

**SEVENTH COLLEGE
ON
MICROPROCESSOR-BASED REAL-TIME SYSTEMS IN
PHYSICS**

28 October - 22 November 2002

Trieste - Italy

Please note that the age limit for participants who are requesting financial support is 45 years at the time of the activity.

The Abdus Salam International Centre for Theoretical Physics (ICTP) will organise its Seventh College on Microprocessor-Based Real-Time Systems in Physics to be held at ICTP from 28 October - 22 November 2002. Professors Abhaya S. Induruwa (presently University of Kent, Canterbury, UK), Ulrich Raich (CERN, Geneva, Switzerland) and Catharinus Verkerk (formerly CERN, Geneva, Switzerland) will jointly direct the College.

I. PURPOSE, NATURE AND PROGRAMME

The College is addressed to physicists who wish to control their experimental equipment with a computer or microprocessor, using a suitable real-time operating system. Also engineers working with computer controlled systems, but who did not receive formal training in informatics may profit from the College.

The programme of the College consists of approximately 55 hours of lectures and 80 hours of laboratory sessions. The goal of the College is to teach how to make use of the facilities a real-time operating system (or a real-time kernel) offers when designing and implementing computer control of experiments. The course will show that the overall task can be broken down into several sub-tasks, which can then be implemented as concurrent processes or program threads, communicating with each other. The participants will be able to put the concepts, taught in the lectures, into practice during the laboratory sessions.

The programming languages used in the course will be C and Java. GNU/Linux, a freely available and widely used implementation of UNIX, for PC compatibles and several other platforms, will be used as the underlying operating system. Real-time Linux and embedded systems running a suitable real-time kernel will also receive the necessary attention.

The lecture programme, after a very brief recall of the C

programming language, will include an introduction to object-oriented programming in Java. Introductory lectures on real-time operating systems and on structured design methods are part of the programme. The development of embedded systems, using a suitable real-time kernel will also be taught. The writing of a Linux device driver for special equipment will be the subject of a number of lectures. Other lecture series will treat the development of a graphical user interface to control external equipment using Awt and Swing. Particular attention will also be given to practical aspects of networks. The microprocessor boards and the associated software development tools used in the laboratory will be described in some detail. It should be noted that the theory of feedback control will not be part of the programme.

During the laboratory sessions, which will start immediately on the first day of the College, the participants will work in teams of two. The first week will be used to familiarise oneself with Linux and the programming languages. Participants will be asked to write several small programs, mainly in Java and including multi-threaded programs. The next two weeks will be dedicated to working with an interface to some simple external equipment, to the study of a device driver, to the cross-development of software for embedded systems and to the development of a graphical user interface. The laboratory work is heavily software oriented and hardware aspects of interfacing will hardly be covered.

Participants will be given the possibility to partake in project work, during the last week of the College. Note that the laboratory will also be accessible during the evenings.

It will be assumed that participants have sufficient practical experience with the C programming language to allow them to write simple programs from the first day of the College, and to enable them to concentrate on becoming familiar with Java. The selected participants will receive a text book on Java well in advance. They are strongly urged to study the book and to exercise in writing programs before joining the College.

II. PARTICIPATION

The College is open to scientists from all Countries that are members of UN, UNESCO or IAEA. Persons having participated in one of the previously held "Real-time Colleges", either in Trieste or elsewhere are excluded from participation. The College will be entirely conducted in English, therefore participants must have an adequate working knowledge of that language.

As the College is for advanced experimentalists and designers, a good knowledge of digital electronics design and practical experience in programming are required. Priority will be given to applications from scientists who will be able to apply the acquired knowledge to their running

or planned experiments or instrumentation.

The organizers will attempt to adapt the course content to the background and needs of participants. The part of the application form, i.e. the "technical questionnaire" which concerns the applicant's experience in digital hardware and in computing, should therefore be filled out completely and with care. Applications which are not accompanied by a completed technical questionnaire will not be taken into consideration.

As a rule, travel expenses of the participants should be borne by their home institutions. However, limited funds are available for scientists from developing countries who will be selected by the organizers. Every effort should be made by candidates to secure support for their fares (or at least half-fare) from their home country.

IMPORTANT: It should be noted that requests for extra funds, above those specified by the applicant on his application form, cannot be taken into consideration at no times. It is the applicant's responsibility to ensure that the administration of his home institute accepts the financial terms specified on the application form.

Mainly for budgetary reasons, the total attendance will be strictly limited to 60 participants. All participants are required to attend for the entire duration of the College.

The closing date for requesting participation in the College is already over!