



IUFS

**INTERNATIONAL UNIVERSITY
OF FUNDAMENTAL STUDIES**

Faculty of Computer Science

B.Sc Degree in
Computer Programming Languages
Information Representation and Processing
Information Systems Management
(MBA – Introduction to Computers &
Information Systems)

IUFS
**International University
of Fundamental Studies**
P O Box 59
St.Petersburg-191040, Russia

2006

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This Program contains a number of courses in computer studies, which have a goal to prepare students for work with personal computer in different spheres. The program is designed to give students a good grasp of fundamental internal concepts and at the same time, to introduce to practical applications which enable them to work successfully with personal computer in the field. Main themes students deal with are personal computers software and associated questions of computer hardware and operating systems architecture.

The program includes 3 levels. Units of level 2 and 3 have their prerequisites. Prerequisites are units, which should have been passed in a previous year.

Level 1

It is planned to offer following units from October 2002:

- C101 Introduction to computers and computer programming (1 unit)
- C102 Fundamentals of computer hardware architecture (1 unit)
- C103 Principles of business computing (1 unit)
- C104 Data, information and information storage (1 unit)

Level 2

It is planned to offer the following units from January 2003:

- C201 Databases (1 unit)
- C202 Programming languages (1 unit)
- C203 Information representation and processing (1 unit)
- C204 Computer architecture.

Level 3

It is planned to offer the following units from September 2003:

- C301 Information management (1/2 unit)
- C302 Software systems development (1/2 unit)

Level 2

Level 1 prerequisites

C201	C101, C103, C104
C202	C101, C102, C104
C203	C101, C103, C104

C204

C102

Level 3

Level 2 prerequisites

C301
C302

C201, C202, C203
C202, C203, C204

C101 INTRODUCTION TO COMPUTERS AND COMPUTER PROGRAMMING (1 UNIT)

Course Aims

The first aim of this course is to teach the basics of computers and programming language. During the progress of the course, the student will be introduced to ideas of structured programming and various aspects of good programming practice will be discussed.

Running parallel to this the student will be introduced to the mechanism of the computer itself. The course will conclude with an introduction to external data storage, files and file handling.

Topics to be included

Brief history of the development of the digital computer.

Expressing a problem solution as an algorithm.

Examples of algorithm for numeric problem solution and for searching and sorting.

Numeric algorithms, storage and manipulation of integers and real numbers, rounding errors.

Elements of computer hardware.

Operating systems and computer operation, e.g. batch, time-sharing

Personal computers operating systems.

IBM compatible computers operating system (MS-DOS, Windows-95, Windows-98, Unix,)

Fundamental Concepts of MS DOS , Windows-95/NT operating system, Windows-95/98 command description according to functional groups.

Main DOS, Windows and BIOS functions. Interrupts controlling.

High and low level languages, basic idea of program compilation.

Principles of structured programming with practical work using a modern scientific/ numeric language (i.e. Turbo-PASCAL V.6.0/7.0,

C++, Borland C++, Borland Power

Builder, Visual C++, Delphi 4v)

Program debugging, and testing.

Integrated environment for program design.

C102 FUNDAMENTALS OF COMPUTER HARDWARE ARCHITECTURE (1 UNIT)

Course Aims

The aim of this course is to teach the basics of computer internal structure and operation of a computer, internal and external memory, (definitions of bytes, kilobytes etc. with reference to current.

computer capacities), memory addressing, CPU, registers. Machine code and Assembler language.

Topics to be included

Arithmetic and logical fundamentals.

Number bases, including binary, octal and hexadecimal systems.

Arithmetic in bases 2, 8, 16. Data coding.

Statements; truth sets and tables;

Laws of logic, Logic gates

Basic logical elements. Logic networks.

Basic computer components and units

Triggers. Registers. Counters

Arithmetic and logical units

Boolean and Arithmetic operations

Binary operations

Addition/subtraction operations

Multiplication and division operations

Fixed-point representation

Floating-point representation

Controlling and principles of control units design

Basic principles of program controlling.

Controlling algorithms

Machine code.

Basic of Assembler language.

