

Program Content			
Semester	I		
Course Code:	IT1206		
Course Name:	Computer Systems		
Credit Value:	04		
Core/Optional	Core		
Hourly Breakdown	Theory	Practical	Independent Learning
	45	30	125

Course Aim/Intended Learning Outcomes:

After following this course, students should be able to

- Describe the basic operations of a computer
- Design simple logic circuits
- Describe components of Central Processing Unit (CPU) with CPU cycle and its use to execute instructions in a computer

Course Content: (Main Topics, Sub topics)

Topics	Theory(Hrs.)	Practical(Hrs.)
1. Introduction	2	0
2. Data Representation and Arithmetic	5	3
3. Boolean Algebra and Circuit Design	5	3
4. Combinational and Sequential Logic Circuits	4	3
5. CPU Organization and Instruction Set Architecture (ISA)	5	4
6. Input and Output Devices	4	2
7. Volatile and Non-Volatile Storage	5	3
8. Expansion Cards and System Interfaces	5	3
9. System Software and Utilities	4	3
10. Introduction to Networks	2	2
11. System Maintenance and Troubleshooting	4	4
Total	45	30

1. Introduction (2 hrs.)

- 1.1 The Parts of a Computer System [Ref 2: pg. 21-31]
- 1.2 Evolution of Computers [Ref 1: pg. 48-74] [Ref 2: pg.10-19]
 - 1.2.1. Key Developments
 - 1.2.2. The mechanical computer
 - 1.2.3. Electronic computers based on digital switching
 - 1.2.4. UNIVAC to the modern day computers
- 1.3. Modern day computers [Ref 3]
 - 1.3.1. Supercomputers
 - 1.3.2. Mainframe computers
 - 1.3.3. Minicomputers
 - 1.3.4. Network Servers
 - 1.3.5. Personal computers and Microcomputers
 - 1.3.5.1. Desktop computers
 - 1.3.5.2. Workstations
 - 1.3.5.3. Notebook computers and Tablet PCs
 - 1.3.5.4. Handheld personal computers
 - 1.3.5.5. Smart phones
- 1.4 The Von Neumann Model [Ref 4]

2 Data Representation and Arithmetic (5 hrs.)

- 2.1. Positioning Numbering Systems [Ref 1: pg. 127-130]
- 2.2. Decimal to Binary Conversions [Ref 1: pg. 131-138]
 - 2.2.1. Converting Unsigned Whole Numbers
 - 2.2.2. Converting Fractions
 - 2.2.3. Converting between Power-of-Two Radices
- 2.3. Signed Integer Representation [Ref 1: pg. 139-178]
 - 2.3.1. Signed Magnitude
 - 2.3.2. Complement Systems
 - 2.3.3. Unsigned Versus Signed Numbers
 - 2.3.4. Carry versus Overflow
- 2.4. Floating-Point Representation [Ref 1: pg. 178-202]
 - 2.4.1. A Simple Model
 - 2.4.2. Floating-Point Arithmetic
 - 2.4.3. Floating-Point Errors
 - 2.4.4. The IEEE-754 Floating Point Standard Range, Precision, and Accuracy
 - 2.4.5. Additional Problems with Floating-Point Numbers
- 2.5. Character Codes [Ref 1: pg. 202-215]
 - 2.5.1. EBCDIC
 - 2.5.2. ASCII
 - 2.5.3. Extended ASCII
 - 2.5.4. UNICODE

3 Boolean Algebra and Circuit Design (5hrs)

- 3.1 Boolean Algebra [Ref 1: pg. 265-284]
 - 3.1.1 Boolean Expressions
 - 3.1.2 Boolean Identities
 - 3.1.3 Simplification of Boolean Expressions
 - 3.1.4 Simplification of Boolean Expressions using Karnaugh Maps
 - 3.1.5 Complements
 - 3.1.6 Representing Boolean Functions
- 3.2 Logic Gates [Ref 1: pg. 284-309]
 - 3.2.1 Symbols for Logic Gates
 - 3.2.2 Universal Gates
 - 3.2.3 Multiple Input gates
- 3.3 Digital Components [Ref 1: pg. 309-318]
 - 3.3.1 Digital Circuits and their relationship to Boolean Algebra
 - 3.3.2 Integrated Circuits

4 Combinational and Sequential Logic Circuits (4 hrs.) [Ref 1: pg.319-337]

- 4.1 Adders
- 4.2 Decoders
- 4.3 Multiplexers
- 4.4 Arithmetic Logic Unit (Unit)
- 4.5 Flip Flop – SR, JK, D(Data)

