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
Unit 1	**Introduction to Python**		**2nd**
1	History, use and basics of Python	1	2nd
2	Data types: Understanding different data-types, size and use	1	2nd
3	Operators: Explanation about relational, conditional, logical, modulo-division, Boolean operators with different examples and programming implementations	1	2nd
Unit 2	**Conditional statement**		**2nd**
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	2nd
Unit 3	**Loop**		
1	Loop-1: Introduction to *while* loop with different examples and programming implementation.	1	2nd
2	Loop-2: Introduction to *for* loop with different examples and programming implementation.	1	2nd
3	Loop-3: Use of range functions in *for* and *while* loop with different examples and programming implementation.	1	2nd
Unit 4	**Lists, Tuple and Dictionary**		
1	Lists-1: Lists constructs, syntax and use	1	2nd
2	Lists-2: Use of lists in *for* and *while* loop with different examples and programming implementation	1	2nd

3	Tuple: Tuple constructs, syntax and use with programming examples	1	2nd
4	Dictionary: Dictionary constructs, syntax and use with programming examples	1	2nd
Unit 5	**Functions and Class**		
1	Functions-1: Introductions to functions, use and classifications of functions	2	2nd
2	Functions-2: Programming examples and implementations of built-in functions and user-defined functions	2	2nd
3	Class concepts: Introduction to object-oriented programming (OOP) with Class with programming implementations	2	2nd
	Exam-1	2	2nd
Unit 6	**Important python packages**		
1	NumPy: Introduction to numPy, numPy array, uses of NumPy in mathematical calculations.	1	2nd
2	SciPy: Introduction to SciPy and uses of SciPy in mathematical calculations.	1	2nd
3	Database management with Pandas: Introduction to Pandas and its uses in database handling. Introduction to different data formats (e.g., .csv, .xlsx).	1	2nd
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	2nd
Unit 7	**Artificial Intelligence and Machine Learning**		
1	AI/ML: Introduction to AI and ML +concepts about supervised and unsupervised learning.	1	2nd
2	ANN: Basic concept of artificial neural network, introduction to Perceptron.	1	2nd
3	Perceptron: How to write a basic program for Perceptron with Python	2	2nd
4	MLP and DNN: Concepts of Multilayer Perception and Deep Neural Network	2	2nd
Unit 8	**Applications of AI/ML in Pharmacy**		
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	2nd

2	Cheminformatics: Basic concepts of cheminformatics and how to calculate molecular descriptors and fingerprints using various non-commercial packages.	2	2nd
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	2nd
4	How to use Scikit-learn for developing ANN models for the pharmaceutical datasets.	2	2nd
5	How to use Tensorflow for developing ANN models for the pharmaceutical datasets.	2	2nd
6	Transformer-CNN: Development of Transformer-CNN models using SMILES notations of chemical compounds.	2	2nd
	Exam-2	2	2nd
	Total	**40**	

Requirement:

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

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

Proposed by: I.T. Cell, BCRCP

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