ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Course work syllabus – (w.e.f. 2022)
Paper I: Recent Advances in Physics and Research Methodology

Unit- I: Introduction and Types of Research Studies

Meaning and objectives of research, motivation and dedication in research, criteria of good research, ethics in research, plagiarism, scientific integrity, selecting a topic, importance of planning, planning experimentation, field work and accessing advanced facilities. Define Library Research, Field Research and Laboratory Research; Explain Sample Survey, Sample Collection and/or Preparation, Data Analyses, Hypothesis, Modeling, Interpretation, and Conclusion

Unit-II: Literature Review

Journals: Standard journals in Physical Sciences, Impact factor, Citations, web based journals, Journal Metrics, Citations, h- index, writing a research paper, popular websites for scientific literature, choosing journal for sending research publications, styles of writing references. Search engines like Science Direct, Web of Science, Indian Citation Index and Google Scholar.

Unit III: Intellectual Property rights

Introduction to Intellectual Property Law-Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory - Overuse or Misuse of Intellectual Property Rights –Compliance and Liability Issues. Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters. Introduction to Trademark – Trademark Registration Process – Post registration procedures – Trademark maintenance – Transfer of rights – Inter parties Proceedings – Litigations in Trademark.

Unit-IV: Research Ethics and Plagiarism

Research Ethics and Plagiarism: Rules and guidelines for research publications -Code of Research ethics, Authorship guidelines- Plagiarism policies of UGC and its software information – Information on UGC Care journals list.

Unit V: Preparation of Thesis:

Structure of thesis, background of the work, importance of language, grammar, scientific and systematic way of presentation, statistical analysis, use of graphical representation, proper preparation of graphs and tables, discussion, comparison with previous work, interpretation of results, summery and conclusions.

References:

1. Blum, Deborah and Mary Knudson, eds. A field guide for science writers: the official guide of the National Association of Science Writers, New York: Oxford University Press, 1997.
2. Booth, Wayne, Gregory G Colombo, Joseph M. Williams. The craft of Research Chicago University of Chicago Press, 1995.
3. Davis, Martha. Scientific Papers and Presentations. San Diego: Academic Press, 1997.

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Model Question Paper

ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Examination - 2022

Paper I: Recent Advances in Physics and Research Methodology

Time: 3 Hours Max Marks: 100 M

Answer all the questions
Each question carried 20 marks

1. Define Research and explain the objectives criteria of good research and ethics in research.

   OR

   Describe various steps involved in field research.

2. What are the standard journals in physical sciences? Explain various journal metrics

   OR

   Explain how to choose a journal for sending research publications. Briefly explain about search engine like science direct and Indian citation index.

3. What is an intellectual property law and explain the basic types, inventions and innovations in intellectual property rights?

   OR

   Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

4. Describe the plagiarism rules and guidelines for research publications and code of research ethics.

   OR

   Write about the plagiarism policies of UGC and explain about UGC-CARE journals.

5. Explain the structure of thesis, importance of the language scientific and systematic presentation.

   OR

   Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

S. Rajyalakshmi 17.10.2022
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ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY

DEPARTMENT OF PHYSICS

Pre-PhD Course work syllabus – (w.e.f. 2022)

NANOSCIENCE AND ITS APPLICATIONS (Mr. Simhachalam Boddu)

Unit 1: Fundamentals of Nanoscience and technology

Introduction and emergence of Nanotechnology, Bottom up and Top down approaches, challenges in nanotechnology: Introduction to Quantum wells, Quantum wires and Quantum dots; Introduction to solid state physics – structures and energy bands; Introduction to physical, Electrical, Mechanical and other properties of Nanomaterials.

Unit 2: Synthesis of Nanomaterials

Types and strategies for synthesis of Nanomaterials depending on end applications, Zero – Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of these Nanomaterials and their technological applications: One- Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials and their technological applications: Two –Dimensional Nano structures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials and their technological applications: Special Nanomaterials and applications: Introduction, different strategies for synthesis of special Nanomaterials (e.g. carbon, micro and mesoporous, zeolites, core-shell structures, hybrid Nanomaterials, nanocomposites etc) and their technological applications.

Unit 3: Characterization of Nanomaterials

Introduction, structural characterisation, X-ray diffraction (XRD powder / single crystal). Small angle X-ray scattering (SAXS), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Mechanical properties, Stress-strain curve, types of stress strain curves, Fracture mechanics, LVDT (a linear variable displacement transducer), Types of loading.

Unit 4: Fabrication of Nanomaterials

Top-Down Approach-Planetary ball milling: Bottom-up approach (Wet chemicals synthesis method). Microemulsion approach. Aerosol synthesis, Spray pyrolysis, electro chemical deposition, Gas phase production Methods: Physical and chemical vapour deposition techniques, Atomic layer deposition.

Unit 5: Applications of nanotechnology in various fields

Electronics and communication systems, Optics, Agriculture, Food, Renewable energy, Solar energy, Fuel cells, Solar cells, Batteries, Defence, Aerospace, Marine, Fuels, Coolants and Lubricants, Sensors, Sporting goods and fabric.

References:

1. Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.
2. Guozhong Cao Nanostructures and Nanomaterials, Synthesis, Properties and applications- Imperial College press.
3. T.Pradeep, "NANO: The Essentials, Understanding Nanoscience and Nanotechnology".Tata McGraw-Hill Publishing CompanyLimited 2007.

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Model Question Paper

ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Examination – 2022

Paper II: Nanoscience and its Applications (Mr. Simhachalam Boddu)

For Industry

Time: 3 Hours

Max Marks: 100

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Answer all the questions
Each question carried 20 marks

1. Explain the top-down and bottom-up methods of nanomaterial preperation.

   OR

   Describe various Quantum structures and properties of Nanomaterials.

2. Explain the classification of Nanomaterials based on dimensionality and their synthesis.

   OR

   Explain various Special Nanomaterials, their synthesis and technological applications.

3. Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

   OR

   What is LVDT? Explain various types of loading techniques.

4. Briefly explain planetary ball milling method, spray pyrolysis method and electro chemical deposition.

   OR

   Explain CVD and PVD techniques.

5. Explain at what extent nanotechnology is being useful in Electronics and Communication systems, defence, marine and aerospace engineering.

   OR

   Describe various applications of nanotechnology to Optics, Solar cells, Batteries, Sensors and Lubricants.

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ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Course work syllabus – (w.e.f. 2022)
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Crystal Growth Due to Science Research Centre
Department of Physics
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15/10/2022
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Model Question Paper

ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Examination - 2022

Paper I: Recent Advances in Physics and Research Methodology

Time: 3 Hours Max Marks: 100 M

Answer all the questions
Each question carried 20 marks

1. Define Research and explain the objectives criteria of good research and ethics in research.

   OR

   Describe various types of research and explain sample survey, preparation, collection and data analysis.

