4. Understand the various types of memory.
5. Understand input/output mechanisms.

Course Code	**:**	**ITPC20**
Course Title	**:**	**Operating Systems**
Number of Credits	**:**	**5**
Prerequisites	**:**	
Course Type	**:**	**PC**

Course Learning Objectives

1. To understand the services and design of an operating system.
2. To understand the structure and organization of file system
3. To understand the process states and various concepts such as scheduling and synchronization related with it.
4. To understand different memory management approaches.
5. Students should be able to use system calls for managing processes, memory and file system.
6. students should understand the data structures and algorithms for implementation of OS.

Course Content

1. Computer system architecture and organization, Introduction and evolution of OS, Introduction to distributed OS, Real time systems and multimedia systems. OS structures: OS services, system calls and programs, OS design and implementation. Processes: Process concept, scheduling policies, algorithms, multilevel queuing, operations on process, Inter-process communication. Threads: multithreading models and threading issues.
   CPU scheduling: Criteria and algorithms, multiprocessor and thread scheduling.

2. Process synchronization: critical sections, classical two process and n-process solutions, hardware primitives for synchronization, semaphores, monitors, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers, etc.).
   Deadlocks: modeling, resource allocation, characterization, prevention and avoidance, detection and recovery.

3. Memory management: Swapping, contiguous memory allocation, paging, multilevel paging, segmentation, demand paging, page replacement algorithms, allocation of frames, thrashing, working set model. Input/Output: I/O system and services, device controllers and device drivers, disks, scheduling algorithms and management.

4. File system interface: access methods, access control, directory structures, file organization, file sharing and protection. system performance, protection and security, access matrix, Security breaches, types of attacks, attack prevention methods, security policy and access control, OS design considerations for security, access, policy and access control, OS design considerations for security, access control lists and OS support, internet and general network security.

Reference Books:

1. A. Silberschatz, Peter B. Galvin and G. Gagne, "Operating System Concepts," (6^{th} or newer edition), Wiley.
2. H. Brinch, "Operating System Principles," Prentice Hall of India.
3. Dhamdhere, "Systems programming & Operating systems," TataMcGraw Hill.
4. A. N. Habermann, "Introduction to Operating System Design," Galgotia publication, New Delhi.
5. A.S. Tanenbaum, "Modern Operating Systems," Prentice Hall of India.

Course outcomes

1. At the end of the course student will be able to

2. Understand functions, structures and history of operating systems
3. Able to know the design issues associated with operating systems
4. Master various process management concepts such as scheduling, synchronization, multithreading and deadlocks
5. Understand the various concepts associated with memory management such as virtual memory, demand paging, page replacements algorithms
6. Be familiar with various protection and security mechanisms

Course Code	**:**	**ITPC22**
Course Title	**:**	**Communication Systems**
Number of Credits	**:**	**4**
Prerequisites (Course code)	**:**	**ITPC10**
Course Type	**:**	**PC**

Course Learning Objectives:
1. Present overview structure of communication system.
2. Understand the basic modulation techniques.
3. Develop an understanding of implementation methodology of digital communication system.

Course Content:
1. **Spectral Analysis and Noise**: Fourier series, Response of linear system Power spectral density, Fourier Transform, Convolution, Parseval's Theorem, correlation between waveforms, Impulse Function, Ideal low pass filter. Hilbert Transform. Random variables, Cumulative distribution function, Probability density function, Average value of random variables Central Limit Theorem Noise and its sources, Methods of noise calculation in network and interconnected networks, Mathematical representation of random noise. Narrow band noise and its representation, Transmission of noise through linear systems, Noise figure, Noise temperature, Computation of signals to noise ratio, and noise bandwidth.

2. **Analog Modulation:** Introduction, Amplitude Modulation, AM demodulators, Spectrum of AM signal, angle modulation, Phase and frequency modulation, spectrum of FM signal, bandwidth of FM signal; NBFM & WBFM, FM generation and demodulation methods.

3. **Pulse and Digital Modulation Techniques**: Sampling theorem for low pass and band pass signals, time division multiplexing, frequency division multiplexing, concept of pulse amplitude modulation and pulse width modulation, demodulation of signals, pulse code modulation, delta modulation and adaptive delta modulation. Binary phase shift keying, differential phase shift keying, quadrature phase shift keying, M-ary PSK, QASK, Binary FSK, M-ary FSK, Minimum shift keying.

4. **Code Division Multiple Access Systems:** Spread spectrum model, direct sequence spread signals, CDMA system based on frequency hopped spread spectrum signal, Uncertainty, Information and Entropy, Source coding theorem, Data compaction, Discrete memory less channels, Mutual information, Channel capacity, channel coding theorem, information capacity theorem.

Reference Books:

1. Simon Haykin, Digital Communication, John Wiley.
2. Taub and Schilling, Principles of Communication System, TMH.
3. G. Kennedy, Electronic Communication System, TMH.
4. J. G. Proakis, Digital Communications, MGH.

Course outcomes:
1. Learn the fundamentals of communication system.
2. Identify the needs of digital communication in real life applications.
3. Have knowledge of contemporary issues for implementation of communication system.