ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE

(AUTONOMOUS)

CUDDALORE-1

PG & RESEARCH DEPARTMENT OF PHYSICS

M.Phil (Physics)

SYLLABUS 2018-2019

P.G. and Research Department of Physics
M.Phil Physics
Curriculum Template

Semester &Course	Course number/ Code	Credits earned	Marks secured (Max:100)
First Semester			
Core	MPH101	5	70
Core	MPH102	5	60
Elective		5	75
Grade point total Weight average total		15	68.33
Second Semester			
Dissertation & Viva voce	JPH201	21	64
Grade point total Weight average total		21	64
Cumulative grade point average 36 Overall weighted percentage marks			65.81

Question paper pattern (Semester)

Internal – 25 Marks
External – 75 Marks

Section A (5×15=75 marks)
(Answer Any 5 out of 8)

YEAR- I SEM- I	Course Code MPH101	Course Title: RESEARCH METHODOLOGY	HRS/WK 7	CREDIT 5
CO1	To know about the various types of research methodology			
CO2	Understand various types of thesis writing			
CO3	To know the errors and approximations in research problem			
CO4	To understand the various numerical methods			
CO5	Understand the basic computer based data analysis			

Mapping of course outcomes with the program specific outcomes

Course Outcomes Cos	Programme Outcomes POs					Programme Specific Outcomes PSOs						Mean Score of CO's
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3.2	3.8	4.1	3.5	3	2.8	3.5	3.1	4	3	3.2	3.38
CO2	3.5	3.2	3.2	3	3.5	3.6	4	3.6	3	2.6	3.8	3.36
CO3	3.5	4.1	3.2	2.6	3	3.2	3	3.5	3.5	3.5	3	3.28
CO4	3.2	3.8	3	4	3	4	3.5	2.8	3.5	3	3.6	3.4
CO5	4	3.5	3.5	3.2	3.5	2.5	3.5	3	4	3	3.5	3.38
Mean Overall Score												3.36

Result: The Score for this course isHigh

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Value Scaling

Mean Score of COs= $\frac{Total\ Values}{Total\ No.of\ POs\ \&\ PSOs}$

Mean Overall Score of COs= $\frac{Total\ Mean Scores}{Total\ No.of\ COs}$

UNIT-I: RESEARCH METHODOLOGY

Meaning of research - Objectives of research - Motivation of research - Types, Approaches and Significance - Method Versus Methodology - Research in Scientific methods - Research Process - Criteria for Good Research - Problem Encountered by Research in India. Research Problem - Selecting the problem - Necessity of defining the problem - Techniques involved in Defining the problem - Research Design - Needs and Features of Good Design - Different Research Design - Basic Principles of Experimental Design - Funding Agencies.

UNIT-II: THESIS WRITING

Meaning of Research Report-Logical Format for Writing Thesis and Paper-Essential of Scientific Report: Abstracts, Introduction, Review of Literature, Material and Method and Discussion-Write Up steps in drafting report- effective illustrations: Tables and figures- Reference styles: Harvard and Vancouver systems-synopsis writing-overhead projector presentation-power point presentation.

UNIT- III: ERRORS AND APPROXIMATIONS

Statistical analysis of data-Mean meridian, mode and Standard Deviation - Correlation - Comparison of sets of data- Chi Squared analysis for data - Characteristics of probability Distribution - Binomial, Poisson and Normal Distribution- Principle of Least Square Fitting - Curve fitting - theory of Errors - Types and Sources of Errors - Errors and residue.

UNIT-IV: NUMERICAL METHODS

Newton's forward and backward difference interpolation formula-Numerical integration by Trapezoidal &Simpson' one third rule-Taylor series .Differential equation method.

UNIT-V: COMPUTER BASED DATA ANALYSIS

Origin 8-Data analysis and Graphing workspace-Workbook-Worksheet& Worksheets column-Importing and Exporting data-Graphing: Customizing and Formatting the graph-Fitting analysis-Introduction to MATLAB. Introduction to Gaussian method-Quantum analysis-Ab initio approximation method.