2. What are the standard journals in physical sciences? Explain their impact factor and citations.

   OR

   Explain how to choose a journal for sending research publications. Briefly explain about search engine like science direct and Indian citation index.

3. What is an intellectual property law and explain the basic types, inventions and innovations in intellectual property rights?

   OR

   Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

4. Describe the plagiarism rules and guidelines for research publications and code of research ethics.

   OR

   Write about the plagiarism policies of UGC and explain its software information.

5. Explain the structure of thesis, importance of the language scientific and systematic presentation.

   OR

   Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

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Department of Physics * Govt. College (A) * Rajahmundry * Crystal Growth and Nanoscience Research Centre

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ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY

DEPARTMENT OF PHYSICS

Pre-PhD Course work syllabus – (w.e.f. 2022)

NANOSCIENCE AND ITS APPLICATIONS (Smt. B Durga Lakshmi)

Unit 1: Introduction and developments of Nanoscience and Technology

Introduction and emergence of Nanotechnology, Bottom up and Top down approaches, Introduction to Physical,chemical and green method approaches : Their Advantages and limitations ;Recent developments and challenges in nanomaterial preparation; Introduction to solid state physics – structures and energy bands, surface to volume ratio, Chemistry in the formation of Nanoparticles.

Unit 2: Synthesis and fabrication of Nanomaterials

Types and strategies for synthesis of Nanomaterials depending on end applications, Zero – Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of these Nanomaterials : One- Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials a Two –Dimensional Nanostructures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials,Physical method: ball milling and laser ablation. Green method and Chemical method: : Precipitation method, hydrothermal method, sol-gel method, combustion method; Calcination effect on structure of nanomaterials

Unit 3: Characterization of Nanomaterials and Software tools

Introduction, structural characterisation, UV-vis spectroscopy (liquid and solid state). Fourier Transform Infrared spectroscopy(FTIR). Raman spectroscopy, elemental analysis of materials ,X-ray diffraction (XRD powder / single crystal). Small angle X-ray scattering (SAXS), Energy Dispersive X-ray spectroscopy (EDX), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Atomic force microscopy (AFM), luminescence spectroscopy, plotting tools in MS Excel, Origin, X'pert highscore

Unit 4: Study of Nanomaterial Properties

Study of Physical, Electrical, Mechanical properties of nanomaterials, Structural properties ,Thermal properties, Luminescent properties and other optical properties, Study of biological properties of nanomaterials : Anti bacterial, anti fungal properties, anti oxidant properties, study antidiabetic properties

Unit 5: Applications of nanotechnology

Medicine, Biology, Electronics and communication systems, Optics, Agriculture, Food, Renewable energy, Solar energy, Fuel cells, Solar cells, Batteries, Defence, Aerospace, Marine, Fuels, Coolants and Lubricants, Sensors, Sporting goods and fabric.Various applications based on size of nanoparticles

References:

1. Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.
2. Guozhong Cao Nanostructures and Nanomaterials, Synthesis, Properties and applications- Imperial College press.
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Model Question Paper

ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Examination – 2022

Paper II: Nanoscience and its Applications (Smt. B Durga Lakshmi)

Time: 3 Hours Max Marks: 100 M

Answer all the questions
Each question carried 20 marks

1. Explain about nanotechnology and bottom up and top down approaches and challenges in nanotechnology.

   OR

   Discuss about recent developments and various limitations in the preparation of nanomaterials

2. Classify Nanomaterials based on dimensionality and their synthesis.

   OR

   Describe various synthesis methods of nanoparticles. Explain advantages and disadvantages of each method

3. Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

   OR

   Describe Optical Spectroscopy, UV-Vis Spectroscopy, Infrared spectroscopy.

4. Discuss about the structural, thermal , optical properties of nanomaterials

   OR

   Discuss about the study of various biological properties of nanomaterials

5. Explain at what extent nanotechnology is being useful in Medicine, Electronics and Communication systems.

   OR

   Describe various applications of nanotechnology in fields of agriculture, food and renewable energy.

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Govt. College (A), Rajahmundry * Department of Physics * Research Centre in Physics with due Recognition in Nanoscience

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ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Course work syllabus – (w.e.f. 2022)
Paper I: Recent Advances in Physics and Research Methodology

Unit- I: Introduction and Types of Research Studies

Meaning and objectives of research, motivation and dedication in research, criteria of good research, ethics in research, plagiarism, scientific integrity, selecting a topic, importance of planning, planning experimentation, field work and accessing advanced facilities. Define Library Research, Field Research and Laboratory Research; Explain Sample Survey, Sample Collection and/or Preparation, Data Analyses, Hypothesis, Modeling, Interpretation, and Conclusion

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Journals: Standard journals in Physical Sciences, Impact factor, Citations, web based journals, Journal Metrics, Citations, h- index, writing a research paper, popular websites for scientific literature, choosing journal for sending research publications, styles of writing references. Search engines like Science Direct, Web of Science, Indian Citation Index and Google Scholar.

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Structure of thesis, background of the work, importance of language, grammar, scientific and systematic way of presentation, statistical analysis, use of graphical representation, proper preparation of graphs and tables, discussion, comparison with previous work, interpretation of results, summery and conclusions.

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Model Question Paper

ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Examination - 2022

Paper I: Recent Advances in Physics and Research Methodology

Time: 3 Hours

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Answer all the questions
Each question carried 20 marks

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OR

Describe various steps involved in field research.

2. What are the standard journals in physical sciences? Explain various journal metrics

OR

Explain how to choose a journal for sending research publications. Briefly explain about search engine like science direct and Indian citation index.

3. What is an intellectual property law and explain the basic types, inventions and innovations in intellectual property rights?

OR

Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

4. Describe the plagiarism rules and guidelines for research publications and code of research ethics.

OR

Write about the plagiarism policies of UGC and explain about UGC-CARE journals.

5. Explain the structure of thesis, importance of the language scientific and systematic presentation.

OR

Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

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ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY

DEPARTMENT OF PHYSICS

Pre-PhD Course work syllabus – (w.e.f. 2022)

NANOSCIENCE AND ITS APPLICATIONS (Mr. Suresh Patnaik Pakki)

Unit 1: Fundamentals of Nanoscience and technology

Introduction and emergence of Nanotechnology, Bottom up and Top down approaches, challenges in nanotechnology: Introduction to Quantum wells, Quantum wires and Quantum dots; Introduction to solid state physics – structures and energy bands; Introduction to physical, Electrical, Mechanical and other properties of Nanomaterials.

