ST JOHN'S COLLEGE ANCHAL

Department of Physics

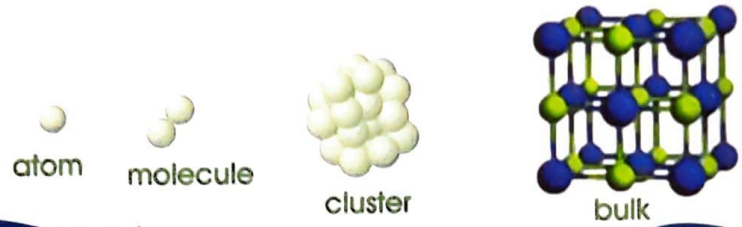
Add-On Course

The Department Physics is conducting an Add on Course during the academic year 2022-2023 for UG and PG students of the college

PROGRAMMABLE METAL NANOCLUSTERS WITH ATOMIC PRECISION

Course Duration: 30hrs

Eligibility: UG & PG Science Students



Date of Commencement

07-10-2022

Course Coordinator

Dr PRAVEEN S G

A specialized training on nanoclusters offers sound knowledge to students about one of the novel and cutting edge areas of materials science . The knowledge about these specialised course leads to the creation of scientific attitude and research aptitude among students.

For further information please contact the Course Coordinator

COURSE SUMMARY REPORT
2022-2023

Name of Course	**Programmable metal nanoclusters with atomic precision PY.A.22.1**
Course Duration	**30 Hours**
Department offering the Course	**Department of Physics**
Faculty In Charge	**Dr PRAVEEN S G**
Number of Students Enrolled	**35**
Start Date & End Date	**07/10/2022 to 24/03/2023**

The add on course on **Programmable metal nanoclusters with atomic precision PY.A.22.1** has been coordinated by the Department of Physics, St John's College, Anchal. The course was specially designed to provide the specialized training course on one of the cutting edge areas of material science . The course aims to enhance the scientific tamper among students and to create an ambience for R and D in the campus .The course had a well-defined syllabus and was approved by the 1QAC. The add on course was coordinated by Dr PRAVEEN S G, Assistant Professor, Department of Physics. The course was properly planned and organised to provide maximum support to students during their learning process. The course duration was 30 hours. 35 students enrolled for the program. The course started on 07.10.2022 and ended on 24.03.2023. After successful completion of course, an exit examination was conducted. All students wrote the examination. Final assessment was done based on the marks secured by them during the written and practical examination. All students passed in the examination. Certificates were also provided to them after the successful completion of the course.

Course Coordinator

Principal

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Name of Course	**Programmable metal nanoclusters with atomic precision**
Course Code	**PY.A.22.1**
Department offering the Course	**Department of Physics**
Course Duration	**30 Hours**
Faculty In Charge	**Dr PRAVEEN S G**

Course Title: PY.A.22.1 Programmable metal nanoclusters with atomic precision

A hands-on training course on Programmable metal nanocluster can be a valuable addition to traditional knowledge on material science and physicsl properties of materials. This course helps the students to understand more details of how physicsl properties of the materials are originating.

Course Objectives:

5. Understand the basics of nano technology and nano materials
6. Study and understand the significance of nanomaterials
7. Identify various materials which shows different physical properties at sub nano meter length scale
8. Know more about nanoclusters and their significance
9. Understand the technological applications of nanoclusters

Course Outcomes: At the end of the course, students should be able to:

- Successfully understand the properties materials at nano scale
- Identify the material which shows significance difference in properties at nanoscale
- Experience some simple method to prepare some nano materials
- Experience size tuning of materials with precision.

Assessment and Certification:

- Practical assessment: Participants will be evaluated based on their ability to set up and maintain a simple experimental sett up to prepare nanomaterials

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- Written test: A written exam covering the theoretical knowledge learned during the course.
- Course completion certificate.
- Additionally, the course can be supplemented with various lab visits

Syllabus

MODULE	TITLE	CONTENT	HOURS
1	**Introduction to Nano technology**	Emergence of Nanoscience with special reference to Feynman and Drexler, Role of particle size, Spatial and temporal scale	6
2	**Nanomaterials**	Nanoclusters, Solid solutions, Thin film, Nanocomposites (Metal Oxide and Polymer based), Core Shell Nanostructure, Buckyballs, Carbon nano tubes	6
3	**NanoParticle Synthesis Methods with atomic precision**	Physcal Vapour Deposition (PVD), Inert gas condensation, Arc discharge, DC sputtering, Ion sputtering,RF & Magnetron sputtering ,Pulse Laser Deposition (PLD), Ball Milling, Molecular beam epitaxy, Electro-deposition Metal nanocrystals by reduction, Sol- gel, Solvothermal synthesis, Photochemical synthesis, Electrochemical synthesis, Nanocrystals of semiconductors and other materials by arrested precipitation,Thermolysis routes, Liquid-liquid interface.	10
4	**Charecterization of nanomaterials**	X-ray diffraction (XRD) technique, particle size determination using XRD, Applications of XRD, Electron diffraction and its application, neutron diffraction and its applications.	5
5	**Industrial applications of nanomaterials**	Nano capacitors, Quantum tunneling, Single electron transistors, Coulomb blockade, Nano lithography, Data storage, Nano-photonics, Nano electronic and Magnetic devices, Spintronic, Carbon based materials: Carbon Nano-tube (CNC), Graphene. Sensors & Nano-sensors	3

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