**Unit I**

**Generations of Operating Systems:**

Operating systems, like computer hardware, have undergone a series of revolutionary changes called generations. In computer hardware, generations have been marked by major advances in componentry from vacuum tubes (first generation), to transistors (second generation), to integrated circuitry (third generation), to large-scale and very large-scale integrated circuitry (forth generation). The successive hardware generations have each been accompanied by dramatic reductions in costs, size, heat emission, and energy consumption, and by dramatic increases in speed and storage capacity.

* **Zeroth generation (1940s) -** Early computing systems had no operating system. Users had complete access to the machine language. They hand-coded all instructions.
* **First generation (1950s) -** The operating systems of the 1950s were designed to smooth the transition between jobs. Before the systems were developed, a great deal of time was lost between the completion of one job and the initiation of the next. This was the beginning of batch processing systems in which jobs were gathered in groups or batches.  Once a job was running, it had total control of the machine. As each job terminated (either normally or abnormally), control was returned to the operating system that "cleaned up after the job" and read in and initiated the next job.
* **Second generation (early 1960s) -** The second generation of operating systems was characterized by the development of shared systems with multiprogramming and beginnings of multiprocessing. In multiprogramming systems several user programs are in main storage at once and the processor is switched rapidly between the jobs. In multiprocessing systems, several processors are used on a single computer system to increase the processing power of the machine.
* **Third generation (Mid-1960s to Mid-1970s) -** The third generation of operating systems effectively began with the introduction of the IBM system/360 family of computers in 1964. Third generation computers were designed to be general-purpose systems. They were large, often ponderous, systems purporting to be all things to all people. The concept sold a lot of computers, but it took its toll. Users running particular applications that did not require this kind of power payed heavily in increased run-time over head, learning time, debugging time, maintenance, etc.

Third generation operating systems were multimode systems. Some of them simultaneously supported batch processing, time sharing, real-time processing, and multiprocessing. They were large and expensive. Nothing like them had ever been constructed before, and many of the development efforts finished well over budget and long after scheduled completion.

* **Fourth generation (Mid-1970s to present) -** Fourth generation systems are the current state of the art. Many designers and users are still smarting from their experiences with third generation operating systems and are careful before getting involved with complex operating systems.

With the widespread use of computer networking and on-line processing, user gain access to networks of geographically dispersed computers through various type of terminals. The microprocessor has made possible the development of the personal computer, one of the most important developments of social consequence in the last several decades. Now many users have dedicated computer systems available for their own use at any time of the day or night. Computer power that cost hundreds of thousands of dollars in the early 1960s is now available for less than a thousand dollars.

Personal computers are often equipped with data communications interface, and also serve as terminals. The user of a fourth generation system is no longer confined to communicating with a single computer in a timeshared mode. Rather the user may communicate with geographically dispersed systems. Security problems have increased greatly with information now passing over various types of vulnerable communications lines. Encryption is receiving much attention it has become necessary to encode highly proprietary or personal data so tat, even if the data is compromised, it is of no use to anyone other than the intended receivers.