C103 PRINCIPLES OF BUSINESS COMPUTING (1 UNIT)

Course Aims

During this course, students will gain an appreciation of the need for systematic method of programme design. The fundamental constructs of sequence, iteration and selection are presented, and individual steps on input and output represented to final programme design structure are considered. Students will be able to appreciate the breadth of computer applications found in today's organizations. An introduction to a widely used software systems will also be provided.

Topic to be included

The first part of the course deals with programming methodology and structured programming techniques. The business environment and some business applications are described in the second part of the course.

Fundamental concepts and operating principles of Spreadsheets and Database management systems are discussed on the base of Excel package.

C104 DATA, INFORMATION AND INFORMATION STORAGE (1 UNIT)

Course Aims

The course is designed to assist students in recognizing what is perceived as being data, information and knowledge by individuals and groups of individuals within an organization. Students are provided with a variety of tools and methods in which data and information can be represented and manipulated (including within a computer) in order to serve the requirements of users.

Topics to be included

- Data storage media, physical data storage.
- Data representation: data types; records, lists, trees, arrays.
- Files and data types.
- Types of files: Text binary, image and record files.
- Physical and logical records.
- Data retrieval methods: sequential and direct files.
- Data manipulation and management.
- Data integrity.
- Data back-up and recovery.
- Data security, hacking and viruses.

C201 DATABASES (1 UNIT)

Course Aims

This course commences with a description of how data is physically stored on external devices. It continues with discussions of the various techniques that are used for indexing files in order to locate records in reasonable times. Following from this, the course then looks at the wider issues of how to organize the electronic storage and retrieval of vast amounts of multi-variate data for which many users will require access to different aspects of different parts of the data.

Topics to be included

- Files and records.
- Data storage media, physical data storage.
- Physical and logical records.
- Data retrieval methods: files, indexes, direct files.
- User views of data, methods of data capture, methods of data output

Types of databases: Hierarchical, Relational, Network.
Data management.
Data base management system.
dBASE-family (dBASEIV, FoxBase, Foxpro).

C202 PROGRAMMING LANGUAGES (1 UNIT)

Course Aims

This course looks at the more common applications of high-level computer language and explains the necessary background to the practicalities of real-world computing. It examines a number of commonly used programming languages and illustrates their strengths and weaknesses on the base of TURBO-PASCAL programming language. Modern programming techniques like Object Oriented Programming and discussed.

Topics to be included

General programming languages and programming systems. (TURBO-PASCAL V6.0., JAVA, C++, UNIX).

The TURBO-PASCAL Programming System

Fundamental concepts of TURBO-PASCAL Programming,
Programme Structure

Data types

Arithmetic and logic in TURBO-PASCAL

General programming techniques: Strings, Recursion and Files,
Merging, Sorting and Searching

TURBO-PASCAL Graphics

TURBO-PASCAL procedure and function library

TURBO-PASCAL units

Object oriented programming (OOP)

Main principles of OOP

Using of OOP in application programs design

C203 INFORMATION REPRESENTATION AND PROCESSING (1 UNIT)

Course Aims

This course deals with a description of how data is physically stored on external devices and represented for users in different software packages and computer applications. It continues with discussions of the various techniques that are used for data processing. Following from this, the course then looks at how to manage information.

Topics to be included

Work on data structures especially on their practical implementation.
Work on algorithms including complexity and efficiency.

Introductions to a number of common programming languages and database management systems, including Turbo-Pascal and Excel for Windows.

C204 COMPUTER ARCHITECTURE.

Course Aims

This course is designed to give students a good grasp of the computer structure and its elements. As well as a thorough grounding in hardware components, the course will include fundamental concepts of operating system for personal computers. Main DOS and BIOS functions are described.

