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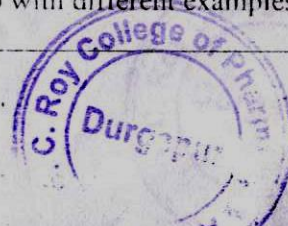
**Course name: Basic programming with Python and its application in database management, artificial intelligence and machine learning (AI/ML).**

**Level of the course:** Certificate

**Course objective:** To teach the students of Pharmacy Python programming language as well as to train them in database management, artificial intelligence/machine learning using Python to improve their career opportunities.

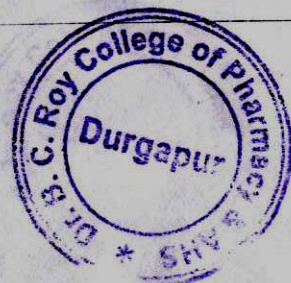
**Proposed course structure:**

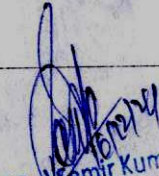
Class	Content/Topic	Required Time (in hour)/Credit hour	Year
<b>Unit 1</b>	<b>Introduction to Python</b>		2 <sup>nd</sup>
1	History, use and basics of Python	1	2 <sup>nd</sup>
2	Data types: Understanding different data-types, size and use	1	2 <sup>nd</sup>
3	Operators: Explanation about relational, conditional, logical, modulo-division, Boolean operators with different examples and programming implementations	1	2 <sup>nd</sup>
<b>Unit 2</b>	<b>Conditional statement</b>		2 <sup>nd</sup>
1	Conditional statement -1: Explaining the syntax of if, if-else and elif	1	
2	Conditional statement -2: Programming examples and implementation of all the conditional statements.	1	2 <sup>nd</sup>
<b>Unit 3</b>	<b>Loop</b>		
1	Loop-1: Introduction to <i>while</i> loop with different examples and programming implementation.	1	2 <sup>nd</sup>
2	Loop-2: Introduction to <i>for</i> loop with different examples and programming implementation.	1	2 <sup>nd</sup>
3	Loop-3: Use of range functions in <i>for</i> and <i>while</i> loop with different examples and programming implementation.	1	2 <sup>nd</sup>
<b>Unit 4</b>	<b>Lists, Tuple and Dictionary</b>		
1	Lists-1: Lists constructs, syntax and use	1	2 <sup>nd</sup>
2	Lists-2: Use of lists in <i>for</i> and <i>while</i> loop with different examples and programming implementation	1	2 <sup>nd</sup>



Prof. (Dr.) Samir Kumar Samanta  
M. Pharm., Ph.D (J.U.)  
Principal  
Dr. B. C. Roy College of Pharmacy, 4 Ahs  
Durgapur, West Bengal-713206

3	Tuple: Tuple constructs, syntax and use with programming examples	1	2 <sup>nd</sup>
4	Dictionary: Dictionary constructs, syntax and use with programming examples	1	2 <sup>nd</sup>
<b>Unit 5</b>			
<b>Functions and Class</b>			
1	Functions-1: Introductions to functions, use and classifications of functions	2	2 <sup>nd</sup>
2	Functions-2: Programming examples and implementations of built-in functions and user-defined functions	2	2 <sup>nd</sup>
3	Class concepts: Introduction to object-oriented programming (OOP) with Class with programming implementations	2	2 <sup>nd</sup>
	Exam-1	2	2 <sup>nd</sup>
<b>Unit 6</b>			
<b>Important python packages</b>			
1	NumPy: Introduction to numPy, numPy array, uses of NumPy in mathematical calculations.	1	2 <sup>nd</sup>
2	SciPy: Introduction to SciPy and uses of SciPy in mathematical calculations.	1	2 <sup>nd</sup>
3	Database management with Pandas: Introduction to Pandas and its uses in database handling. Introduction to different data formats (e.g., .csv, .xlsx).	1	2 <sup>nd</sup>
4	Database management with Pandas: How to import/export the different data types with Pandas and how to edit the data and obtain statistical results	1	2 <sup>nd</sup>
<b>Unit 7</b>			
<b>Artificial Intelligence and Machine Learning</b>			
1	AI/ML: Introduction to AI and ML +concepts about supervised and unsupervised learning.	1	2 <sup>nd</sup>
2	ANN: Basic concept of artificial neural network, introduction to Perceptron.	1	2 <sup>nd</sup>
3	Perceptron: How to write a basic program for Perceptron with Python	2	2 <sup>nd</sup>
4	MLP and DNN: Concepts of Multilayer Perception and Deep Neural Network	2	2 <sup>nd</sup>
<b>Unit 8</b>			
<b>Applications of AI/ML in Pharmacy</b>			
1	Databases in Pharmacy and Bioinformatics: Collection and curation of chemical/pharmaceutical datasets for a specific biological target from ChEMBL and Binding Database (using Pandas and NumPy) and other databases.	2	2 <sup>nd</sup>



  
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2	Cheminformatics: Basic concepts of cheminformatics and how to calculate molecular descriptors and fingerprints using various non-commercial packages.	2	2 <sup>nd</sup>
3	Rdkit and molecular descriptors: Introduction to Python based Rdkit program to import data, convert data formats and calculations of molecular descriptors and fingerprints.	2	2 <sup>nd</sup>
4	How to use Scikit-learn for developing ANN models for the pharmaceutical datasets.	2	2 <sup>nd</sup>
5	How to use Tensorflow for developing ANN models for the pharmaceutical datasets.	2	2 <sup>nd</sup>
6	Transformer-CNN: Development of Transformer-CNN models using SMILES notations of chemical compounds.	2	2 <sup>nd</sup>
	Exam-2		40
	<b>Total</b>		

**Requirement:**

Human resource: Will be conducted by selected faculties of Dr. B. C. Roy College of Pharmacy and A. H. S. (BCRCP)

Course coordinators: (a) Mr. Soumen Banerjee, Assistant Professor, BCRCP

(b) Dr. Amit Kumar Halder, Associate Professor, BCRCP

Proposed by: I.T. Cell, BCRCP

- (a) Prof. Subhbrata Ray
- (b) Dr. Souvik Basak
- (c) Dr. Amit Kumar Halder
- (d) Dr. Falguni Patra
- (e) Mr. Soumen Banerjee

*Ray*  
07/07/23

*Soumen Banerjee*  
Amit Kumar Halder 7/7/23

*Falguni Patra*  
07/07/23



*Samir Kumar Samanta*  
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