Unit 2: Synthesis of Nanomaterials

Types and strategies for synthesis of Nanomaterials depending on end applications, Zero – Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of these Nanomaterials and their technological applications: One- Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials and their technological applications: Two –Dimensional Nano structures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials and their technological applications: Special Nanomaterials and applications: Introduction, different strategies for synthesis of special Nanomaterials (e.g. carbon, micro and mesoporous, zeolites, core-shell structures, hybrid Nanomaterials, nanocomposites etc) and their technological applications.

Unit 3: Characterization of Nanomaterials

Introduction, structural characterisation, X-ray diffraction (XRD powder / single crystal), Small angle X-ray scattering (SAXS), scanning electron microscopy (SEM), transmission electron microscopy (TEM), Biomaterial characterization, cell culture, cell proliferation, cell viability, in-vitro, in-vivo methods, biocompatibility, bio-degradability, biotoxicity.

Unit 4: Fabrication of Nanomaterials

Top-Down Approach-Planetary ball milling: Bottom-up approach (Wet chemicals synthesis method). Microemulsion approach. Aerosol synthesis, Spray pyrolysis, electro chemical deposition, Gas phase production Methods: Physical and chemical vapour deposition techniques, Atomic layer deposition.

Unit 5: Applications of nanotechnology in various fields

Medicine, Biology, Bio-implant materials, steel, Titanium based implant materials, Sutures, surgical tapes, adhesives, Fracture fixation devices.

References:

1. Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.
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Model Question Paper

ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Examination – 2022

Paper II: Nanoscience and its Applications (Mr. Suresh Patnaik Pakki)

Time: 3 Hours

Max Marks: 100

Answer all the questions
Each question carried 20 marks

1. Explain the top-down and bottom-up methods of nanomaterial preperation.

   OR

   Describe various Quantum structures and properties of Nanomaterials.

2. Explain the classification of Nanomaterials based on dimensionality and their synthesis.

   OR

   Explain various Special Nanomaterials, their synthesis and technological applications.

3. Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

   OR

   Write about biomaterial characterization techniques?

4. Briefly explain planetary ball milling method, spray pyrolysis method and electro chemical deposition.

   OR

   Explain CVD and PVD techniques.

5. Explain about biomaterials for sutures, surgical tapes and adhesives.

   OR

   Explain about various fracture fixation biomaterials.

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Journals: Standard journals in Physical Sciences, Impact factor, Citations, web based journals, Journal Metrics, Citations, h- index, writing a research paper, popular websites for scientific literature, choosing journal for sending research publications, styles of writing references. Search engines like Science Direct, Web of Science, Indian Citation Index and Google Scholar.

Unit III: Intellectual Property rights

Introduction to Intellectual Property Law-Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory - Overuse or Misuse of Intellectual Property Rights –Compliance and Liability Issues. Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters. Introduction to Trademark – Trademark Registration Process – Post registration procedures – Trademark maintenance – Transfer of rights – Inter parties Proceedings – Litigations in Trademark.

Unit-IV: Research Ethics and Plagiarism

Research Ethics and Plagiarism: Rules and guidelines for research publications -Code of Research ethics, Authorship guidelines- Plagiarism policies of UGC and its software information – Information on UGC Care journals list.

Unit V: Preparation of Thesis:

Structure of thesis, background of the work, importance of language, grammar, scientific and systematic way of presentation, statistical analysis, use of graphical representation, proper preparation of graphs and tables, discussion, comparison with previous work, interpretation of results, summery and conclusions.

References:

1. Blum, Deborah and Mary Knudson, eds. A field guide for science writers: the official guide of the National Association of Science Writers, New York: Oxford University Press, 1997.
2. Booth, Wayne, Gregory G Colombo, Joseph M. Williams. The craft of Research Chicago University of Chicago Press, 1995.
3. Davis, Martha. Scientific Papers and Presentations. San Diego: Academic Press, 1997.

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Model Question Paper

ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Examination - 2022

Paper I: Recent Advances in Physics and Research Methodology

Time: 3 Hours | Max Marks: 100 M

Answer all the questions
Each question carried 20 marks

1. Define Research and explain the objectives criteria of good research and ethics in research.

   OR

   Describe various types of research and explain sample survey, preparation, collection and data analysis.

2. What are the standard journals in physical sciences? Explain their impact factor and citations.

   OR

   Explain how to choose a journal for sending research publications. Briefly explain about search engine like science direct and Indian citation index.

3. What is an intellectual property law and explain the basic types, inventions and innovations in intellectual property rights?

   OR

   Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

4. Describe the plagiarism rules and guidelines for research publications and code of research ethics.

   OR

   Write about the plagiarism policies of UGC and explain its software information.

5. Explain the structure of thesis, importance of the language scientific and systematic presentation.

   OR

   Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

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ADIKAVI NANNAYA UNIVERSITY :: RAJAHMUNDRY

DEPARTMENT OF PHYSICS

Pre-PhD Course work syllabus – (w.e.f. 2022)

NANOSCIENCE: SYNTHESIS, CHARACTERIZATION AND APPLICATIONS

(Mr. B.V. Vamsi Krishna)

Unit 1: Concept of Nanoscience and Technology

Introduction and emergence of Nanotechnology, Bottom-up and Top-down approaches, challenges in nanotechnology. Size matters reduction of dimensionality and surface to volume ratio, changes to the system total energy, changes to the system structure, structural properties, thermal properties, chemical properties, mechanical properties, magnetic properties, optical properties and electronic properties of nano-scale systems.

Unit 2: Synthesis of Nanomaterials

Types and strategies for synthesis of Nanomaterials depending on end applications, Zero – Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of these Nanomaterials: One- Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials a Two –Dimensional Nano structures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials and their technological applications: Special Nanomaterials and applications: Introduction, different strategies for synthesis of special Nanomaterials (e.g., carbon, micro and mesoporous, zeolites, core-shell structures, hybrid Nanomaterials, nanocomposites etc) and their technological applications.

Unit 3: Characterization of Nanomaterials

Introduction, structural characterisation, X-ray diffraction (XRD powder / single crystal). Small angle X-ray scattering (SAXS), field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), Atomic force microscopy (AFM). Optional spectroscopy, luminescence spectroscopy, UV-vis spectroscopy (liquid and solid state). Fourier Transform Infrared spectroscopy (FTIR). Raman spectroscopy, energy dispersive X-ray spectroscopy (EDX), thermogravimetric analysis (TGA), differential Thermal analysis (DTA) and differential scanning colorimetry (DSC), Brunauer-Emmett-Teller (BET).

