

DEPARTMENT OF PHYSICS
CERTIFICATE COURSE REPORT
ON
Computational methods in Physics , Chemistry &
Botany

Summary of Course along with outcomes Objective: The certificate course aimed to introduce undergraduate students to an interdisciplinary application of mathematical techniques in subjects apart from their university curriculum. These techniques were applied to different problems using computer programs. The interdisciplinary certificate course: a computational method in physics, chemistry, and botany was designed for undergraduate students of physics, chemistry and botany. This certificate course was conducted during the week 18th – 23rd July 2022. During this course, we gave lectures to the participant students followed by hands-on exercises on lab computers based on the lectures. The course was started by an introductory lecture on Linux operating system followed by hands-on session. For the rest of the week, the students were introduced to basic mathematical techniques and their applications in subjects outside their curriculum. In the hands-on sessions, students learned applications and significance of these techniques by using computer programs. In the last session, students were introduced to basic statistical techniques required in their daily experimental work and data analysis. At the end of the certificate course students got an exposure to the usefulness of these mathematical techniques outside their subject. The introduction to the Linux operating system and relevant applications gave them a new outlook. The whole motive of this course was to give students to a broad interdisciplinary perspective of mathematical and computing methods.

Greetings to all,

The departments of Botany, Chemistry, Physics, Computer Science and Information Technology are conducting a 30 hrs Add-on course: 'Computational Methods in Physics, Chemistry and Botany'.

The use of computational tools has become indispensable for modern day research. It could be storing and analysing data, doing statistics or using computational models. This course will introduce students to computational thinking and data literacy.

The learning objective for this course includes:

- Students will learn to use the Linux operating system for graph plotting, elementary statistics etc.
- Students will be introduced to simulation techniques

There are no prerequisites and fee for this course.

However, the registration for this course is compulsory. Attendance for the course is mandatory for the registered students. After the commencement of the course a short test based on multiple choice questions will be conducted. All the registered students will be awarded with certificates along with the grades.

Registration link: <https://forms.gle/NjBhTmmdrrttkRvs6>

Resource People

Prof. Shantanu Kadam, Assistant Professor, Department of Physics

Dr. Shilpa Hatewar, Assistant Professor, Department of Computer Science and
Department of Information Technology

Time: 12:00 noon to 3:00 PM

Date: 18th July – 23rd July 2022

Venue: Lab 4 (first floor)



DNYANASADHANA, THANE

EST : 1980 (Reg. No. MAH/759/THN)

Dnyanasadhana, Thane. Ground Floor, Salish Pradhan Dnyanasadhana College, Thane, Off, Eastern Express, Dnyanasadhana Marg,
Thane (West) 400504 Maharashtra, India. 🌐 : www.dnyanasadhanacollege.org ✉ : dnyanasadhanamanagement@gmail.com

DT/ GGA /2022-23

DATE: 17.06.2022

To,
Dr. Dhananjay.D.Mulajkar
Head, Department of Physics

Subject: Sanction of proposed Certificate Course of your department

Dear Sir,

Your proposal dated 20th April 2022 for the conduct of a Certificate Course titled, "Computational methods in Physics, Chemistry & Botany" was placed before the CDC held on 17th June, 2022. The proposal with syllabi designed was discussed at length in the CDC and unanimously approved. You are hereby instructed to conduct the same in the current academic year 2022-23.



Pradhank
SECRETARY

Syllabus

Interdisciplinary Course in Computational Methods

Shantanu Kadam

S.P. Dnyanasadhana College, Thane

Duration : 30 hrs

1. Module I (5 hrs)

Importance of graphs, plotting graphs of linear, non-linear, exponential, trigonometric and algebraic functions with their relevant biological applications, fitting curve to a data (e.g. experimental data), plotting 2D functions (as heat map) : mathematical representation of an image/picture, importance of derivatives : actin filament polymerization, dissociation of bacteria from DNA, 1D concentration gradient, calculating derivatives using graphs (not using formulae !), calculating integrals using graphs (not using formulae !), importance of Fourier series, application of Fourier series : proteins in crystalline form as sawtooth function

2. Module II (13 hrs)

Using law of mass-action kinetics to write ordinary differential equations (ODEs) for zero order, first order, second order elementary chemical reactions, writing ODEs for cellular bio-chemical reaction networks : insulin signalling pathway, GAL network, ERK pathway etc., numerically solving ODEs using different methods, deterministic simulation of chemical reactions with examples, Biostatistics : analysing data through mean, standard deviation, plotting histograms and probability distributions, applications of Binomial, Poisson and Normal distributions to biological problems.

3. Module III (12 hrs)

Introduction to Monte Carlo / kinetic Monte Carlo simulation (Gillespie Algorithm) / stochastic simulation, estimating value of π , random walker in one-dimension (1D), applications of Gillespie Algorithm : simulating chemical reactions, oscillatory chemical reactions : Lotka-Volterra (predator-prey) model, Brusselator model, Oregonator model.

