KRISHNA UNIVERSITY- MACHILIPATNAM

PRE Ph.D. SYLLABUS - PHYSICS

PAPER 1 - RESEARCH METHODOLOGY

UNIT – I INTRODUCTION TO RESERCH

(a) Introduction to research – Meaning and definition of research, objectives of research, motivations of research, types of research , Formulating a research problem – selecting the problem, techniques involved in defining a problem

(b) Research process and steps involved in the process, Criteria of good research, problems encountered in research.

UNIT – 2 RESERCH DESIGNING & SAMPLING DESIGN

(a) Meaning of research design, need for research design, features of research design, different research designs

(b) Sampling techniques – Meaning of sample, sampling techniques, steps in sampling, types of sampling, advantages and limitations of sampling

UNIT – 3 DATA COLLECTION & PROCESSING

(a) Literature need, procedure –Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection

(b) Data Collection & Processing - Collection of data – primary data and secondary data – Data Processing – processing the data, editing, coding and classification , tabulation, Analysis and interpretation of data

UNIT – 4 SCALING & HYPOTHESIS

(a) Scaling method – types of measured scale and problems of scaling correlation – types of correlation scatter diagram method, Karl Pearson's Coefficient of Correlation, Regression – simple linear regression, linear growth rate.

(b) Hypothesis – characteristics of a good hypothesis, procedure of testing hypothesis – flow diagram, large sample tests, small sample tests, Applications of t test, F test, Chi square test

UNIT – 5 REPORT GENERATION

(a) Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract , introduction, review of literature, result, conclusions, Concepts of Bibliography and references

(b) Significance of Report writing, objectives and types of research reports, Format and content of research report, Steps of thesis writing, Layout of report

Books for Reference

1. Research Methodology methods and techniques – C R Kothari
2. An Introduction to Research Procedure in Social Science – M. H. Gopal
3. Statistical Methods – S P Gupta
4. Methodology of Research in Social Sudies – O R Krishna Swamy, M Ranganatham

Question Paper Pattern

1) Time: 3 Hours Max. Marks: 100
2) Two questions are to be set up from each unit with internal choice
3) One question from (a) and 1 question from (b) (Each Unit)

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KRISHNA UNIVERSITY – MACHILIPATNAM		
SUBJECT: PHYSICS	**COURSE: Pre Ph.D**	**PAPER: I**
PAPER TITLE: RESEARCH METHODOLOGY		
MODEL PAPER		

Time: 3Hrs **Max.Marks:100**

ANSWER THE FOLLOWING

5 x 20 = 100 M

(1) Define Research. Also explain its nature, objectives and types

(or)

Describe different steps involved in a research process.

(2) Explain the meaning and significance of a Research design

(or)

What is meant by Sampling? Discuss various types of Sampling with advantages and disadvantages

(3) Discuss how literature survey is made in research. Explain various methods of data collection.

(or)

"Processing of data implies editing, coding classification and tabulation" Describe in brief these four operations pointing out the significance of each in the context of research study

(4) Define Hypothesis. Explain t test, F test and Chi square test in detail

(or)

What do you mean by scaling? Write notes on Correlation, Regression

(5) Discuss the format of writing research paper for a Journal. Explain how research findings fulfill the needs of society by taking an example

(or)

Define Research report. Explain different steps in report writing.

KRISHNA UNIVERSITY- MACHILIPATNAM

COURSE: PRE Ph.D EXAMINATION SYLLABUS - PHYSICS

PAPER 2 – METHODS IN PHYSICS

UNIT-I: INTEGRAL TRANSFORMS

a) Laplace transform; Laplace transform of derivative and integral of a function, first and second shifting theorems

b) Inverse Laplace transforms by partial fractions, Convolution theorem

UNIT 2: SPECTROSCOPIC TECHNIQUES

c) Raman Spectrophotometer – Principle, working and applications, Structure determination by Raman spectroscopy.

d) NMR Spectroscopy - principle, working and applications, ESR Spectrometer — Principle, working and applications

UNIT 3: ELECTRONICS

e) Block diagram of a typical Op-Amp. Inverting and noninverting amplifiers. Parameters, Applications of op amps - Summing, Scaling and Averaging amplifiers, Integrator and Differentiator.

f) 8085μp – Architecture and organization of 8085 microprocessor, Instruction set – Data Transfer, Arithmetic, Logical types, Addressing modes