Unit 4: Fabrication of Nanomaterials

Physical method: ball milling and laser ablation. Chemical method: co-precipitation method, hydrothermal method, sol-gel method, combustion method, polyol method and microwave assisted synthesis method. Green synthesis using plant and microbes. Mechanism of nanoparticle formation via chemical and green method.

Unit 5: Applications of nanotechnology

In vitro biomedical applications: antimicrobial, antidiabetic and antioxidant. Electronics and communication systems, Optics, Agriculture, Food, Renewable energy, Solar energy, Fuel cells, Solar cells, Batteries, Defence, Aerospace, Marine, Fuels, Coolants and Lubricants, Sensors, Sporting goods and fabric. Various applications based on size of nanoparticles

References:

1. Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.

2. Guozhong Cao Nanostructures and Nanomaterials, Synthesis, Properties and applications- Imperial College press.

3. T.Pradeep, "NANO: The Essentials, Understanding Nanoscience and Nanotechnology",Tata McGraw-Hill Publishing CompanyLimited 2007.

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Model Question Paper

ADIKAVI NANNAYA UNIVERSITY:: RAJAHMUNDRY
DEPARTMENT OF PHYSICS
Pre-PhD Examination – 2022

Paper II: NANOSCIENCE: SYNTHESIS, CHARACTERIZATION AND APPLICATIONS

(Mr. B.V. Vamsi Krishna)

Time: 3 Hours | Max Marks: 100 M

Answer all the questions
Each question carried 20 marks

1. Explain about nanotechnology and bottom-up and top-down approaches and challenges in nanotechnology.

   OR

   Explain structural, mechanical, magnetic, thermal properties and optical properties of nanomaterials. Discuss about surface to volume ratio of nanomaterials.

2. Classify Nanomaterials based on dimensionality and their synthesis.

   OR

   Explain Special Nanomaterials, their synthesis and technological applications.

3. Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

   OR

   Describe principle and instrumentation working of thermogravimetric analysis (TGA), differential Thermal analysis (DTA) and differential scanning colorimetry (DSC), Brunauer-Emmett-Teller (BET).

4. Briefly explain the synthesis of nanomaterials using hydrothermal method and ball milling method. Discuss about mechanism of nanoparticles formation via chemical method.

   OR

   Explain the green synthesis of nanoparticles using plant extracts and microbes. Discuss about mechanism of nanoparticles formation via green method.

5. Explain three In vitro biomedical applications, electronics and communication systems.

   OR

   Describe various applications of nanotechnology to Optics, Solar cells, Batteries, Sensors and Lubricants.

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ADIKAVI NANNAYA UNIVERSITY: RAJAHMUNDRY

Department of Physics

Pre Ph.D. Examination Syllabus (w.e.f.2019)

Paper: I Recent Advances in Physics and Research Methodology

Unit- I: Introduction

Meaning and objectives of research, motivation and dedication in research, criteria of goodresearch, ethics in research, plagiarism, scientific integrity, selecting a topic, importance of planning, planning experimentation, field work and accessing advanced facilities.

Types of Research Studies

Define Library Research, Field Research and Laboratory Research; Explain Sample Survey, Sample Collection and/or Preparation, Data Analyses, Hypothesis, Modeling, Interpretation, and Conclusion

Unit-II: Literature Review

Journals: Standard journals in Physical Sciences, Impact factor, Citations, web based journals, Journal Metrics, Citations, h- index, writing a research paper, popular websites for scientificliterature,choosingjournal for sending research publications, styles of writing references. Search engines like Science Direct, Web of Science, Indian Citation Index and Google Scholar.

Unit III: Intellectual Property rights

Introduction to Intellectual Property Law-Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory - Overuse or Misuse of Intellectual Property Rights –Compliance and Liability Issues.Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright OwnershipIntroduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.Introduction to Trademark – Trademark Registration Process – Post registration procedures – Trademark maintenance – Transfer of rights – Inter parties Proceedings – Litigations in Trademark.

Unit-IV: Research Ethics and Plagiarism

Research Ethics and Plagiarism: Rules and guidelines for research publications -Code of Research ethics, Authorship guidelines- Plagiarism policies of UGC and its software information – Information on UGC Care journals list.

Unit V: Preparation of Thesis:

Structure of thesis, background of the work, importance of language, grammar, scientific and systematic way of presentation, statistical analysis, use of graphical representation, proper preparation of graphs and tables, discussion, comparison with previous work, interpretation of results, summery and conclusions.

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1.Blum, Deborah and Mary Knudson, eds. A field guide for science writers: the official guide of the National Association of Science Writers, New York: Oxford University Press, 1997.

2. Booth, Wayne, Gregory G Colombo, Joseph M. Williams. The craft of Research Chicago University of Chicago Press, 1995.

3.Davis, Martha. Scientific Papers and Presentations. San Diego: Academic Press, 1997.

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Pre PhD Examinations Model Questions papers

Paper-I Recent Advances in Physics and Research Methodology

Time: 3hours Max Marks -100

SECTION-A

Answer all questions

Each carried 20 Marks

Answer the Following 5×20=100M

1 .Define Research and explain the objectives criteria of good research and ethics in research.

OR

.Describe various types of research and explain sample survey, preparation, collection and data analysis.

2.What are the standard journals in physical sciences? Explain their impact factor and citations.

OR

Explain how to choose a journal for sending research publications. Briefly explain about search engine like science direct and Indian citation index.

3.What is an intellectual property law and explain the basic types, inventions and innovations in intellectual property rights?

OR

Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

4.Describe the plagiarism rules and guidelines for research publications and code of research ethics.

OR

Write about the plagiarism policies of UGC and explain its software information.

5.Explain the structure of thesis, importance of the language scientific and systematic presentation.

OR

Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

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Department of Physics

Pre Ph.D. Examination syllabus (w.e.f 2019)

Paper: II Preparation Techniques in Materials and Experimental characterization (w.e.f 2019)

(B.Shiva Krishna)

Unit I

Fundamentals of Nanoscience and technology: Introduction and emergence of Nanotechnology, Bottom up and Top down approaches, challenges in nanotechnology: Introduction to Quantum wells, Quantum wires and Quantum dots; Introduction to solid state physics – structures and energy bands ; Introduction to physical, Electrical , Mechanical other properties.

Unit II

Synthesis of Nanomaterials: Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of these Nanomaterials and their technological applications: One- Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials and their technological applications: Two –Dimensional Nano structures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials and their technological applications: Special Nanomaterials and applications: Introduction, different strategies for synthesis of special Nanomaterials (e.g. carbon, micro and mesoporous , zeolites, core-shell structures, hybrid Nanomaterials, nanocomposites etc) and their technological applications.

