Course Title: Fundamentals of Information Technology			
Course Code: UDS 104	**No. of credits:** 3	**L-T-P:** 18-16-22	**Learning hours:** 45
			L: Lectures**; T:** Tutorials**; P:** Practicals
Pre-requisite Course Code and Title (if any): None			
Department: Natural and Applied Sciences			
Course Coordinator: Dr. Adwitiya Sinha		**Course Instructor:**	
Contact Details:			
Course Type: Major		**Course Offered in:** Semester 2	

Course Description

This course encompasses a comprehensive understanding of information technology for digital communication with an emphasis on the fundamental concepts that underpin effective data storage, retrieval, and exchange. The learners will explore the significance of computing technologies in diverse digital applications, recognizing their pivotal role in shaping modern technological landscapes. The course aims to demonstrate the structure and function of computer organization and storage systems. The students will gain insights on the critical role of operating systems and the importance of quantifying performance to evaluate the overall system efficiency. Also, the course will address contemporary challenges by identifying and examining various security concerns prevailing in the modern age of digitization.

Course Objectives

- To understand the basic concepts of information technology for digital communication
- To identify significance of computing technologies for digital applications
- To explain the structure and function of computer organization and storage
- To identify the role of operating system, and the need for quantifying system performance
- To identify different issues of information security in modern digital age

Course Content

Module	Topic	L	T	P
1	**Computing Technologies & Applications**			
	This module highlights the significance of general-purpose computing technologies and their multifunctional aspects to perform variety of computational tasks. The students will learn about the digital computers, and their types based on size and purpose, including mainframes, minicomputers, microcomputers, and supercomputers. This will be followed by insights on computer arithmetic, and several types of software that can cater to specific user needs, thereby highlighting the diverse capabilities and constraints of modern computing systems. The following topics related to information technology (IT) will be addressed in this module: Basics of general-purpose computers, types, characteristics stages of evolution of computing technologies, applications, categorization of digital computers anatomy of a digital computing device, capabilities and constraints, computer arithmetic, positional (decimal, octal, binary, etc.) & non-positional (excess-3, cyclic, gray, etc.) number system, number base conversions, system software, application software (word processor, spread-sheets, data marts, graphics, presentations using Prezi, Google slides, etc.), advanced IT tools for data	5	4	10

	processing, data visualization, collaborative coding, data repositories, etc. (Weka, Orange, Gephi, Google Colab, GitHub, Kaggle, etc.)			
2	**Basics of Computer Organization & Storage**			
	The focus of this module lays on computer peripherals and storage devices that act as an interface between end-users and computers. It will cover data storage and retrieval methods for efficient access of information. The learners will be able to acknowledge the eminence of primary storage for quick data access, and auxiliary storage for long-term data retention. It will also cover essentials of file management, thus highlighting the complexity and diversity of storage systems. Following topics will be covered in this context: Input and output devices, I/O terminals and its types, voice recognition systems, vision input system, screen types and technologies, impact, and non-impact printers sound cards, etc., storage fundamentals, primary and secondary storage system, data retrieval methods, types of storage: primary and auxiliary, file types, file organization.	4	4	
3	**Operating System Fundamentals**			
	The purpose of this module is to illustrate the importance of operating system for facilitating user interaction. The learners will understand the need for programming languages, ranging from machine-level to high-level languages; thus, enabling communication between humans and computers. This module will help in understanding several ways of measuring and evaluating system performance. The topics to be covered in this module include: Basics of operating system, programming languages, types (machine, assembly, high level), assembler, loader, linker, language translators (compiler, interpreter), functions of operating system, system performance metrices, batch processing, multiprogramming, multiprocessing, multi-tasking, time sharing, instances (DOS, Windows, Unix/Linux).	4	4	6
4	**Data Communication, Internet & Security**			
	This module combines the effectiveness of data communication and internet technologies required for performing information exchange over networked devices. The students will perceive knowledge on analog and digital data transmission, across wired and wireless communication medium. It will also cover different network topologies and protocols to accommodate diverse communication needs. The learners will acquire awareness on computer and internet-related crimes, along with the need for security mechanism in the modern digital age. This module will include the following contents: Overview of data communication, data transmission types of communication, medium of transmission, modem, communication network, network characteristics, network types, network LAN topologies, protocols for digital communication, basics of world wide web, web designing with html, web technologies, network data analysis using Wireshark, internet addressing, e-	5	4	6