UNIT 4: ELECTRON MICROSCOPY

g) Electron microscopy, types of Electron microscopy Fundamentals of Transmission Electron Microscopy, study of crystal structure using Transmission Electron Microscope

h) Fundamentals of Scanning Electron Microscopy, study of microstructure using Scanning Electron Microscope

UNIT 5: C PROGRAMMING

i) Basics of C programming ; Overall view, Constants, Variables and Data types, Operators and expressions, formatted input and formatted output, decision making and branching – IF statement, IF…ELSE statement, nested IF….ELSE statements, SWITCH Statement, Conditional operator

j) Decision making and looping statements: WHILE, DO --- WHILE, FOR statements, Arrays – Programs on Matrices.

Reference Books:

1. *Laplace n Fourier Transforms Goyal & Gupta,*
2. *Basics of NMR, Joseph. P. Hornack, Free Online Text*
3. *Fundamentals of Molecular Spectroscopy CN Banwell*
4. *Transmission Electron Microscopy: A Textbook for Materials Science - David B. William*
5. *Op.Amps and Linear Integrated Circuits – Ramakant A.Gayakwad (PHI)*
6. *C Programming – Balaguruswamy*

Question Paper Pattern

1. Time: 3 Hours Max. Marks: 100
2. Two questions are to be set up from each unit with internal choice
3. One question from (a) and 1 question from (b) (Each Unit)

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KRISHNA UNIVERSITY – MACHILIPATNAM		
SUBJECT: PHYSICS	**COURSE: Pre Ph.D**	**PAPER: II**
PAPER TITLE: METHODS IN PHYSICS		
MODEL PAPER		

Time: 3Hrs **Max.Marks:100**

ANSWER THE FOLLOWING

5 x 20 = 100 M

1.(a) (i) Find $L\left[e^{-t}\int_0^t \frac{Sin\,t}{t}\right]$ (ii) $L\left[\int_0^t \int_0^t \int_0^t (t\sin t)\,dt\,dt\,dt\right]$

(or)

(b) (i) Apply Convolution Theorem to evaluate $L^{-1}\left[\frac{1}{(S+a)(S+b)}\right]$

(ii) Find $L^{-1}\left[\frac{S^2+S-2}{S(S+3)(S-2)}\right]$

2.(a) Explain the principle of operation of the Raman Spectrophotometer with necessary diagram

(or)

(b) Explain the working of ESR Spectrometer. List out few applications of ESR Spectroscopy

3.(a) Discuss the block diagram of an Operational Amplifier. Discuss various applications of an Operational Amplifiers

(or)

(b) Draw the block diagram of 8085 Microprocessor and explain the functioning of each block in detail.

4.(a) What is the principle of Scanning Electron Microscope (SEM) and discuss its operation in detail.

(or)

(b) Discuss the operation of Transmission Electron Microscope (TEM) with necessary diagrams

5.(a) Discuss various Operators used in C Programming

(or)

(b) Write a program in C for the addition of two matrices using arrays

KRISHNA UNIVERSITY - MACHILIPATNAM

COURSE: PRE Ph.D EXAMINATION SYLLABUS - PHYSICS

PAPER 3 – ADVANCED PHYSICS

UNIT 1: COMPUTATIONAL METHODS

(a) Iterative methods: Bisection Method - Newton Raphson iterative method Formulae and Algorithms

(b) Interpolation: Newton's forward and backward difference formulae; Numerical Integration by Trapezoidal and Simpson's rule - Formulae and Algorithms

Reference Books:

1. *Computer oriented Numerical Methods –Rajaraman*
2. *Numerical Methods for Scientific and Engineering Computation – MK Jain, SRK Iyengar and RK Jain, Wiley Eastern publn.*

UNIT 2: NANOMATERIALS

(a) Introduction to Nanomaterials – Top-down and Bottom-up approach. Properties of Nanomaterials- Physical, Chemical and Optical Properties

(b) Various synthesizing methods of nanomaterials: RF plasma- Ball Milling – Applications of nanotechnology in Electronics, Diagnosis, Novel Drugs, Energy, Advanced Materials, Computers, Sensors etc.

