COURSE TITLE	**NANO-INFORMATICS**
COURSE CODE	**01CB0605**
COURSE CREDITS	**3**

Objective:

1 The course will acquaint students with tools and databases of nano informatics to help in drug discovery, drug delivery, and cytotoxicity prediction

Course Outcomes: After completion of this course, student will be able to:

1 Apply principles of nanotechnology and nanoinformatics.
2 Apply principles of nanotechnology and nanoinformatics.
3 Utilize biophysical methods for nanomaterial characterization.
4 Apply computational tools for nanoinformatics data analysis.
5 Evaluate nanoinformatics databases for data interpretation.

Pre-requisite of course: Basic knowledge of Bioinformatics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Basics of nanoscience and nanotechnology** Introduction to Nanotechnology, synthesis of nanomaterials by top down: 1) Mechanical grinding (Ball Milling) 2) Lithography 3) Etching 4) Erosion and bottom-up approach: 1) Sol-gel method 2) Chemical Vapour Deposition 3) Physical Vapour Deposition 4) Electrochemical deposition 5) Hydrothermal method 6) Atomic layer deposition	7
2	**Characterization of nanomaterials** Characterization of nanomaterials by UV visible spectroscopy, XRD, SEM, TEM, etc., Application of Nanomaterial in pharmaceutical science, agriculture, medical science, etc.	7
3	**Tools for Nanoinformatics** Introduction to nanoinformatics, Need of nanoinformatics, Nanodatabase, Nanomine: an online platform of materials genome prediction for polymer nanocomposites.	7

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Contents : Unit	Topics	Contact Hours
4	**Data storage tool** MICAD - Molecular Imaging Contrast Agent Database NCL - Assay Cascade Protocols CaNanoLab - Cancer Nanotechnology Laboratory NBI KB - Nanomaterial-Biological Interactions Knowledgebase.	7
Total Hours		**28**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Module1:** Preparation of plant extract for synthesis of nanoparticles.	2
2	**Module1:** To synthesize metallic nanoparticles via green approach	2
3	**Module2:** Characterization techniques for metallic nanoparticles	2
4	**Module2:** Estimation of antimicrobial activity of metallic nanoparticles	2
5	**Module2:** Estimation of antioxidant activity of metallic nanoparticles.	2
6	**Module3:** Synthesis of core-shell nanocomposites.	2
7	**Module4:** Analyze different products with the use of a nano-database.	2
8	**Module4:** To expedite and validate the bio-nanomedicine by caNanolab.	2
9	**Module4:** To study Molecular Imaging and Contrast Agent Database (MICAD).	2
10	**Module4:** To study Assay Cascade Protocols by NCL	2
11	**Module4:** To study the Nano-EHS database analysis tool	2
12	**Module3:** To study analytical tools and simulation via NanoHub	2
13	**Module4:** To predict the zeta potential of nanoparticles by PhyChem: NanoXtract model	2
14	**Module3:** To analyze hazard prediction and cytotoxicity of metal oxide nanoparticles by CyTox	2
Total Hours		**28**

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Textbook :

1 Nanotechnology: an introduction to synthesis Properties and applications of nanomaterials, Thomas Varghese and K.M balakrishna, Atlantic Publisher, 2019

References:

1 Nanotechnology: The science of Small, Nanotechnology: The science of Small, M.A shah and K.A Shah, wiley publisher, 2019

2 Nanotechnology: uses and applications, Nanotechnology: uses and applications, Anil verma, SBS publishers and distributors pvt ltd, 2012

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	30.00	20.00	10.00	10.00	10.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Supplementary Resources:

1 https://cananolab.cancer.gov/

2 https://cellviability.cloud.nanosolveit.eu/2/instructions.zul

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