

SADAKATHULLAH APPA COLLEGE (AUTONOMOUS)

DEPARTMENT OF PHYSICS

M.Phil. (Physics)

I SEMESTER			
DSC 1	RESEARCH AND TEACHING METHODOLOGY	18MCPH11	
Hrs/Week: 4	Hrs/ Sem: 60	Hrs/Unit: 12	Credits: 4

Preamble: To introduce the knowledge on research. This paper provides a broad knowledge on methods of research and teaching, problem solving and analytical techniques

Course Outcomes: Students who completed this course should

- ✓ Have made progress with research leading to a M.Phil thesis.
- ✓ Capable to deliver oral presentation and written report to a very high international standard
- ✓ In-depth analysis & study of the selected research topics
- ✓ refill communication skill – demonstrate the capability in written and spoken (English as a medium) to present and discuss research information within the scientific community and society.
- ✓ Be familiar with the main statistical tests used in Physics.
- ✓ Be familiar with the numerical methods
- ✓ Be familiar with the different methods of teaching

Unit I: Basics of Research

Basics: Meaning, purpose and characteristics of research –. Scientific research : Aim and motivation - Principles and ethic: Identification of research problem - Current status – Literature survey – Abstraction of a research paper – Role of research guide and researcher – Preparation and presentation of scientific reports- Need and methods (Oral and poster) –Writing of synopsis and dissertation.

Unit II: Modern Research Practices in Scientific Research

Usage of open source software and freely licensed software for research work and data analysis – Effective use of internet for research needs-Collaborative work- Interdisciplinary research - scholarly research articles –National, International and Electronic Journals- Online submission of research articles -Open access articles benefits- Impact factor, h-index- Citations- Seminars, workshops, conferences and symposia- Respecting copy rights- Avoiding plagiarism- Intellectual property rights and patents.

Unit III: Methods of Data Analysis

Data-collection – Statistical description of data (mean, median mode, kurtosis , skewness,) – Distributions (Student's t-test, F-test, Chi-square test & Annova), Correlation (linear and nonparametric/rank); Modeling data: Least squares, Fitting data – linear and non-linear models. Pictorial representation of data.

Unit – IV: Numerical Methods

Iterative methods: Newton Raphson iterative method – Secant Method; Interpolation: Newton's forward and backward difference formulae; Differentiation and Integration: Numerical differentiation with interpolation polynomials – Numerical Integration by Trapezoidal and Simpson's rule- Ramberg integration.

Unit – V: Methodology of Teaching:

Teaching – Objectives of Teaching, Phases of Teaching – Teaching Methods: Lecture Method, Discussion Method, Discovery Learning, Inquiry, Problem Solving Method, Project Method, Seminar – Integrating ICT in Teaching: Individualised Instruction, Ways for Effective Presentation with Power Point – Documentation – Evaluation: Formative, Summative & Continuous and Comprehensive Evaluation – Later Adolescent Psychology: Meaning, Physical, Cognitive, Emotional, Social and Moral Development – Teaching Later Adolescents.

Books for Reference

1. Thesis and Assignment Writing – J Anderson, B.H. Dursten and M. Poole, Wiley Eastern (1977).
2. A Hand Book of Methodology of Research – P. Rajammal and P. Devadoss, R.M.M Vidya Press (1976).
3. Research Methodology – S.Rajasekar, P.Philominathan, V. Chinnathambi, RPC Publications, Tirunelveli. (2014)
4. Computer Oriented Numerical Methods – V. Rajaraman, Prentice Hall of India.
5. Numerical Methods for Scientific and Engineering Computation – MK Jain, SRK Iyengar and RK Jain, Wiley Eastern publ.
6. Sampath K, Panneerselvam, A & Santhanam S (1984). Introsuction to educationaltechnology. (2nd revised ed.) New Delhi: Sterling Publishers.
7. Sharma. SR (2003) Effective classroom teaching modern methods, tools & techniques. Jaipur: Mangal Deep
8. Vendanayagam EG (1989). Teaching technology for college teachers. New York: Sterling Publishers