Unit III

Characterization of Materials: Introduction to structural characterisation, Diffraction Techniques (XRD powder / single crystal). Small angle X-ray scattering(SAXS), scanning electron microscopy (SEM), transmission electron microscopy(TEM), Resonance Techniques (ESR and Mossbauer) – Spectroscopic Techniques (Laser Raman , FTIR, UV (Liquid and solid) - X- ray photoelectric spectroscopy (XPS), Energy Dispersive X-ray spectroscopy(EDS), Auger electron spectroscopy(AES).

Unit IV

Preparation of some Advanced Materials: Preparation of Glass materials, Bulk and Nano Preparation Techniques, Optical Properties, Advanced applications, Preparation of ferrites – planetary ball milling method, wet chemical synthesis method and electro chemical deposition , Atomic layer deposition, Pervoskite solar cells, preparation methods.

Unit V

Applications of nanotechnology in various fields: Medicine, Biology, Electronics and communication systems, Optics, Agriculture, Food, Renewable energy, Solar energy, Fuel cells, Solar cells, Batteries, Defence, Aerospace, Marine, Fuels, Coolants and Lubricants,Sensors, Sporting goods and fabric.

References:

1. Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.
2. Guozhong Cao Nanostructures and Nanomaterials, Synthesis, Properties and applications- Imperial College press.
3. T.Pradeep, "NANO: The Essentials, Understanding Nanoscience and Nanotechnology",Tata McGraw- Hill Publishing CompanyLimited 2007.
4. Solar cells,M.Markvat and Luis Castaner ,Elasverpublications
5. Introduction to Glass Science and Technology by J.E.Shelby

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Pre PhD Examination Model Question Paper

Paper: IIPreparation Techniques of Materials and Experimental characterization (w.e.f 2019)

(B.Shiva Krishna)

Time: 3hours

Max Marks -100

SECTION-A

Answer all questions

Each carried 20 marks

Answer the Following

5×20=100M

1. Explain about nanotechnology and bottom up and top down approaches and challenges in nanotechnology.

OR

Describe various Quantum structures and properties of Nanomaterials.

2. Classify Nanomaterials based on dimensionality and their synthesis.

OR

Explain Special Nanomaterials, their synthesis and technological applications.

3. Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

OR

Explain the Raman setup and characteristic analysis of Raman Spectroscopy

4. Explain any one of Preparation Techniques of Glasses and what are its advanced applications?

OR

Discuss the efficiency of perovskite solar cell and Explain the different preparation methods

5. Explain the Nano Technological applications in Marine and space applications.

OR

Describe various applications of nanotechnology to Optics, Batteries, Sensors and Lubricants.

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ADIKAVI NANNAYA UNIVERSITY: RAJAHMUNDRY

Department of Physics

Pre Ph.D. Examination Syllabus (w.e.f.2019)

Paper: I Recent Advances in Physics and Research Methodology

Unit- I: Introduction

Meaning and objectives of research, motivation and dedication in research, criteria of goodresearch, ethics in research, plagiarism, scientific integrity, selecting a topic, importance of planning, planning experimentation, field work and accessing advanced facilities.

Types of Research Studies

Define Library Research, Field Research and Laboratory Research; Explain Sample Survey, Sample Collection and/or Preparation, Data Analyses, Hypothesis, Modeling, Interpretation, and Conclusion

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Journals: Standard journals in Physical Sciences, Impact factor, Citations, web based journals, Journal Metrics, Citations, h- index, writing a research paper, popular websites for scientificliterature,choosingjournal for sending research publications, styles of writing references. Search engines like Science Direct, Web of Science, Indian Citation Index and Google Scholar.

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Structure of thesis, background of the work, importance of language, grammar, scientific and systematic way of presentation, statistical analysis, use of graphical representation, proper preparation of graphs and tables, discussion, comparison with previous work, interpretation of results, summery and conclusions.

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3.Davis, Martha. Scientific Papers and Presentations. San Diego: Academic Press, 1997.

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Pre PhD Examinations Model Questions papers

Paper-I Recent Advances in Physics and Research Methodology, w.e.f.2019

Time: 3hours Max Marks -100

SECTION-A

Answer all questions

Each carried 20 Marks

Answer the Following 5×20=100M

1 .Define Research and explain the objectives criteria of good research and ethics in research.

OR

.Describe various types of research and explain sample survey, preparation, collection and data analysis.

2.What are the standard journals in physical sciences? Explain their impact factor and citations.

OR

Explain how to choose a journal for sending research publications. Briefly explain about search engine like science direct and Indian citation index.

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OR

Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

4.Describe the plagiarism rules and guidelines for research publications and code of research ethics.

OR

Write about the plagiarism policies of UGC and explain its software information.

5.Explain the structure of thesis, importance of the language scientific and systematic presentation.

OR

Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

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ADIKAVI NANNAYA UNIVERSITY: RAJAHMUNDRY

Department of Physics

Pre Ph.D. Examination syllabus (w.e.f 2019)

Paper: II Synthesis and Characterization of Nano Materials (w.e.f 2019)

(M.Raju)

Unit I

Introduction to Solid State Physics and Nano science: Crystal structures,Millerindicies ,determination of Miller indicies,Superconductivity, Misner effect,Type-I and Type-II,BCS Theory, Introduction and future Advantages of Nanotechnology, Bottom up and Top down approaches,.

Unit II

Synthesis of Nanomaterials: Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of these Nanomaterials and their technological applications: One- Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials and their technological applications: Two –Dimensional Nano structures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials and their technological applications: Special Nanomaterials and applications: Introduction, different strategies for synthesis of special Nanomaterials (e.g. carbon, micro and mesoporous , zeolites, core-shell structures, hybrid Nanomaterials, nanocomposites etc) and their technological applications.

Unit III

Preparation of Photocatalyst and Other Advanced Materials: Standard Ceramic Method, Preparation of Photo catalyst,Solgel Method, Coprecipitation Method, Applications of Photo catalyst, Preparation of Ferrites,Preparation of Glasses, Spray pyrolysis, electro chemical deposition, Atomic layer deposition, Pervoskite solar cells, preparation methods

Unit IV

Characterization of Materials: Introduction to structural characterisation, Diffraction Techniques (XRD powder / single crystal). Small angle X-ray scattering(SAXS), scanning electron microscopy (SEM), transmission electron microscopy(TEM), Resonance Techniques (ESR and Mossbauer) – Spectroscopic Techniques (Laser Raman , FTIR, UV (Liquid and solid) - X- ray photoelectric spectroscopy (XPS), Energy Dispersive X-ray spectroscopy(EDS), Auger electron spectroscopy(AES).

