



## **HECToR course syllabus: “Fortran 95”**

### *The Basics*

History Of Fortran; Books; Compilers and Compiling; Source Form; The main program; The Character Set; Variables and Variable Attributes; Constants; Basic mathematical and character operations; Intrinsic subprograms; Basic I/O

### *Selection And Repetition*

Logical variables and operations; If statement and construct; Stop; Case construct; Do loops; Cycle and Exit; ForAll

### *Arrays*

What an array is; Declaring arrays; Indexing; Array sections; Array storage; Array operations; Masks; The Where construct; Implied Do loops; Array constructors; Vector subscripts; Array I/O; Dynamic storage via Allocatable arrays

### *Program Structure 1*

Subprogram types; Internal (Contained) Subprograms; Actual And dummy arguments; Argument association; TKR matching; Intent; Host association; Scope; Local Variables; Initialization; The Save attribute; Character and Array arguments; Inquiry Functions; Allocatable arrays and scope; optional arguments; Keyword arguments; Return; Pure and Elemental subprograms

### *Program Structure 2*

Modules; Modules, Scope and Use association; Multiple file compilation; Control of use association by Private and Public; Namespace Pollution; Only; Rename lists; External subprograms; Interfaces and Interface blocks; Functions as arguments; Overloading; TKR matching revisited; User defined operations and assignment

### *Input and Output*

Formats; Edit Descriptors; Units; Open; Unformatted Files; Records; Direct access files; Non-advancing I/O; Close; Rewind, Backspace and Endfile; Inquire; Internal I/O and conversion of characters to/from numeric data types

### *More On Data Types*

Parameterized Data types and Kind; Derived Types; Pointers; Pointers and dynamic storage; Derived data types and Pointers; Dynamic sized derived type components

### *Fortran 2003*

What Fortran 2003 is; Books and background reading; TR15881 – Allocatable components of derived types and arguments; TR15580 - IEEE exception handling; Interoperability with C; Object oriented features; Data manipulation improvements; Access to the environment; I/O; Internationalization

### *Odds And Ends*

Include; Namelist I/O; Fixed Format source; Implicit typing; Alternate forms for Variable Declaration; Various other obsolete forms

### *Background Reading*

It is not essential to do any reading in advance of the course but the following references may be useful.

1. Michael Metcalf, John Reid and Malcolm Cohen "Modern Fortran Explained", Oxford University Press
2. Stephen J. Chapman, "Fortran 95/2003 For Scientists And Engineers", McGraw-Hill
3. Jeanne C. Adams, Walter S. Brainerd, Richard A. Hendrickson, Richard E. Maine, Jeanne T. Martin and Brian T. Smith "The Fortran 2003 Handbook", Springer
4. Ian Chivers and Jane Sleightholme "Introducing Fortran 95", Springer
5. The international standards committee, ISO/IEC JTC1/SC22/WG5, <http://www.nag.co.uk/sc22wg5/>. This is not the place to start, but may be of interest to see how the language has evolved.