5 CPU Organization and Instruction Set Architecture (ISA) (5 hrs.)

- 5.1 CPU Basics and Organization [Ref 1: pg. 416-420]
- 5.2 The BUS [Ref 1: pg.420-428]
- 5.3 Clocks [Ref 1: pg. 428-432]
- 5.4 Memory Organization and Addressing [Ref 1: pg. 433-446]
- 5.5 Instruction Processing [Ref 1: pg. 464-473]
- 5.6 Instruction sets – definition and features
 - 5.6.1 Instruction types [Ref 1: pg. 593-599]
 - 5.6.2 Operand organization
 - 5.6.3 Number of operands and instruction length
 - 5.6.4 Addressing modes [Ref 1: pg.599-607]
 - 5.6.5 Instruction execution – pipelining [Ref 1: pg.607-743]
- 5.7 Features of machine instruction set
- 5.8 Instruction formats [Ref 1: pg.564-593]

6 Input and Output Devices (4 hrs.)

- 6.1 Input Devices [Ref 5]
 - 6.1.1 Keyboard [Ref 2: pg.795-811]
 - 6.1.1.1 Standard keyboard layout
 - 6.1.1.2 Special keyboards
 - 6.1.1.3 How the computer accepts keyboard inputs
 - 6.1.2 Pointer devices [Ref 2: pg.814-817]
 - 6.1.2.1 Mouse
 - 6.1.2.2 Trackball
 - 6.1.2.3 Touchpad
 - 6.1.2.4 Pointing stick
 - 6.1.3 Other devices [Ref 2: pg.826]
 - 6.1.3.1 Pen
 - 6.1.3.2 Touch screen
 - 6.1.3.3 Joystick and Game Pad
 - 6.1.3.4 Gesture recognition platforms
 - 6.1.3.5 Graphic tablets
 - 6.1.3.6 Webcams
 - 6.1.4 Optical devices
 - 6.1.4.1 Barcode readers
 - 6.1.4.2 Scanners and OCR devices
 - 6.1.4.3 Other optical input devices
 - 6.1.5 Audiovisual devices
 - 6.1.5.1 Microphones
 - 6.1.5.2 Video Input
 - 6.1.5.3 Digital cameras
- 6.2 Output devices [Ref 6]
 - 6.2.1 Monitors
 - 6.2.1.1 CRT
 - 6.2.1.2 Flat-Panel
 - 6.2.1.3 LCD
 - 6.2.1.4 LED
 - 6.2.1.5 Comparison of monitor types
 - 6.2.2 Multimedia projectors
 - 6.2.3 Sound systems
 - 6.2.4 Printers
 - 6.2.4.1 Dot matrix
 - 6.2.4.2 Ink Jet
 - 6.2.4.3 Laser Jet
 - 6.2.4.4 Other Printers
 - 6.2.4.5 Key features

7 Volatile and Non-volatile Storage (5 hrs.)

- 7.1 BIOS [Ref 2: pg. 281-284]
 - 7.1.1 BIOS concept
 - 7.1.2 BIOS settings
- 7.2. Volatile storage (Memory) [Ref 2: pg.356-361]
 - 7.2.1. Memory types and their relevance to different applications
- 7.3 Non-volatile Storage Devices
 - 7.3.1 Magnetic Storage devices [Ref 2: pg. 475-479]
 - 7.3.1.1 Fixed storage devices
 - 7.3.1.1.1 Hard Disks Drive(HDD)
 - 7.3.1.1.2 Solid State Drive(SSD)
 - 7.3.1.2 Removable storage devices
 - 7.3.1.2.1 Floppy disks
 - 7.3.1.2.2 Magnetic drives
 - 7.3.2 Optical storage devices
 - 7.3.2.1 Compact Disk [Ref 2: pg. 569-592]
 - 7.3.2.1.1 CD-R
 - 7.3.2.1.2 CD-RW
 - 7.3.2.2 Digital versatile Disk [Ref 2: pg. 593-596]
 - 7.3.2.2.1 DVD±X (X is ROM/R/RW)
 - 7.3.2.2.2 DVD-Multi Drives
 - 7.3.3 Flash memory [Ref 2: pg. 547, 558-564]
 - 7.3.3.1 USB flash drive
 - 7.3.3.2 Secure Digital card and Multimedia card
 - 7.3.3.3 X-Picture card
 - 7.3.3.4 Compact Flash card
 - 7.3.3.5 Memory stick
- 7.4 Taking Backups [Ref 2: pg. 292-302]

8 Expansion Cards and System Interfaces (5 hrs.)

- 8.1 Expansion slots
 - 8.1.1. PCI [Ref 2: pg. 263-270]
 - 8.1.2. ISA [Ref 2: pg. 262]
 - 8.1.3. AGP [Ref 2: pg. 270]
- 8.2 Expansion cards [Ref 7]
 - 8.2.1 Graphics accelerator cards
 - 8.2.2 Sound card
 - 8.2.3 Network cards
 - 8.2.4 TV and Video capture card
 - 8.2.5 USB card and USB Hub
 - 8.2.6 Fire-wire card
- 8.3 Interfaces
 - 8.3.1 IDE with Master-slave setting [Ref 2: pg. 409-410]
 - 8.3.2 SATA [Ref 2: pg. 431-445]
 - 8.3.3 SCSI [Ref 2: pg. 263-270]
 - 8.3.4 Standard Serial and Parallel port
 - 8.3.5 Universal serial bus
 - 8.3.6 Fire-wire