.Unit V

Advanced Applications of Nano Technology: Medical, Agriculture, Food,Biology, Electronics and communication systems, Optics, , Renewable energy, Solar energy, Fuel cells, Solar cells, Batteries, Defence, Aerospace, Marine, Fuels, Coolants and Lubricants,Sensors, Sporting goods and fabric.

References:

1. Solid State Physics; S.O.Pillai
2. Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.
3. Guozhong Cao Nanostructures and Nanomaterials, Synthesis, Properties and applications- Imperial College press.
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5. Solar cells,M.Markvat and Luis Castaner ,Elasverpublications

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Pre PhD Examination Model Question Paper

Paper –II Synthesis and Characterization of Nano Materials, w.e.f 2019

(M.Raju)

Time: 3hours Max Marks -100

SECTION-A

Answer all questions

Each carried 20 marks

Answer the Following

5×20=100M

1 What are Miller indices? Explain the procedure of finding these Miller indices with an examples

OR

Define Superconductivity and Explain BCS theory of Super Conductivity?

2 Classify Nano materials based on dimensionality and their synthesis.

OR

Explain Special Nanomaterials, their synthesis and technological applications.

3. Explain Preparation of Photo catalysy in Sol-gel Method and what are its Applications?.

OR

Discuss the efficiency of perovskite solar cell and Explain the different preparation method

4 Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

OR

Describe Laser Raman spectroscopy, UV-Vis Spectroscopy, Infrared spectroscopy(FTIR).

5 Biology, Electronics and Communication systems.

OR

Describe various applications of nanotechnology to Optics, Batteries, Sensors and Lubricants.

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Department of Physics

Pre Ph.D. Examination Syllabus (w.e.f.2019)

Paper: I Recent Advances in Physics and Research Methodology

Unit- I: Introduction

Meaning and objectives of research, motivation and dedication in research, criteria of goodresearch, ethics in research, plagiarism, scientific integrity, selecting a topic, importance of planning, planning experimentation, field work and accessing advanced facilities.

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Journals: Standard journals in Physical Sciences, Impact factor, Citations, web based journals, Journal Metrics, Citations, h- index, writing a research paper, popular websites for scientificliterature,choosingjournal for sending research publications, styles of writing references. Search engines like Science Direct, Web of Science, Indian Citation Index and Google Scholar.

Unit III: Intellectual Property rights

Introduction to Intellectual Property Law-Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory - Overuse or Misuse of Intellectual Property Rights –Compliance and Liability Issues.Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright OwnershipIntroduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.Introduction to Trademark – Trademark Registration Process – Post registration procedures – Trademark maintenance – Transfer of rights – Inter parties Proceedings – Litigations in Trademark.

Unit-IV: Research Ethics and Plagiarism

Research Ethics and Plagiarism: Rules and guidelines for research publications -Code of Research ethics, Authorship guidelines- Plagiarism policies of UGC and its software information – Information on UGC Care journals list.

Unit V: Preparation of Thesis:

Structure of thesis, background of the work, importance of language, grammar, scientific and systematic way of presentation, statistical analysis, use of graphical representation, proper preparation of graphs and tables, discussion, comparison with previous work, interpretation of results, summery and conclusions.

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1.Blum, Deborah and Mary Knudson, eds. A field guide for science writers: the official guide of the National Association of Science Writers, New York: Oxford University Press, 1997.

2. Booth, Wayne, Gregory G Colombo, Joseph M. Williams. The craft of Research Chicago University of Chicago Press, 1995.

3.Davis, Martha. Scientific Papers and Presentations. San Diego: Academic Press, 1997.

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Pre PhD Examinations Model Questions papers

Paper-I Recent Advances in Physics and Research Methodology

Time: 3hours Max Marks -100

SECTION-A

Answer all questions

Each carried 20 Marks

Answer the Following 5×20=100M

1 .Define Research and explain the objectives criteria of good research and ethics in research.

OR

.Describe various types of research and explain sample survey, preparation, collection and data analysis.

2.What are the standard journals in physical sciences? Explain their impact factor and citations.

OR

Explain how to choose a journal for sending research publications. Briefly explain about search engine like science direct and Indian citation index.

3.What is an intellectual property law and explain the basic types, inventions and innovations in intellectual property rights?

OR

Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

4.Describe the plagiarism rules and guidelines for research publications and code of research ethics.

OR

Write about the plagiarism policies of UGC and explain its software information.

5.Explain the structure of thesis, importance of the language scientific and systematic presentation.

OR

Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

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Department of Physics

Pre Ph.D. Examination syllabus (w.e.f 2019)

Paper: II Nanoscience and Experimental characterization (w.e.f 2019)

(A.SimhaDri)

Unit I

Introduction to Solid State Physics: Crystal structures, Crystal planes,lattice parameter, determination lattice parameter, Band model of semiconductors - carrier concentrations in intrinsic and extrinsic semiconductors, Hall effect and Datermination of Hall coefficient

Unit II

Nno science and synthesis Methods: Introduction to Nano science, Nanoparticles, One-Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials and their technological applications: Two –Dimensional Nano structures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials and their technological applications: Special Nanomaterials and applications: Introduction, different strategies for synthesis of special Nanomaterials (e.g. carbon, micro and mesoporous , zeolites, core-shell structures, hybrid Nanomaterials, nanocomposites etc) and their technological applications.

Unit III

Characterization of Materials: Introduction to structural characterisation, Diffraction Techniques (XRD powder / single crystal). Small angle X-ray scattering(SAXS), scanning electron microscopy (SEM), transmission electron microscopy(TEM), Resonance Techniques (ESR and Mossbauer) – Spectroscopic Techniques (Laser Raman , FTIR, UV (Liquid and solid) - X- ray photoelectric spectroscopy (XPS), Energy Dispersive X-ray spectroscopy(EDS), Auger electron spectroscopy(AES).

Unit IV

Fabrication of Nanomaterials: Top Down approach-Planetary ball milling: Bottom up approach (Wet chemicals synthesis method). Microemulsion approach.Aerosol synthesis, Preparation of ferrites and glass, Materials –Spray pyrolysis, electro chemical deposition, Atomic layer deposition, Pervoskite solar cells, preparation methods.

