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List of Employability/ Entrepreneurship/ Skill Development Courses with Course Contents

Colour Codes			
Employability Contents	Green		
Entrepreneurship Contents	Light Blue		
Skill Development Contents	Pink		
Name of the Subjects/Related to all three Components (Employability/ Entrepreneurship/ Skill Development)	Yellow		





List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : Pure and applied physics

Programme Name : Master of Science in Physics

Academic Year: 2017-18

List of Courses Focus on Employability/Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	PT-304	Material Science –I
02.	PT-401	Experimental Technique in Physics
03.	PT-402	Accelerator Physics
04.	PT-404	Material Science –II

विभागाध्यक्ष/H.O.D. शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग Dept. of Pure & Applied Physics गुरु घारीदास विश्वविद्यालय Guru Ghasidas Vishwavidyalaya

बिलासपुर (छ.ग.)/Bilaspur (C.G.)





Scheme and Syllabus

Semester-I	Semester-II
PT-101-Mathematical Physics	PT-201-Atomic and Molecular
PT-102-Classical Mechanics	Physics
PT-103-Quantum Mechanics-I	PT-202- Nuclear and Particle Physics
PT-104-Basic Electronic Devices	PT-203- Solid State Physics
PT-105- Lab Course	PT-204- Quantum Mechanics-II
11-103- Lao Course	PT-205 - Lab Course
Semester-III	Semester-IV
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PT-301- Statistical Mechanics	PT-401-Experimental Technique in
PT-301- Statistical Mechanics PT-302-Introductional to Computational	PT-401-Experimental Technique in Physics
PT-302-Introductional to Computational	Physics PT-402- Accelerator Physics
PT-302-Introductional to Computational Physics	Physics
PT-302-Introductional to Computational Physics PT-303- Electrodynamics	Physics PT-402- Accelerator Physics PT-403-Molecular Physics and Group
PT-302-Introductional to Computational Physics PT-303- Electrodynamics PT-304-Specilization	Physics PT-402- Accelerator Physics PT-403-Molecular Physics and Group Theory

PT304

Courses Focus on Employability/Entrepreneurship/Skill Development

स्थानास्थ्य/H.O.D. शुद्ध एवं अनुप्रमुक्त भारिकी विभाग Dept. of Pure & Applied Physics मुख्यातीकर विश्वविद्यालय Guru Ghasakdas Vishwavidyalaya विकारपुर (ज.ग.)/Bilaspur (C.G.)





Guru Ghasidas Vishwavidyalaya (A Central University Established by the Central Universities Act 2009 No. 25 of 2009)

Koni, Bilaspur - 495009 (C.G.)

Special Paper: Material Science -I

Laws of thermodynamics, Thermodynamic functions, Concept of free energy, Stability and metastability, Relative stability of phases, Phase rule and phase diagrams, Solid solutions, Limited and unlimited solid solubility, interstitial and substitutional solid solutions, Hume Rothery rules, Uniary (single component) and Binary phase diagrams (Lead - tin and Iron-carbon phase diagram), Lever rule, Homogeneous and heterogeneous nucleation, growth and transformation kinetics, Microstructural changes during cooling and heating.

Preparation of bulk, thin film and nano-materials: Solid state reactions method, sol-gel method, precipitation method. Nanomaterials: Bottom up method: Cluster beam evaporation, Ion beam deposition, Chemical bath deposition; Top down method: Ball Milling, Lithography. Advantages and disadvantages of various synthesis methods.

Polymers, mechanism of polymerization, Molecular weight distribution in linear polymers, condensation, polymers, size distribution in polymer molecules, Effect of polymer structure on properties conducting polymer, Introduction to liquid crystalline materials, Mechanism of liquid crystal display devices,

Introduction to Dielectric, magnetic and multiferroic materials: Dielectric materials, linear and nonlinear dielectrics, Ferro-electric materials, Important characteristics and applications of ferro-electric materials, Para, ferro, anti-ferro magnetic properties of materials, hysteresis losses, hard and soft magnetic materials, Structure and properties of spinals, garnets and hexagonal ferrites, and their uses. magnetic bubbles.

Books Recommended:

- 1. Materials Science & Engineering: V. Raghavan
- 2. Elements of materials science & Engineering: L.H. Van
- 3. The Structure and properties of materials: R.M. Rose & J. Wulf

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Guru Ghasidas Vishwavidyalaya (A Central University Established by the Central Universities Act 2009 No. 25 of 2009)

Koni, Bilaspur - 495009 (C.G.)

Experimental Technique in Physics

Unit – I

Signal processing techniques: pre-amplifiers, filters; Measurement techniques: sensors and transducers, general instrumentation, measurement of voltage, current, charge, frequency etc.