9 System Software and Utilities (4 hrs.)

- 9.1 System Software [Ref 1: pg.903-905]
 - 9.1.1 Operating system [Ref 1: pg. 906-907]
 - 9.1.1.1 Types of Operating systems
 - 9.1.1.2 Providing a user interface
 - 9.1.1.2.1 Graphical User interface
 - 9.1.1.2.2 Command-Line Interface
 - 9.1.1.3 Running Programs
 - 9.1.1.4 Managing hardware
 - 9.1.2 Different Operating Systems [Ref 1: pg. 918]
 - 9.1.2.1 DOS
 - 9.1.2.2 Windows
 - 9.1.2.3 UNIX
 - 9.1.2.4 Linux
 - 9.1.2.5 Mac
 - 9.1.2.6 OS X
 - 9.1.2.7 OS/2
 - 9.1.2.8 BSD
 - 9.1.2.9 Network Operating Systems
 - 9.1.2.10 Embedded Operating Systems
 - 9.1.3 Utilities
 - 9.1.4 Drivers and Device Installation with Windows

10 Introduction to Networks (2 hrs.) [Ref 8]

- 10.1 Uses of a Network
 - 10.1.1 Simultaneous access
 - 10.1.2 Sharing peripheral devices
 - 10.1.3 Communicate between computers
 - 10.1.4 backup data
- 10.2 Data communication media
 - 10.2.1 Wired Media
 - 10.2.1.1 Twisted-pair cable
 - 10.2.1.2 Coaxial cable
 - 10.2.1.3 Fiber-optic cable
 - 10.2.2 Wireless Media
 - 10.2.2.1 Microwave
 - 10.2.2.2 Cellular
 - 10.2.2.3 Infrared
- 10.3 Devices used to link computers [Ref 2: pg.869-892]
 - 10.3.1 Network Interface Card
 - 10.3.2 Modem
 - 10.3.3 Bridge
 - 10.3.4 Switch
 - 10.3.5 Router
 - 10.3.6 Gateways
- 10.4 Different Types of networks [Ref 2: pg.854]
 - 10.4.1 Personal Area Network

10.4.2 Local Area Network

10.4.3 Wide Area Network

11 System Maintenance and Troubleshooting (4 hrs.)

11.1 Maintenance guidelines

11.1.1 PC Maintenance Tools [Ref 2: pg.1063-1068]

11.1.1.1 Basic Tools

11.1.1.2 Advanced Tools

11.1.2 Safety [Ref 2: pg.1068]

11.1.3 Preventive Maintenance [Ref 2:1075-1085]

11.1.3.1 Active Preventive Maintenance

11.1.3.2 Passive Preventive Maintenance

11.2 Troubleshooting guidelines [Ref 2:1085-1088]

11.2.1 Diagnostic software [Ref 2:1039]

11.2.2.1 POST (Power on Self-Test) [Ref 2: 1040-1053]

11.2.2.2 Procedure to Make troubleshooting more successful

11.2.2.3 Troubleshooting using deductive reasoning

11.2.2.4 Reinstalling [Ref 2:1086]

11.2.2.5 Replacing [Ref 2:1087]

11.2.2.6 Building up the system while troubleshooting

11.3 Upgrading a system [Ref 2: 993-1037]

11.3.1 Upgradeability

11.3.2 Upgrading

11.3.3 Requirement Specific Upgrade

Teaching /Learning Methods:

You can access all learning materials and this syllabus in the VLE: <http://vle.bit.lk/>, if you are a registered student of the BIT degree program. It is important to participate in learning activities given in the VLE to learn this course.

Assessment Strategy:

In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

The final examination of the course will be held at the end of the semester. The paper consists of 40 MCQs and candidates have to answer all 40 questions within 2 hours.

References/ Reading Materials:

- **Ref 1:** Essentials of Computer Organization and Architecture by Linda Null and Julia Lobur, 5th Edition, Jones & Bartlett Learning, 2018.
- **Ref 2:** Upgrading and Repairing PCs by Scott Mueller, 22nd Edition, Que Publishing, 2015.
- **Ref 3:** Modern Day Computers
https://en.wikipedia.org/wiki/Computer#Modern_computers
[Accessed: 01-Jan-2021]
- **Ref 4:** The Von Neumann Model
https://en.wikipedia.org/wiki/Von_Neumann_architecture
[Accessed: 01-Jan-2021]
- **Ref 5:** Input Devices
https://en.wikipedia.org/wiki/Input_device
[Accessed: 01-Jan-2021]
- **Ref 6:** Output Devices
https://en.wikipedia.org/wiki/Output_device
[Accessed: 01-Jan-2021]
- **Ref 7:** Expansion cards
https://en.wikipedia.org/wiki/Expansion_card
[Accessed: 01-Jan-2021]
- **Ref 8:** Computer Networks
https://en.wikipedia.org/wiki/Computer_network
[Accessed: 01-Jan-2021]