Reference books:

1. Research Methodology, Methods And Techniques- C. R. Korthari-Wishwa Prakasam Publications, II Edition.2004
2. A Handbook of Methodology of Research – Rajammal P.A. Devadass-Vidyalaya Press.2011
3. Thesis and assignment writing- Anderson- Wiley Eastern Ltd.1998
4. Statistical Methods- S. P. Gupta 2007
5. Numerical methods-P.K andasamy,K.Thilagavathi&K.Gunavathi 1985
6. Numerical methods –B.D.Guptha 2013
7. Numerical methods-Rajaram. 2013
8. Alan Hinchliffe,Molecular Modelling for Beginners, Second Edition, the university of mancheste,2008,johnwiley&sons Ltd.
9. Andrew R.leach Molecular Modelling, principle Applications. Pearson Education Limited 1996, 2001.

YEAR- I SEM- I	**Course Code MPH102**	**Course Title: ADVANCED PHYSICS-I**	**HRS/WK 7**	**CREDIT 5**
CO1	To know about Schrodinger and klein Gordon field equation			
CO2	Understand various types of nuclear models and quark			
CO3	To know types of bonds in solids			
CO4	Understand the dielectric studies in different phase			
CO5	Understand the non linear and molecular mechanics			

Mapping of course outcomes with the program specific outcomes

Course Outcomes Cos	**Programme Outcomes POs**					**Programme Specific Outcomes PSOs**						Mean Score of CO's
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3.5	3	3.2	3.5	4	3	3	3.5	3.5	4	3.38
CO2	4	4	3.5	4	4	4	2.5	3.5	4	3.5	4	3.73
CO3	4	3.5	4	3.5	3	3.5	4	4	4	3	3.5	3.64
CO4	3.5	3.5	4	3.5	3.5	3.5	4	3.5	3.5	3.5	3.5	3.59
CO5	4	4	3.5	3.5	4	4	3.5	4	4	3.5	3	3.73
Mean Overall Score												3.61

Result: The Score for this course isHigh

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Value Scaling

Mean Score of COs= $\frac{Total\ Values}{Total\ No.of\ POs\ \&\ PSOs}$

Mean Overall Score of COs= $\frac{Total\ Mean\ Scores}{Total\ No.of\ COs}$

UNIT-I QUANTUM MECHANICS

Second Quantization of Schrodinger and Klein –Gordon fields- creation and annihilation operators- Communication relations- second Quantization of Dirac field- covariant and anti-communication relation for Dirac field.

UNIT – II NUCLEAR AND PARTICLE PHYSICS

Compound nucleus and statistical theory- experimental evidence- statistical assumption – average cross section- angular distribution- transmission coefficients- level density- decay of the statically compound nucleus- emission of charged particles. Symmetries and conservation laws – Gell Mann Nishijima formula – CPT invariance – Quark model.

UNIT - III: SOLID STATE PHYSICS

Types of bonds in crystals-Ionic, Valence, Metallic, Vander Waals and hydrogen bonding-Band structure theory – Band structure for some semiconductors – Semiconductor transport theory – Basis of continuity equation – Kronig penny model -Theory of generation and recombination – theory of PN junction – solar cells – Ionic conductivity – Normal and super ionic conductors – Application of super ionic solids - Fuel cells, Electro chromic display.

UNIT – IV: DIELECTRIC STUDIES

Basic concepts of dielectrics: static fields –Time dependent fields – Static dielectric constant: Dipolar interaction – dipolar molecules in gases and dilute solutions – Onsager equation – Debye equations – Dielectric relaxation and loss – Distribution of relaxation time – Complex plane diagrams – Cole- Cole, Cole-Davidson plots.

UNIT – V: NON-LINEAR AND MOLECULAR MECHANICS

Basis of nonlinearity – Linear and nonlinear oscillators – Autonomous and non-autonomous system – Dynamical systems. The energy calculations – Energy minimization – Force field paramertization – Conformation analysis – Solvation – Monte Carlo methods – Molecular dynamics – Free energy calculation.

Reference books:

1. Advanced Quantum Mechanics – Sathyaprakash 2004
2. Physics of the Nucleus – M.A. Preston – Addison – Wesley 1962
3. Elementary Particles – D. Griffiths.2010
4. Nonlinear dynamics – M. Lakshmanan and S. Rajesekar – Springer International 2003
5. Super ionic solids – S. Chandra – North Holland Publishing Company Ltd.1981
6. Theory of Dielectrics – H. Frohlich – Oxford University Press
7. Solid state physics by Sexena & Gupta Sexena
8. Lasers & Non linear optics, B.B.Laud-New age International pvt. Ltd, 2nd ed. 2009