertation

Continuous Internal Assessment	:	40 Marks
End Semester Examination	:	60 Marks
Total	:	100 Marks

Question Pattern:

Answer any Five Questions (5 x 12 = 60)

Question 1 (or) Question 2 → Unit 1

Question 3 (or) Question 4 → Unit 2

Question 5 (or) Question 6 → Unit 3

Question 7 (or) Question 8 → Unit 4

Question 9 (or) Question 10 → Unit 5

Programme: M.Phil., **Subject:** Physics

Semester: I **Course:** Research Methodology

Course Type: Core -I Common Paper **Credits:** 4

Hours Required: 6 Hrs / Week

CIA: 40 **CA:** 60

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Knowing the research methods and techniques, selecting and formulating research problems.	Knowledge (Level 1)
Collecting literature based on research problem and understanding the concepts	Comprehension (Level 2)
Using an understanding of mathematical concepts for solving problems with physical principles	Analysis (Level 4)
Designing experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies.	Evaluation(Level 5)
Producing results based on scientific problems encountered in everyday life.	Synthesis (Level 6)

COURSE CONTENT

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.

Books for Study:

- Santosh Gupta, Research Methodology and statistical techniques, Deep and deeppublications, 2005.
  - J.Anderson, B.H Durston, M.Poole, Thesis and assignment Writing, WileyEastern university 1998.
- B.C.Nakra, K K.Chaudhry, Instrumentation, Measurement and Aalysis,2nd edition, Tata McGraw-Hill publishing Company Ltd, 2004.
- John R.Tayore, An Introduction to Error Analysis, University Science Books,1982.

Books for Reference:

- V. Rajaraman, Computer oriented Numerical Methods, 3New Delhi.1993M.K. Jain, S.R. Iyengar and R.K. Jain, Numerical Methods for Scientific and
  Engineering Computation, 3rd Ed. New Age International, New Delhi.2012
- F. Scheid, Numerical Analysis, 2nd Edition, Schaum's Series McGraw-Hill, NY.1988

Programme: M.Phil., **Subject:** Physics

Semester: I **Course:** Advanced Experimental Techniques

Course Type: Core - II **Credits:** 4

Hours Required: 6 Hrs / Week

CIA: 40 **CA:** 60

Course Outcomes:

Description	Blooms' Taxonomy Level
Acquiring the knowledge about various techniques available for characterising the materials	Knowledge (Level 1)
Assessing the structure of various materials synthesized using X-ray diffraction experiments.	Comprehension (Level 2)
Understanding of light property of materials from from UV Visible spectroscopy	Analysis (Level 4)
Designing experiments for the structural analysis of samples IR and Raman Spectroscopy are used.	Application (Level 3)
Analysing Morphology and Strength of materials using SEM and TEM experimental setup .	Analysis (Level 4)

COURSE CONTENT

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

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

Unit IV: Infrared and Raman

Spectroscopy Infrared spectrometery

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- comparision of Raman with Infrared spectroscopy.

Unit V: Electron Microscopy

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

Books for Study

- Willard, Merritt, Dean, Settle, Instrumental Methods of Analysis, CBS publishers, New Delhi.1989
- Skoog, Holler, Niemann, Priniciples of Instrumental Analysis, Thomson, 2005.

Book for References

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

PROFESSIONAL SKILLS (Common Paper)

Hours 6/ Credits 4

Course Outcomes:

After completing the course, certain outcomes are expected from the learners.

Description of COs	Bloom's Taxonomy Level
Acquiring knowledge of communication skills with special reference to its elements, types, development and styles.	Knowledge (Level 1)
Understanding the terms like Communication technology, Computer Mediated Teaching	Comprehension (Level 2)
Developing skills in ICT and applying them in teaching, learning contexts and research.	Synthesis (Level 6)
Developing Multimedia/E-contents in their respective subjects.	Synthesis (Level 6)
Integrating Technology into Teaching and Learning	Synthesis (Level 6)

COURSE CONTENT

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 asbilities – 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 Hasll, New York.
- Information and Communication Technology in Education: A Curriuculum 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

MCOD21 – DISSERTATION AND VIVA VOCE

(14 Credits)

By the end of program duration a Dissertation is to be presented by each student. The Dissertation must exhibit knowledge and skills of formulating research objectives and hypotheses, designing of good research tools, collecting relevant data, analyzing and interpreting the data, writing a lucid and purposeful report.

For this purpose each research student will be placed under the guidance of a faculty member. The dissertation together with the Viva Voce carries 14 credits. The dissertation is to be assessed separately by the guide-cum-supervisor and an external examiner. The Dissertation carries 200 marks. The Viva-Voce is conducted for only for those who get minimum 50% pass marks in the Dissertation by a Board of Examiners consisting of Guide and HOD/Senior Professor in the department. A minimum of 50% is needed for a pass.