

2nd SEMESTER
SKILL ENHANCEMENT COURSE (SEC)

PHY222S: COMPUTATIONAL PHYSICS

(CREDITS: THEORY: 02, PRACTICAL: 02)

THEORY (2 CREDITS)

UNIT-I

Scientific Programming: Some fundamental Linux Commands (Internal and External commands). Development of FORTRAN, Basic elements of FORTRAN: Character Set. Constants and their types, Variables and their types, Keywords, Variable Declaration and, concept of instruction and program. Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Fortran Statements: I/O Statements (unformatted/formatted), Executable and Non—Executable Statements, Layout of Fortran Program, Format of writing Program and concept of coding, Initialization and Replacement Logic. Examples from physics problems.

UNIT-II

Control Statements: Types of Logic (Sequential. Selection. Repetition), Branching Statements (Logical IF, Arithmetic IF, Block IF, Nested Block IF. SELECT CASE and ELSE IF Ladder statements), Looping Statements (DO—CONTINUE, DO- ENDDO, DO- WHILE, Implied. an: Nested DO Loops), Jumping Statements (Unconditional GOTO. Computed GOTO, Assigned GOTO) Subscripted Variables (Arrays: Types of Arrays,. DIMENSION Statement. Reading and Writing Arrays), Functions and Subroutines (Arithmetic Statement Function. Function Subprogram and Subroutine), RETURN, CALL. COMMON and EQUIVALENCE Statements), Structure, Disk I/O Statements, open

PRACTICAL (2 CREDITS):

Fortran Programmes

- 01) Exercise on syntax usage of FORTRAN
- 02) To printout natural even/odd numbers between given limits.
- 03) To find maximum/minimum and range of a given set of numbers.
- 04) To find area of Triangle, Rectangle etc.
- 05) Calculating Eulers number using $\exp(x)$ series evaluated at $x=1$.
- 06) To compile a frequency distribution and evaluate mean standard deviation etc.
- 07) To evaluate sum of finite series and area under a curve.
- 08) To find the sum of two matrices.
- 09) To find the product of two matrices.
- 10) To find the roots of a quadratic equation.
- 11) Motion of a projectile using simulation and plot the output for visualization.
- 12) To find a set of prime numbers and Fibonacci series.

REFERENCE BOOKS:

- 1) *Introduction to Numerical Analysis: S. S. Sastry*
- 2) *Computer Programming in Fortran 77 : V. Rajaraman*