Unit V

Applications of NanoTechnology: Renewable energy, Solar energy, Fuel cells, Solar cells, Batteries, Defence, Aerospace, Marine, Fuels, Coolants and Lubricants,Sensors, Sporting goods and fabric. Medicine, Biology, Electronics and communication systems, Optics, Agriculture, Food,

References:

1. Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.
2. Guozhong Cao Nanostructures and Nanomaterials, Synthesis, Properties and applications-Imperial College press.
3. T.Pradeep, "NANO: The Essentials, Understanding Nanoscience and Nanotechnology",Tata McGraw- Hill Publishing CompanyLimited 2007.
4. Solar cells,M.Markvat and Luis Castaner ,Elasverpublications
5. Edward L. Wolf, Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience, Wiley-VCH (2006)

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Pre PhD Examination Model Question Paper

Paper: II Nanoscience and Experimental characterization(w.e.f 2019)

(A.Simhadri)

Time: 3hours Max Marks -100

SECTION-A

Answer all questions

Each carried 20 marks

Answer the Following

5×20=100M

1 Define lattice parameter? Explain any one of methods to determination of lattice constant of Cubic structure?

OR

Define Hall effect and Explain the determination of Hall coefficient?

2 Classify Nanomaterials based on dimensionality and their synthesis.

OR

Explain Special Nanomaterials, their synthesis and technological applications.

3 Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

OR

Desribe the Experimental setup for FTIR and Discuss various analysing parameters ?

4 Briefly explain planetary ball milling method, wet chemical synthesis method and electro chemical deposition.

OR

Explain any one of synthesis method for Ferrites and what are its applications?

5 What are attractive applications in Defence and Medical applications.

OR

What are the advanced applications in renewable energy and explain any one of synthesising techniques for any type of solar cell?

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Department of Physics

Pre Ph.D. Examination Syllabus (w.e.f.2019)

Paper: I Recent Advances in Physics and Research Methodology

Unit- I: Introduction

Meaning and objectives of research, motivation and dedication in research, criteria of goodresearch, ethics in research, plagiarism, scientific integrity, selecting a topic, importance of planning, planning experimentation, field work and accessing advanced facilities.

Types of Research Studies

Define Library Research, Field Research and Laboratory Research; Explain Sample Survey, Sample Collection and/or Preparation, Data Analyses, Hypothesis, Modeling, Interpretation, and Conclusion

Unit-II: Literature Review

Journals: Standard journals in Physical Sciences, Impact factor, Citations, web based journals, Journal Metrics, Citations, h- index, writing a research paper, popular websites for scientificliterature,choosingjournal for sending research publications, styles of writing references. Search engines like Science Direct, Web of Science, Indian Citation Index and Google Scholar.

Unit III: Intellectual Property rights

Introduction to Intellectual Property Law-Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory - Overuse or Misuse of Intellectual Property Rights –Compliance and Liability Issues.Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright OwnershipIntroduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.Introduction to Trademark – Trademark Registration Process – Post registration procedures – Trademark maintenance – Transfer of rights – Inter parties Proceedings – Litigations in Trademark.

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Structure of thesis, background of the work, importance of language, grammar, scientific and systematic way of presentation, statistical analysis, use of graphical representation, proper preparation of graphs and tables, discussion, comparison with previous work, interpretation of results, summery and conclusions.

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2. Booth, Wayne, Gregory G Colombo, Joseph M. Williams. The craft of Research Chicago University of Chicago Press, 1995.

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Pre PhD Examinations Model Questions papers

Paper-I Recent Advances in Physics and Research Methodology (w.e.f.2019)

Time: 3hours Max Marks -100

SECTION-A

Answer all questions

Each carried 20 Marks

Answer the Following 5×20=100M

1 .Define Research and explain the objectives criteria of good research and ethics in research.

OR

.Describe various types of research and explain sample survey, preparation, collection and data analysis.

2.What are the standard journals in physical sciences? Explain their impact factor and citations.

OR

Explain how to choose a journal for sending research publications. Briefly explain aboutsearch engine like science direct and Indian citation index.

3.What is an intellectual property law and explain the basic types, inventions and innovations in intellectual property rights?

OR

Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

4.Describe the plagiarism rules and guidelines for research publications and code of research ethics.

OR

Write about the plagiarism policies of UGC and explain its software information.

5.Explain the structure of thesis, importance of the language scientific and systematic presentation.

OR

Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

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Department of Physics

Pre Ph.D. Examination syllabus (w.e.f 2019)

Paper: II Preparation of Advanced Materials and Characterization (w.e.f 2019)

(S.J.Gosu)

Unit I

Concepts in Nano science: Introduction to Nano science and Nanotechnology, Bottom up and top down approaches, challenges in nanotechnology: Introduction to Quantum wells, Quantum wires and Quantum dots; Fundamentals of solid state physics – band theory of solids ;Brags law of solids, Diffraction Techniques: of solids, Laue and Powder diffraction Method .

Unit II

Synthesis of Nanomaterials: Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of these Nanomaterials and their technological applications: One- Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials and their technological applications: Two –Dimensional Nano structures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials and their technological applications: Special Nanomaterials and applications: Introduction, different strategies for synthesis of special Nanomaterials (e.g. carbon, micro and mesoporous , zeolites, core-shell structures, hybrid Nanomaterials, nanocomposites etc) and their technological applications.

Unit III

Characterization of Materials: Introduction to structural characterisation, Diffraction Techniques (XRD powder / single crystal). Small angle X-ray scattering(SAXS), scanning electron microscopy (SEM), transmission electron microscopy(TEM), Resonance Techniques (ESR and Mossbauer) – Spectroscopic Techniques (Laser Raman , FTIR, UV (Liquid and solid) - X- ray photoelectric spectroscopy (XPS), Energy Dispersive X-ray spectroscopy(EDS), Auger electron spectroscopy(AES).

Unit IV

Preparation of some Advanced Materials: Preparation of Glass materials, Bulk and Nano Preparation Techniques, Optical Properties, Advanced applications, Preparation of ferrites – planetary ball milling method, wet chemical synthesis method and electro chemical deposition , Atomic layer deposition, Pervoskite solar cells, preparation methods.

Unit V

Applications and Advantages of NanoTechnology: Medicine, Biology, Electronics and communication systems, Optics, Agriculture, Food, Renewable energy, Solar energy, Fuel cells, Solar cells, Batteries, Defence, Aerospace, Marine, Fuels, Coolants and Lubricants,Sensors, Sporting goods and fabric.