Reference Books:

1. *The Chemistry of nanomaterials: Synthesis, Properties and Applications, Vol-I by C.N.R.Rao, A. Muller and A.K.Cheetam*
2. *Introduction to Nano Technology by Charles P.Poole Jr and Frank J.Owens. Wiley India Pvt Ltd.*

UNIT 3: ULTRASONICS & APPLICATIONS

(a) Ultrasonics - Production of Ultrasonic waves – Piezoelectric, Magnetostriction and electrostatic transducers, Measurement of Ultrasonic velocity - acoustic interferometer

(b) Applications of ultrasonics, Low Power applications – flaw detection, thickness gauging, Medical applications, High energy applications – Cavitation, Emulsification, Ultrasonic Cleaning, Metallurgical Applications, Ultrasonic Welding, Medical Applications

Reference Books:

1. *Fundamentals of Ultrasonics – Jack Blitz – Butter Worths – London (1967).*
2. *Introduction to Chemical Ultrasonic – M.J.Blandamer – Academic press, London*
3. *Absorption and Dispersion of Ultrasonic waves – A. Litvoitz–Academic Press, London*

UNIT 4: GLASS SCIENCES

(a) Glass definition - Glass transition temperature- Enthalpy vs Temperature diagram of a melt - Batch materials of glass - batch calculation

(b) Zachariasen rules of glass forming systems - vitreous silica, Applications of Glasses Electronic applications. Optical applications. Magnetic applications etc.

Reference Books:

1. *Introduction to Glass science & Technology - J.E. Shelby; Publishers : RS.C*
2. *Physics of amorphous materials - S.R. Elliot ; Longman scientific and technical company*

3. *Introduction to material science for Engineers - James F. Shackelford ; Macmillan Co., Newyork . 1985*

UNIT 5: LIQUID CRYSTALS

(a) Liquid crystals, History, Chemical constitution, Types ***of*** liquid crystals – Lyotropic, Thermotropic, Enantiotropic, Monotropic types, Phases of Liquid crystals - Smectic, Nematic and Cholesteric phases

(b) Applications of liquid crystals - Display application of liquid crystal, Thermal mapping and non-destructive testing, Medicinal Uses, Technological applications, Other Liquid Crystal Applications

Reference Books:

1. *Introduction to liquid crystals: E. Priestely plenum press, Newyork*
2. *Hand book of liquid crystals*
3. *Liquid crystals: S. Chandrasekhar, Satyendra Kumar*
4. *The molecular physics of liquid crystals: G. W. Gray*

Question Paper Pattern

1) Time: 3 Hours Max. Marks: 100
2) Two questions are to be set up from each unit with internal choice
3) One question from (a) and 1 question from (b) (Each Unit)

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KRISHNA UNIVERSITY – MACHILIPATNAM		
SUBJECT: PHYSICS	**COURSE: Pre Ph.D**	**PAPER: III**
PAPER TITLE: ADVANCED PHYSICS		
MODEL PAPER		

Time: 3Hrs **Max.Marks:100**

Answer the following

5 x 20 = 100 M

1. (a) (i) Find a root of the equation $x^3-4x-9=0$ using bisection method in Four stages

   (ii) Give formula for Newton – Raphson Method and give algorithm

   (or)

   (b) (i) Estimate the values of $f(22)$ from the available data

x	20	25	30	35	40	45
f (n)	354	332	291	260	231	204

   (ii) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by Trapezoidal rule

2. (a) Define Nanomaterial? Discuss Physical, chemical and optical properties of the nanomaterials.

   (or)

   (b) Discuss various applications of Nanotechnology

3. (a)Explain how Ultrasonic Velocity is measured using Ultrasonic Interferometer with necessary diagram

   (or)

   (b)Discuss various High Energy Applications of Ultrasonic Waves

4. (a) How batch materials are categorized based on their role in the formation of glass. Give two examples to each.

   Calculate weights of batch components of 20 Na_2O - 5 Al_2O_3 - 75SiO_2 for 100 grams of glass. Molecular wt. of components (in g mol^{-1}) are as follows

   Na_2O = 61.98, Al_2O_3 = 101.96 , SiO_2 = 60.0

   (or)

   (b)Explain a) Electronic applications b) Magnetic applications c) Optical applications of amorphous materials.

5. (a) What are the various types of Liquid Crystals? Discuss different phases of Liquid Crystals.

   (or)

   (b)Discuss various Display, Medical and Technical Applications of Liquid Crystals.