Schedule

Date	Name of the Resource Person	Time	Signature
18 th July 2022	Kavita Chouk	12:00PM – 3:00 PM	
19 th July 2022	Shantanu Kadam	12:00PM – 3:00 PM	
20 th July 2022	Shantanu Kadam	12:00PM – 3:00 PM	
21 st July 2022	Shantanu Kadam	12:00PM – 3:00 PM	
22 nd July 2022	Shantanu Kadam	12:00PM – 3:00 PM	
23 rd July 2022	Shilpa Hatewar	12:00PM – 3:00 PM	

**Schedule of Add-on Interdisciplinary Course:
Computational Methods in Physics, Chemistry and Botany**

Registrations

Timestamp	Full Name	Phone number	Email	Gender	Department
2022/07/14 11:35:04 am GMT+5:30	Shantanu Kadam	832943673 7	shantanurk123@g mail.com	Male	Physics
2022/07/15 3:19:10 pm GMT+5:30	Shiwani jaiswar	843358210 0	shiwanijaiswar200 3@gmail.com	Female	Chemistr y
2022/07/15 3:25:33 pm GMT+5:30	Nirvighna korde	913650892 9	kordenirvighna@g mail.com	Male	Chemistr y
2022/07/15 3:30:07 pm GMT+5:30	Neetu Ravindra Yadav	859108223 4	geeta.yadav00007 @gmail.com	Female	Chemistr y
2022/07/15 3:49:27 pm GMT+5:30	Siddhi Rajan Vishwakarma	767809283 8	siddhivishwakarma 900@gmail.com	Female	Chemistr y
2022/07/15 3:52:42 pm GMT+5:30	Sadika Abdul kalam Shaikh	845094314 1	shaikhabdulkalam0 5@gmail.com	Female	Chemistr y
2022/07/15 3:53:11 pm GMT+5:30	MRUDULA MILIND KADAM	816974457 5	mrudula692@gmai l.com	Female	Chemistr y
2022/07/15 4:05:08 pm GMT+5:30	Gandharvi Devdatta Parab	730433840 2	parabgandharvi@g mail.com	Female	Chemistr y
2022/07/15 4:33:23 pm GMT+5:30	Sahil ramesh keshiya	861914284 5	sahilfitness.1020@ gmail.com	Male	Chemistr y
2022/07/15 5:04:56 pm GMT+5:30	Bhaud Sanika Santosh	914543436 3	sanubhaud@gmail .com	Female	Chemistr y
2022/07/15 5:20:54 pm GMT+5:30	Akash Rajesh Vishwakarma	865784300 8	akashvishwakarma 1110@gmail.com	Male	Chemistr y

2022/07/15 6:04:07 pm GMT+5:30	Payal Subhash sarkate	730405715 1	payalsarkate70429 @gmail.com	Female	Chemistr y
2022/07/15 6:46:16 pm GMT+5:30	Snehankita Angad Sawant	932658678 8	snehankitasawant 2003@gmail.com	Female	Chemistr y
2022/07/15 6:52:27 pm GMT+5:30	Sanskriti suresh khadse	88798 35072	Sanskrutikhadse00 98@gmail.com	Female	Chemistr y
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2022/07/16 1:20:14 am GMT+5:30	Gayatri manik andhale	932672475 1	gayatrimanik1925 @gmail.com	Female	Chemistr y
2022/07/16 7:08:19 am GMT+5:30	Saurabh tanaji yevale	932620667 4	dadayevale512@g mail.com	Male	Chemistr y
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2022/07/16 9:23:44 am GMT+5:30	Siddhant prakash bachhav	932411745 7	siddhantbachhav2 003@gmail.com	Male	Chemistr y
2022/07/16 9:40:54 am GMT+5:30	Mrunmayi Dhage	876790257 5	mrunmayidhage54 8@gmail.com	Female	Chemistr y
2022/07/16	Samiksha Vishwas	9.19E+11	samikshavishwas0	Female	Botony

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2022/07/16 10:27:34 am GMT+5:30	WANKHEDE SAYALI DILIP	703952705 6	sayaliwankhede54 782@gmail.com	Female	Botony
2022/07/16 10:33:07 am GMT+5:30	Shah Sufiya Jamaluddin	91365 28747	sufiyashah000@g mail.com	Female	Botony
2022/07/16 10:35:48 am GMT+5:30	Namrata sagar Torne	970201509 2	namratatorne2@g mail.com	Female	Botony
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2022/07/16 11:36:59 am GMT+5:30	Priti Pradip Shinde	892871281 1	prishinde393@g mail.com	Female	Physics
2022/07/16 11:39:15 am GMT+5:30	Srushti Kharat	892859704 2	Srushtikharat489@ gmail.com	Female	Physics
2022/07/16 11:39:18 am GMT+5:30	Abhishek Arun Kadam	915243748 3	kadamabhishek81 9@gmail.com	Male	Physics
2022/07/16 11:39:57 am GMT+5:30	HARSHAD GOLE	907623200 4	orharshad@gmail. com	Male	Physics
2022/07/16 11:40:19 am GMT+5:30	Aditi Ashok Vaity	975701111 1	aditivaity40@gmai l.com	Female	Botony
2022/07/16 11:43:12 am GMT+5:30	Suraj Rajendra Paswan	809735744 9	surajpaswan9900 @gmail.com	Male	Physics
2022/07/16 11:44:11 am	Ankita Chaurasiya	992071964 6	ankitachaurasiya12 90@gmail.com	Female	Physics

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2022/07/16 1:30:29 pm GMT+5:30	Vinay Pawalkar	829145740 2	kingpawalkar@gm ail.com	Male	Botony
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Photos