References:

1. T.Pradeep, "NANO: The Essentials, Understanding Nanoscience and Nanotechnology",Tata McGraw- Hill Publishing CompanyLimited 2007.
2. Solar cells,M.Markvat and Luis Castaner ,Elasverpublications
3. Introduction to Glass Science and Technology by J.E.Shelby
4. Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.
5. Guozhong Cao Nanostructures and Nanomaterials, Synthesis, Properties and applications- Imperial College press

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Pre PhD Examination Model Question Paper

Paper: II Preparation of Advanced Materials and Characterization (w.e.f 2019)

(S.J.Gosu)

Time: 3hours Max Marks -100

SECTION-A

Answer all questions

Each carried 20 marks

Answer the Following

5×20=100M

1. Explain Band theory of solids and Classify it on basis of Band theory of solids?

   OR

   Explain different Diffraction techniques of solid and Discuss on Powder diffraction Method?.

2. Classify Nanomaterials based on dimensionality and their synthesis.

   OR

   Explain Special Nanomaterials, their synthesis and technological applications.

3. Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

   OR

   Describe Laser Raman spectroscopy, UV-Vis Spectroscopy, Infrared spectroscopy(FTIR).

4. Explain any one of Preparation Techniques of Glasses and what are its advanced applications?

   OR

   Discuss the efficiency of perovskite solar cell and Explain the different preparation methods

5. Biology, Electronics and Communication systems.

   OR

   Describe various applications of nanotechnology to Optics, Batteries, Sensors and Lubricants.

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Department of Physics

Pre Ph.D. Examination Syllabus (w.e.f.2019)

Paper: I Recent Advances in Physics and Research Methodology

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Types of Research Studies

Define Library Research, Field Research and Laboratory Research; Explain Sample Survey, Sample Collection and/or Preparation, Data Analyses, Hypothesis, Modeling, Interpretation, and Conclusion

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Journals: Standard journals in Physical Sciences, Impact factor, Citations, web based journals, Journal Metrics, Citations, h- index, writing a research paper, popular websites for scientificliterature,choosingjournal for sending research publications, styles of writing references. Search engines like Science Direct, Web of Science, Indian Citation Index and Google Scholar.

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Structure of thesis, background of the work, importance of language, grammar, scientific and systematic way of presentation, statistical analysis, use of graphical representation, proper preparation of graphs and tables, discussion, comparison with previous work, interpretation of results, summery and conclusions.

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Pre PhD Examinations Model Questions papers

Paper-I Recent Advances in Physics and Research Methodology, (w.e.f 2019)

Time: 3hours Max Marks -100

SECTION-A

Answer all questions

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Explain how to choose a journal for sending research publications. Briefly explain about search engine like science direct and Indian citation index.

3.What is an intellectual property law and explain the basic types, inventions and innovations in intellectual property rights?

OR

Describe Patent law, rights under patent law, application process, granting of patent and new developments in patent law.

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Write about the plagiarism policies of UGC and explain its software information.

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Explain the statistical analysis and preparation of graphs and tables and explain how do you interpret the results and write the conclusions.

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Department of Physics

Pre Ph.D. Examination syllabus (w.e.f 2019)

Paper: II Nano Science, Preparation Techniques and Their characterization(w.e.f 2019)

(G.Hanumantha Rao)

Unit I

Fundamentals in Nano Technology: Introduction and Features of Nanotechnology, size dependent nano properties of nano materials: chemistry and properties of Nano-structured materials. Variation in properties of micro and Nanomaterials,Introduction to solid state physics – crystal structures, Free electron theory of metals, Properties of metals, Expression for electrical conductivity, verification of ohms law

Unit II

Synthesis of Nanomaterials: Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of these Nanomaterials and their technological applications: One- Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D Nanomaterials and their technological applications: Two –Dimensional Nano structures. Thin film: Introduction, different strategies for synthesis of 2D Nanomaterials and their technological applications: Special Nanomaterials and applications: Introduction, different strategies for synthesis of special Nanomaterials (e.g. carbon, micro and mesoporous , zeolites, core-shell structures, hybrid Nanomaterials, nanocomposites etc) and their technological applications.

Unit III

Preparation of Photocatalyst and Other AdvancedMaterials: Standard Ceramic Method, Preparation of Photo catalyst,Solgel Method, Coprecipitation Method, Applications of Photo catalyst, Preparation of Ferrites,Preparation of Glasses, Spray pyrolysis, electro chemical deposition, Atomic layer deposition, Pervoskite solar cells, preparation methods

Unit IV

Characterization of Materials: Introduction to structural characterisation, Diffraction Techniques (XRD powder / single crystal). Small angle X-ray scattering(SAXS), scanning electron microscopy (SEM), transmission electron microscopy(TEM), Resonance Techniques (ESR and Mossbauer) – Spectroscopic Techniques (Laser Raman , FTIR, UV (Liquid and solid) - X- ray photoelectric spectroscopy (XPS), Energy Dispersive X-ray spectroscopy(EDS), Auger electron spectroscopy(AES).

.Unit V

Potential Applications of Nano Technology: Nano solar cells,Pervoskite solar cells, Fuel cells, Medical applications,Biological applications, Food and agricultural applications, Batteries, Milatary. Aerospace, Marine, communication applications, sensor applications

References:

1 Solid stste Physics : Charles Kittle

2 Charles P, Poole. Jr.& Frank J.owens, Introduction to Nano technology- John wiley& sons Inc.Publushers-2006.

3 Guozhong Cao Nanostructures and Nanomaterials, Synthesis, Properties and applications- Imperial College press.

4 Introduction to Glass Science and Technology by J.E.Shelby

5 .T.Pradeep, "NANO: The Essentials, Understanding Nanoscience and Nanotechnology",Tata McGraw- Hill Publishing CompanyLimited 2007.

6. Solar cells,M.Markvat and Luis Castaner ,Elasverpublications

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Pre PhD Examination Model Question Paper

Paper –II Nano Science, Preparation Techniques and Their characterization(w.e.f.2019)
(G.HanumanthaRao)

Time: 3hours Max Marks -100

SECTION-A
Answer all questions
Each carried 20 marks

Answer the Following

5×20=100M

1. Explain the Variation in properties of micro and Nanomaterials with Length scale involved and effect on properties

OR

Express the equitation for electrical conductivity and verification of ohms law.

2. Classify Nanomaterials based on dimensionality and their synthesis.

OR

Explain Special Nanomaterials, their synthesis and technological applications.

3. Explain Preparation of Photo catalysy in Sol-gel Method and what are its Applications?.

OR

Explain the any preparation method in fabrication of Giass

4. Describe Structural Characterisations- X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).

OR

Explain the description for UVspectrsocpy and analyse different parameters using this UV spectroscopy

5. Explain Biological and Medical applications of Nano Tecnology?

OR

Explain the Fabication of perovoskit solar cells and what are its significance?

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