GEO022 – Numerical methods in Fortran
Ladislav Hanyk, KG

Annotation:
A course of numerical methods with the emphasis on their implementation in Fortran. From libraries of numerical routines through standard methods of algebra and analysis to solution of ordinary and partial differential equations. Less theory, more practice. Examples of geophysical applications.

Syllabus:

Literature:
V. Zahradník, Programování: Fortran 90 (scriptum), Vydavatelství ČVUT, 1996. WWW.
PRF017 – Fortran programming
Ladislav Hanyk, KG

Annotation:

Syllabus:
4. Norm of FORTRAN 77: Type declaration, array declaration, definition of named constants, data initialization, memory sharing, retaining local variables. Assignments, goto statements, conditional statements, cycle statements, empty statement, stopping and pausing, return from a unit. Subroutines, functions, data subprograms. Actual and formal parameters.

Literature:
J. Hřebíček a kol., FORTRAN 77 a vědeckotechnické výpočty, Academia, 1989.
V. Zahradník, Programování: Fortran 90 (scriptum), Vydavatelství ČVUT, 1996.
User manuals (MS Fortran PowerStation, HP-UX Fortran).
WWW.
PRF018 – Computers in geophysical practice
Ladislav Hanyk, KG

Annotation:
Course of using computing facilities for students of geophysics. Understanding hardware, operating systems of Microsoft, Unix systems and computer networks. Introduction to the Fortran language and libraries of numerical routines. Software for visualization and typesetting.

Syllabus:
1. Understanding hardware: personal computers, Unix workstations, peripherals (printers, scanners, streamers, CD recorders, ZIP drives, modems).
2. Understanding operating systems: Unix (HP-UX, Linux) and MS Windows: basic concepts, commands, utilities (archiving and compressing, code page conversion).
3. Local area networks: shared disks and printers, access to shared resources, system and user communication (telnet, ssh, ftp, scp, NFS, system X-Window).
4. Computational software: compilers of Fortran 77, 90 and 95 for HP-UX, Linux and MS Windows, libraries of numerical methods (Numerical Recipes, IMSL, NAG, LAPACK, Internet sources). Optimizing compilers, compiler configuration.
5. Graphic and visualization software: data visualization in 1, 2 and 3 dimensions (Gnuplot, Grapher, Surfer, IDL, GMT, Amira).
6. Preparation of typographically valuable texts: TeX and LaTeX. Structuring source files. Selected keywords. Writing mathematical expressions. Import of graphics. Conversion to PDF and HTML.

Literature:
J. Hřebíček a kol., FORTRAN 77 a vědeckotechnické výpočty, Academia, 1989.
V. Zahradník, Programování: Fortran 90 (scriptum), Vydavatelství ČVUT, 1996.
User manuals (MS Fortran PowerStation, HP-UX Fortran, IDL).
WWW.
PRF039 – Fortran 90 and parallel programming
Ladislav Hanyk, KG

Annotation:
Course of programming in Fortran 90/95. Fortran features supporting data parallelism. Parallel algorithms. Compilers and numerical libraries for Microsoft Windows and Unix.

Syllabus:
1. Recapitulation of Fortran 77.
2. Basics of Fortran 90: Formatting source codes, syntactical elements, specification, statements, constructs; compatibility of Fortran norms, obsolescent features.
4. More on Fortran 90: modules, program unit interfaces, data sharing; internal subprograms; direct and indirect recursion; optional arguments; pointers and targets; new standard functions.
5. Fortran 95: more parallelization (forall construct, pure and elemental subprograms). Perspectives of Fortran standards.
6. Compilers of Fortran 90-95: MS PowerStation, Digital/Compaq, Fortran 90 for HP-UX, Absoft and Portland for Linux; compilers of supercomputers; optimalization levels, optimizing preprocessors, numerical libraries bundled with compilers.
7. Parallel programming: using standard Fortran 90, parallel versions of standard constructs; parallel versions of basic algorithms (linear recurrence, cyclic reduction, linear algebraic equations with tridiagonal matrices, FFT).

Literature:
V. Zahradník, Programování: Fortran 90 (scriptum), Vydavatelství ČVUT, 1996.
WWW.