	mail basics, computer crimes, computer security techniques, computer viruses, spam, malwares, identity theft.			
	Total	**18**	**16**	**22**
Practical	Application software and tools for word processing, data storage, graphics, presentations, etc.			2
	Advanced IT tools like Weka, Orange, Gephi, Google Colab, GitHub, Kaggle, etc.			8
	Unix programming, shell scripting, Unix commands & filters, profiling			6
	Analysing network data with Wireshark, profiling network traffic, web designing, Minor Project			6
	Total			**22**

Evaluation Criteria

- Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 20%
- Minor Test 2: Written test [at the end of teaching of module 3] -- 20%
- Practical: Practical test [including modules 1 and 3] -- 20%
- Minor Project: Project-based learning [at the end of teaching of module 4] -- 10%
- Major Test: Written test [at the end of the semester, full syllabus] -- 30%

Learning Outcomes

By the end of the course, students will:

- Develop critical understanding of computer technology, applications, and software fundamentals [module 1 and 2; minor test 1]
- Acquire knowledge of characteristics, components, and software architectures associated with information processing [module 2 and 3; minor test 2; practical test]
- Gain insights of functionalities of information systems for securing and managing digital data [module 1, 2, 3, and 4; minor project; major test]

Pedagogical Approach

- The course will provide knowledge and awareness on concepts of information technology through classroom discussions, lectures, tutorials, assessments, practical, project-based learning
- The course will allow learners to develop an understanding of computing technologies and their wide variety of usage in digital communication, processing, and storage.
- The course will enable students to explore different issues in context of information security.

Reading Resources (* = compulsory readings)

- * Leon, A., Leon, M. (2009). *Fundamentals of Information Technology, Second Edition.* Vikas Publishing House, ISBN: 9788182092457, 602 pages
- * Thareja, R. (2019). *Fundamentals of Computers.* Oxford University Press, ISBN: 9780199499274, 296 pages
- Anoop, M., Murugeshan S.K. (2013). *Fundamentals of Information Technology*. Narosa Publishing, ISBN: 9788184872439, 236 pages
- Radhakrishnan, N., Ramya, D.S.A. (2023). *Fundamentals of Information Technology.* MJP Publisher, ISBN: 9789355282545, 236 pages
- Doja, M.N. (2005). *Fundamentals of Computers and Information Technology*. Deep & Deep Publications, ISBN: 9788176296755, 428 pages
- Sinha, P.K., Sinha, P. (2004). *Computer Fundamentals. Sixth Edition*. BPB publications, ISBN: 9788176567527, 536 pages
- Gioia, R. (2022). *Fundamentals of Information Technology, 3.5 hours on-demand video lectures*. Available at: udemy.com/course/fundamentals-of-information-technology

- IBM Skills Network Team. (2023). *Information Technology (IT) Fundamentals for Everyone*. 18 hours on-demand video lectures, available at: coursera.org/learn/information-technology-it-fundamentals-for-everyone

Student Responsibilities

The students are required to come prepared with readings that would be given in the class. The students are required to participate in the class discussions.

Course Designed by:

- Dr. Adwitiya Sinha, Associate Professor, Department of Computer Science & Engineering and Information Technology, Jaypee Institute of Information Technology, Noida-62, Uttar Pradesh – 201309

Course Reviewers:

The course is reviewed by the following reviewers:

- Dr Nanhay Singh, Professor, Department of Computer Science & Engineering, Netaji Subhas University of Technology, East Campus, New Delhi
- Dr. Vir Bahadur Singh, Professor, School of Computer & Systems Sciences, Jawaharlal Nehru University, New Delhi