NATIONAL EDUCATION POLICY-2020

Common Minimum Syllabus for all Uttarakhand

State Universities and Colleges

Syllabus Proposed
2023-24

Sri Dev Suman Uttarakhand University
Badshahithol, Tehri (Garhwal)

पाठ्यक्रम निर्माण समिति, उत्तराखण्ड
Curriculum Design Committee, Uttarakhand

क्र0 सं0	नाम एवं पद	
1	**प्रो0 एन0 के0 जोशी** कुलपति, श्रीदेव सुमन उत्तराखण्ड विश्वविद्यालय, टिहरी	**अध्यक्ष**
2	कुलपति, कुमाऊँ विश्वविद्यालय, नैनीताल	**सदस्य**
3	**प्रो0 जगत सिंह बिष्ट** कुलपति, सोबन सिंह जीना विश्वविद्यालय, अल्मोड़ा	**सदस्य**
4	**प्रो0 सुरेखा डंगवाल** कुलपति, दून विश्वविद्यालय, देहरादून	**सदस्य**
5	**प्रो0 ओ0 पी0 एस0 नेगी** कुलपति, उत्तराखण्ड मुक्त विश्वविद्यालय, हल्द्वानी	**सदस्य**
6	**प्रो. एम0 एस0 एम0 रावत** सलाहकार–रूसा, रूसा निदेशालय, देहरादून	**सदस्य**
7	**प्रो0 के0 डी0 पुरोहित** सलाहकार–रूसा, रूसा निदेशालय, देहरादून	**सदस्य**

NATIONAL EDUCATION POLICY-2020

Skill Enhancement Course

in

Scientific Writing and Computing

Sridev Suman Uttarakhand University

Badshahi Thaul (Tehri Garhwal) Uttarakhand -249199

(State University of Uttarakhand)

2023

Skill Enhancement Course

in

“Scientific Writing and Computing”

Course designed by:

S.No.	Name	Designation	Affiliation
1.	Prof. Anita Tomar	Professor and Head	Department of Mathematics Pt. L. M. S. Campus, Sridev Suman Uttarakhand University Campus, Rishikesh
2.	Dr. Gaurav Varshney	Associate Professor	Department of Mathematics Pt. L. M. S. Campus, Sridev Suman Uttarakhand University Campus, Rishikesh
3.	Dr. Deepak Singh	Assistant Professor	Department of Mathematics B.L.J. Govt. (P.G.) College Purola, Uttarkashi

Course Description

S.No.	Course Code	Course	Semester	Credit
1.	SWC01	Methods of Scientific Writing: LaTeX	First	3
2.	SWC02	Visualizing Data with MATLAB: Techniques and Strategies	Second	3
3.	SWC03	Computer Science: Programming in Python- I	Third	3
4.	SWC04	Computer Science: Programming in Python- II	Fourth	3

Mathematics and computer science are closely related fields. Problems in computer science are often formalized and solved with mathematical methods. Many significant problems currently faced by computer scientists may be solved by researchers skilled in algebra, analysis, combinatorics, logic and /or probability theory. The purpose of this program is to allow students to study a combination of mathematical and potential areas of application in computer science.

Syllabus

SWC01	
Course Title: Methods of Scientific Writing: LaTeX	**Credits:** 3

Objective: The objective of this course is to provide students with the knowledge and skills required to write scientific documents using LaTeX. Students will learn the basics of LaTeX programming and document formatting, including tables, figures, and equations. The course will also cover advanced topics such as bibliography management, creating presentations, and using templates.

Course Outcome: Upon completion of the course, students will be able to:

- Understand the basic concepts of LaTeX typesetting system and document formatting.
- Use LaTeX to prepare scientific papers, reports, and presentations.
- Apply formatting and typography techniques to enhance the visual appeal of documents.
- Use LaTeX to typeset mathematical equations, figures, and tables.

Unit	Contents	No. of Lectures
1	**Introduction to LaTeX** • Introduction to LaTeX and its advantages • Basic LaTeX commands • Document structure and formatting	**10**
2	**Tables, Figures, and Equations** • Creating tables using LaTeX • Inserting figures in LaTeX • Creating equations and formulas using LaTeX • Mathematical typesetting in LaTeX	**11**
3	**Bibliography Management** • Creating bibliographies and references using LaTeX • Managing citations using BibTeX • Formatting bibliographies and references	**10**
4	**Advanced LaTeX Topics** • Creating presentations using LaTeX • Using templates to create documents efficiently • Customizing document formatting and styles • Debugging LaTeX errors	**14**
5	**Project Work:** It is mandatory for the students to undertake a project assigned by the course instructor	

Reference Books:

1. "Latex For Beginners" by *Murugan Swaminathan* (2022).
2. "LATEX - A Beginner Guide to Professional Documentation" by *S. Swapna Kumar* (2019).
3. "A Beginners Guide to Latex" by *Chetan Shirore* (2015).
4. "LaTeX for Complete Novices" by *Nicola L. C. Talbot* (2012).