Topics to be included

- Microprocessor's system architecture
- Memory control
- Memory addressing methods
- Random access memory
- Direct memory access (DMA)
- Peripheral devices interface
- Asynchronous communication interface
- Parallel input/output interface
- Disk device interface
- Computer architecture units
- Bus architecture
- Central processor unit
- Direct memory access controller
- Interrupt controller
- Timers
- Display controller
- Disk memory controller
- Keyboard controller
- Bus controller
- IBM and compatible personal computers.
- Personal computers classification
- Personal computers software structure and components,
- Personal computers operating systems.
- IBM compatible computers operating system (MS-DOS, Windows-95/98/NT)
- Fundamental Concepts of Windows-95/NT operating system,
- Main DOS and BIOS functions.
- Interrupts controlling
- MS DOS command description according to functional groups.
- Disk Commands, Directory Commands, File Commands
- Screen and Printer Commands
- DOS Utilities
- Batch commands subset

CONFIG.SYS Commands

C301 INFORMATION MANAGEMENT (1/2 UNIT)

Course Aims

This course is a mixture of theory and skills teaching. It aims particularly to give students a detailed understanding of data and information management technologies available in the market place and currently being used within organizations.

Topics to be included

An introduction to Data analysis, overview of types of information. Word processing technique. WORD for Windows text processor.

General aspects.

Main features and operation modes of WORD for Windows 95, 98

WORD for Windows 95 , 2000 and NT Installation, Starting and ending of work session.

Commands and menus.

Creating and Updating of a document. Search and Replace, Cut and Paste.

Formatting and printing document. Window manipulating.

Graphics and Layout features. Word Warp and Spell Checking.

Standard style sheets. Creating of user style sheets.

Spreadsheets of Lotus/Supercalc family

Spreadsheets SUPERCALC (LOTUS 1-2-3)

Fundamental concepts and operating principles,

Data representation and calculation.

Macro programming

Excel for Windows

Fundamental concepts and operating principles,

Data representation and calculation.

Macro programming

Database management systems. Concepts, structures and operating principles.

Database management languages and packages

Database management systems of dBASE-family (dBASEIV, Fox-Base, Foxpro).

C302 SOFTWARE SYSTEMS DEVELOPMENT (1/2 UNIT)

Course Aims

This course designed to introduce students to the discipline of software engineering. It aims particularly: to give students a detailed understanding of the functions, stages and options within the software engineering process; to enable students to develop practical skills in the use of the main software engineering techniques, especially Object oriented Programming.

Topics to be included

Definition of software engineering. An overview of types system development methodology, placing the structured systems approach within the context of the traditional and more modern approaches. An introduction to Data Analysis. Teaching of practical skills in data modeling. An introduction to Object-Oriented Analysis. Practical teaching in OOA. Human Computer interaction. Interface design. Design techniques for dialogue.

The Faculty of Computer Science is an established center of excellence in all major areas of computer science, information systems and operational research. This faculty is joint collaboration research center with the St.Petersburg State University of Aerospace Instrumentation and State University of Telecommunication. It has international for its research in many areas, including, international degree qualification with American, British and Russian state university educational programmes in computer vision, visualization, safety critical software, and hardware engineering.

We offer University of London degrees for external students, BTEC, BCS - British Computer Society fro professional qualifications, HNC, and HND from Edexcel London Examination Board. Both Information Systems and Computer Science degree programmes provided exemption from the examinations of the BCS and constitute a first step towards becoming a Chartered Engineer.

Introduction to Computer Science:

Algorithms and programming
Data structures
Applications programmms
Discrete mathematics
Mathematical logic and theory of algorithms

Software:

Database systems
Object-Oriented programming
System programming
Real-time system programming
Knowledge-Based and expert systems

Algorithms:

Computational mathematics
System theory
Optimization and operations research
Control theory
Artificial intelligence Approach to problem solving control
Adaptive systems
Information and control systems design and development:
system Analysis in problem solving in control
Technology of system modeling

Software Tools for information and control systems design
Computer aided design of control systems

Hardware:

Microprocessors in control
Computers and systems
Local area systems and networks
Hardware for computer aided management
Information and control complexes

Software for CAD systems:

Data structures
Software engineering and system programming
Computer graphics
Local area networks

Microprocessor Engineering and Servicing

Microprocessor Engineering
Microprocessor systems
Programming

Computer Communication:

Internet and computer communication engineering
Network communication

Ph.D research Degrees:

Computer Systems, software and management of computer complexes
Computers and Networks
Software for computers, Systems and Networks
Automated control systems

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