

IT Skills Specification

IT Skills taught in the School of Physics, (in order initially taught or experienced),

1. Use of WWW resources for learning and information retrieval. *Level 1*
2. Use of e-mail and on-line discussion groups. *Level 1*
3. Word processing and document presentation. *Starts in Level 1*
4. Use of Unix system and basic programming skills in Java. *Level 2*
5. Numerical programming and and basic computer simulation techniques. *Level 3*
6. Computer algebra and symbolic manipulation using MAPLE. *To be re-introduced to Level 3.*

All student have the option to enhance their IT skill with the additional items which are primarily designed for the COMPUTATIONAL PHYSICS degree programme. These being:

1. Graphic Computer Simulation using using Java. *Level 2*
2. Advanced numerical techniques. *Level 3*
3. Computational Physics applications, scalability and efficiency of computational problems. *Level 4*
4. Parallel programming techniques using message passing. *Level 5*

In addition there is the a range of computational projects at fourth and fifth year level.

Details

Level 1

First Year: Physics 1Ah.

This course is supported by extensive on-line WWW resources integrated via the WEBCT interface. This material contains core course material, backup revision and interest material, on-line interactive multiple choice tests and a student bulletin board. In additional all students have e-mail accounts, full Web access and access to Microsoft office, graphics packages, and digital photography packages via the extensive University microlabs.

This resources teaches new students to make active use of the WEB for learning, self testing and resource searching. Also constructive use of bulletin boards and e-mail.

Assessment: Not explicitly assessed, but used at used at teaching resource and support material for the course.

Development: Maintenance and annual review.

First Year: Physics 1Bh

On-line course material similar to Physics 1Ah is being developed with the same WEBCT framework. The on-line lecture material is less well developed than for Physics 1Ah, currently being scanned pages, but is being upgraded.

This course includes an essay which must be word processed. This encourages the use of Web for information searching and the use of standard Microsoft Office products for document presentation. Assistance on use of Windows and Office products is available to all students via the “help desks” in all the main University microlabs. More details helps is also available via the frequent courses offered by the University Computing Service.

Assessment: Not explicitly assessed, but used at used at teaching resource and support material for the course.

Development: Take the WEBCT site up to the same standard as the Physics 1Ah one.

Additional Information

Students in most University halls of residents also have Internet access via ResNet to their rooms for connection of personal computers. This facility is available in about 70% of University owned accommodation including all the main first year halls of residence, and is being expanded as the accommodation is being refurbished.

Level 2

Second Year: Physics 2

This course includes a 6 week self-paced programming course using JAVA under UNIX using the School’s Computational Physics Laboratory. This course teaches elementary programming and is supported by locally extended graphical interface and data presentation package allowing novice programmers access to the graphical power of JAVA.

Assessment: Self paced checkpoints

Development: Present the Scientific Programming course material in WebCT framework rather than on-line PDF documents used at present.

Integration of computing into the Physics 2 lecture material with tutorial questions that require computational skills.

Development of on-line course material for the bulk of Physics 2, at present only one unit, Probability and Statistics, has significant on-line material. This should all be integrated into the WebCT framework.

Word processing and document presentation is required for laboratory reports again supported via the public University Microlabs with help-desk support.

Second Year: Computer Simulation 2h (Optional)

Optional second year half course primarily for Computational Physics and Informatics students. This half course is taught jointly with EPCC and concentrates on OOP techniques and, data and model presentation using the AWT toolbox. It has a prerequisite of either the Physics 2 computing module *or* Computer Science 1Ah, and is thus open to all physics students as well as the all students from the School of Informatics.

Course is taught via weekly lectures and computing class staffed by academic staff and post-graduate demonstrators.

Assessment: Self paced checkpoints

Development: This is a new course running for its second year. Numbers have increased from

30 in its first year to 58 in its second. This course is running well and no major development work is intended in the short term.

Level 3

Third Year: Physics 3 (Computational Methods)

This course contains a 9 week self paced computing module building on the Second Year course, again taught in JAVA using the UNIX environment. This course teaching the basics of OOP and its application to physics computational problems mainly based on particle and molecular interactions.

Assessment: Self paced checkpoints

Development: Extend written and on-line course material to make course more self contained and less reliant on demonstrators. Present the course material in WebCT framework rather than current HTML documents used at present.

Third Year: Computational Physics 3 (Computer Simulation 3)

Optional replacement for 9 week third year course primarily for Computational Physics students that build on the second year COMPUTER SIMULATION 2H course. Advanced course on numerical simulation covering basic numerical integration, solution of PDEs, FFT algorithm etc. (add more here).

Taught via on-line material written in XML.

Assessment: Self paced checkpoints followed by short project.

General Third Year Development:

- 1. Integration of computing skills into main lecture material with computational tutorial work for all courses.*
- 2. Introduction of computer controlled experimentation into the laboratory programme. This must complement the JAVA computing skills the student already have. See also Laboratory report.*
- 3. Development of better integrated on-line teaching material, perhaps using the WEBCT interface.*
- 4. Re-introduction of Computer Algebra using MAPLE. This was removed from the computational element of the course to make more room for JAVA with the intension that it would be introduced to the PHYSICAL MATHEMATICS course. The latter was not implemented last year, and MUST be done so this year.*

Level 4

Fourth Year: Computational Physics 4 (Computer Simulation 4)

Optional fourth level course aims primarily at Computational Physics students but also available to students in other degrees. Course concentrates on numerical algorithms, numerical efficiency with examples taken from physics problems, in particular numerical solutions to Schrödinger, Laplace and Navier-Stokes equations.

Course is taught in JAVA on UNIX machines and builds on the COMPUTER METHODS 3 course, so making it accessible to a larger number of students than those taking the COMPUTER SIMULATION 3 option in their third year.

Course taught via series of lectures with associated computing coursework presented via on-line tutorials.

Assessment: Written examination and self-paced checkpoints.

Level 5

Fifth Year: Parallel Architectures and Algorithms

New optional fifth level course to be launched introduced for 2004/5 session aimed primarily at Computational Physics students but also available to students from other degree programmes with a suitable computational background. The course will cover parallel architectures and algorithms with physics examples and course work using FORTRAN-95 and OPEN-MP making use of parallel hardware within EPCC.

Format and assessment of course is not specified at this time.