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*

10/8/24

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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*

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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10/1/14

BoS - Physics
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