SYLLABUS
Post-Graduate Diploma in Advance Scientific Computing (PGDASC)
One Year Course (Two Semesters)

OBJECTIVE OF THE COURSE

With the advent of Computing Tools and the applicability in various domains of sciences, engineering, humanities, languages and arts, this course will impart training to students in the usage and further development of field specific tools for doing data science analyses, usage of Artificial Intelligence, Machine Learning and Deep Learning tools.

SEMESTER I

Paper 1: Introduction to Python Programming　　　　　**100 Marks (4 Credits)**

- Introduction to programming and Python
- Python IDEs, Google Collab, Linux OS
- Variables, data types, and operators
- Control structures (if/else, loops)
- Functions and modules
- Input/output (I/O) operations
- Basic file handling

Paper 2: Advanced Python Programming　　　　　**100 Marks (4 Credits)**

- Advanced data types (lists, tuples, dictionaries, sets)
- Object-oriented programming (OOP) concepts
- Classes and objects
- Inheritance and polymorphism
- Exceptions and error handling
- Regular expressions
- Debugging techniques

Paper 3: Practical and Problem Solving　　　　　**100 Marks (4 Credits)**

SEMESTER II

Paper 4: Web Development with Python　　　　　**100 Marks (4 Credits)**

- HTML and CSS fundamentals
- Client-side scripting with JavaScript
- Server-side programming with Python
- Web frameworks (Django, Flask)
- Web APIs and RESTful services
- Database integration (SQL, ORM)

Paper 5: Data Science and Machine Learning with Python   100 Marks (4 Credits)

- Data analysis with Pandas
- Data visualization with Matplotlib and Seaborn
- NumPy for scientific computing
- Machine learning fundamentals
- Supervised learning (regression, classification)
- Unsupervised learning (clustering, dimensionality reduction)
- Deep learning with Tensorflow, Keras or PyTorch

Paper 6:   300 Marks (12 Credits)
    Project Work (2nd Semester): on AI, ML/DL and Data Science based on:
(Project Report to be submitted for final evaluation)
Visual Python, Parallel Python, Machine Learning(ML), Deep Learning(DL) tools and libraries, Connection to Artificial Intelligence(AI) and problem solving techniques, model building and testing, interpreting outcomes and results, applications of Data Science

Text and Reference Books:
1. Allen B. Downey, Think Python, Shroff Publishers, O'Reilly.
2. **Python Crash Course** by Eric Matthes
3. **Automate the Boring Stuff with Python** by Al Sweigart
4. **Fluent Python: Clear, Concise, and Effective Programming** by Luciano Ramalho
5. **Flask Web Development: Developing Web Applications with Python** by Miguel **Grinberg**
6. **HTML and CSS: Design and Build Websites** by Jon Duckett
7. **Python for Data Analysis** by Wes McKinney
8. **Introduction to Machine Learning with Python: A Guide for Data Scientists** by Andreas C. Müller & Sarah Guido
9. **Deep Learning** by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

Additional Reference Books:

10. Laura Cassell & Alan Gauld, Python Projects, Wrox A Wiley Brand.
11. Charles Dierbach, *Introduction to Computer Science using Python : A Computational Problem Solving Focus*, John-Wiley and Sons, 2012
12. Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, *How to Think Like a Computer Scientist: Learning with Python* , 2012, Published As Online Open Book
13. Paul Greis, Jennifer Campbell, Jason Montojo, Practical Programming – An Introduction to Computer Science using Python, Shroff Publishers.