Unit – II

Vacuum: Rotary vane pump, Roots blower pump, Diffusion pump, Ionization pump, Diaphragm pump, Adsorption pump, Turbo molecular pump; Measurement of Vacuum: Pirani/Thermocouple gauge, Penning/Ionization Gauge (hot cathode and cold cathode), Leak detection.

Unit – III

Production, properties and applications of x-rays, x-ray absorption and its roll in structure evaluation, x-ray detectors, structure factor, form factor, Small Angle X-ray Scattering (SAXS), x-ray fluorescence (XRF), energy dispersive x-ray (EDX), particle induced x-ray emission (PIXE).

Unit - IV

Surface morphology using Transmission electron microscopy (TEM), Scanning Electron Microscopy (SEM), Scanning Tunneling Microscopy (STM) and Atomic Force Microscopy (AFM). Depth profiling by ion beam sputtering and Secondary ion mass spectrometry (SIMS), Low energy ion scattering (LEIS), Rutherford Back Scattering Spectrometry (RBS), Nuclear reaction analysis (NRA).

TEXT AND REFERENCE BOOKS

- 1. Analog and Digital Electronics for Scientists (2nd Ed.) (Wiley Inter-science, New York).
- 2. Surface Analysis Methods in Materials Science : D. J. O. Conner (Springer Verlag).

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- 3. Characterization of Solid Surface: P.F. Kane (Plenum).
- 4. R. Sahu, *Physics of solid, nuclei and particle*, Narosa publishing house, 2006.

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्राष्ट्र एवं अनुष्युक्त शांतिकी विभाग Jept. of Pure & Applied Phys चुल धातीवास विश्वविद्यालयः vuru Ghasidas Vishwavidyक्षः

चिलासपुर (छ.ग.) Bilaspur (C.G.)

PT404





Special Paper: Materials Science-II

Elementary idea of Advanced materials: General features and classifications, Structure models for amorphous materials, Structure and properties of metallic glass and amorphous semiconductors, Quasicrystalline materials, Materials for solar cell applications, Hydride materials (Hydrogen storage materials), Materials for Sensors and transducers application,

Materials Characterization techniques: X- ray diffaction methods for materials characterisation, powder diffraction methods, Indexing of powder diffraction patterns, Determination of particle size, Increase in x-ray diffraction peaks of nanoparticles, Shift in photo luminescence peaks, Raman and FTIR spectroscopy of materials, Photoemission microscopy,

Light / Optical Microscopy: Optical microscope- Basic principles & components, Different examination modes (Bright field illumination, Oblique illumination, Dark field illumination, Phase contrast, Polarised light, Hot stage, Interference techniques), Electron Microscope and its applications in materials characterisation. Principle of Scanning Electron Microscope, study of microstructure, determination of grain size etc, Advantages of Neutron diffraction.

Thermal Analysis: Thermal analysis, Thermogravimetric analysis, Differential thermal analysis, Differential Scanning calorimetry, Thermomechanical analysis and dilatometry,

Book Recommended:

1. Introduct ion to solid state physics: C.Kittel

2. Superconduct ivity Today: T.V. Ramkr ishnan and C.V. R.R

3. Raghvan, V., Materials Science & Engineering, PHI (1998).

4. Callister, W.D., Materials Science & Engineering: An Introduction, Wiley & Sons (2001).

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PT-402 Accelerator Physics

UNIT-I

History of Accelerators, Brief descriptions of Accelerators centers worldwide, Accelerator Centers in India, Motion of charge particle in electric and magnetic field, Hamiltonian for particle motion Accelerator, Linear betatron motion, Particle motion dipole and quadrupole, Liouville's theorems, Emittance, Brightness DC Accelerators: Van-de-Graaff, Tandem and Pelletron Accelerator, DC accelerators in India, Bilaspur accelerator.

UNIT-II

Circular Accelerator: Synchrotron, Longitudinal equation of motion, evolution of synchrotron phase space ellipse, Injection & extraction, Circular accelerator: Simple cyclotron, Superconducting accelerators, Cyclotrons in India, colliders and storage

UNIT-III

Linear Accelerator: Fundamental properties of accelerator structure; transit time, shunt impedance, Particle Accelerator by EM waves, Longitudinal particle dynamics in LINAC, Transversal beam dynamics in LINAC, Druft tube Linac, Radio Frequency Quadrupole,

UNIT-IV

Production of charged particles, space charges limitation; n-tou product, Extraction & focusing geometries, positive ion sources; penning ionization source, ECR source, Electron beam ion source, negative ion sources; SNICS, TORVIS, duo-plasmatron.

Beam optics: Transfer matrix method, dipole, quadrupole, sextupole, octupole, Einzel lens, solenoid, beam analyzers, steerer, beam line components.

Applications: Solid State physics & materials science, Nuclear physics, high energy particle physics, industrial applications, medical applications

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