SWC02

Course Title: Visualizing Data with MATLAB: Techniques and Strategies | **Credits:** 3

Objective: The objective of this course is to provide students with an understanding of the techniques and strategies for visualizing data using MATLAB. The course will introduce students to the basic concepts of data visualization and the tools and techniques available in MATLAB. Students will learn how to create effective visualizations and how to use MATLAB to analyze and interpret data.

Course Outcome: Upon completion of the course, students will be able to:

- Understand the basic concepts of data visualization.
- Develop effective visualization strategies and techniques.
- Use MATLAB to create and analyze data visualizations.
- Interpret and communicate complex data using effective visualizations.

Unit	Contents	No. of Lectures
1	**Unit 1: Introduction to Data Visualization** • Overview of data visualization and its importance • Basic concepts of data visualization • Types of data and visualization techniques • Data visualization tools and software	**10**
2	**Unit 2: Introduction to MATLAB** • Introduction to MATLAB environment and tools • MATLAB programming basics • Data structures in MATLAB • Plotting functions and tools in MATLAB	**11**
3	**Unit 3: Advanced Data Visualization Techniques** • 2D and 3D plotting techniques in MATLAB • Visualization of large datasets • Customizing plots and graphics • Animation and interactive visualization	**12**
4	**Unit 4: Applications of Data Visualization** • Visualization of scientific data • Visualization of financial data • Data visualization for machine learning and artificial intelligence • Case studies in data visualization	**12**
5	**Project Work:** It is mandatory for the students to undertake a project assigned by the course instructor	

Reference Books:

1. MATLAB: A Practical Introduction to Programming and Problem Solving (5th edition) by Stormy Attaway.
2. Learning MATLAB by Tobin A. Driscoll and Richard J. Braun.
3. MATLAB for Engineers (5th edition) by Holly Moore.
4. MATLAB Programming for Engineers (6th edition) by Stephen J. Chapman.

SWC03

Course Title: Programming in Python- I | **Credits: 3**

Objective: The objective of this course is to provide students with a strong foundation in computer programming using Python. Students will learn how to write programs to solve mathematical problems, and how to use Python to visualize mathematical concepts. The course will also introduce students to data structures and algorithms commonly used in computer science.

Course Outcome: Upon completion of the course, students will be able to:

- Understand the basic principles of programming in Python.
- Write Python programs to solve mathematical problems.
- Understand and implement common data structures and algorithms.
- Use Python to visualize mathematical concepts.
- Use Python to solve real-world problems.

Unit	Contents	No. of Lectures
1	**Unit 1: Introduction to Python Programming** • Overview of computer programming concepts • Introduction to the Python programming language • Data types, variables, operators, and expressions • Input/output operations in Python • Introduction to Jupyter Notebook	15
2	**Unit 2: Flow Control and Functions in Python** • Conditional statements and loops in Python • Functions and procedures in Python • Recursion • Exception handling in Python	15
3	**Unit 3: Data Structures and Algorithms** • Introduction to data structures • Lists, arrays, and tuples • Stacks, queues, and trees • Sorting and searching algorithms	15
4.	**Project Work:** It is mandatory for the students to undertake a project assigned by the course instructor	

Reference Books:

1. "Python Crash Course: A Hands-On, Project-Based Introduction to Programming" by Eric Matthes.
2. "Automate the Boring Stuff with Python: Practical Programming for Total Beginners" by Al Sweigart.
3. "Python Programming: An Introduction to Computer Science" by John Zelle.
4. "Introduction to Computing and Programming in Python" by Mark J. Guzdial and Barbara Ericson.

SWC04

Course Title: Programming in Python- II | **Credits: 3**

Objective: The objective of this course is to provide students with a strong foundation in computer programming using Python. Students will learn how to write programs to solve mathematical problems, and how to use Python to visualize mathematical concepts. The course will also introduce students to data structures and algorithms commonly used in computer science.

Course Outcome: Upon completion of the course, students will be able to:

- Understand the basic principles of programming in Python.
- Write Python programs to solve mathematical problems.
- Understand and implement common data structures and algorithms.
- Use Python to visualize mathematical concepts.
- Use Python to solve real-world problems.

Unit	Contents	No. of Lectures
1	**Unit 1: Advanced Python Programming** • Object-oriented programming • Exception handling • File I/O	**8**
2	**Unit 2: Numerical Computing with Python** • Linear algebra and matrix computations • Introduction to NumPy and SciPy • Numerical optimization • Applications to mathematical modeling	**10**
3	**Unit 3: Probability and Statistics with Python** • Introduction to probability distributions • Statistical inference and hypothesis testing • Regression analysis • Applications to data analysis	**5.**
4	**Unit 4: Visualization with Python** • Introduction to matplotlib • Scatterplots, line plots, and histograms • 3D plotting and animation • Applications to mathematical visualization	**6.**
5	**Project Work:** It is mandatory for the students to undertake a project assigned by the course instructor	

Reference Books:

5. "Python Crash Course: A Hands-On, Project-Based Introduction to Programming" by Eric Matthes.
6. "Automate the Boring Stuff with Python: Practical Programming for Total Beginners" by Al Sweigart.
7. "Python Programming: An Introduction to Computer Science" by John Zelle.
8. "Introduction to Computing and Programming in Python" by Mark J. Guzdial and Barbara Ericson.