



## Course Handout

Institute/School Name	Chitkara University Institute of Engineering and Technology		
Department Name	Computer Science & Engineering		
Programme Name	Bachelor of Engineering (B.E) - Computer Science & Engineering		
Course Name	Operating System	Session	Jan-June 2025
Course Code	24CSE0105	Semester/Batch	2nd/2024
L-T-P(Per Week)	2-0-2	Course Credits	3
Pre-requisite	NA	NHEQF Level	4.5
Course Coordinator	Dr. Monika Sethi	SDG Number	4, 9

## 1. Objectives of the Course

This course focuses on fundamental design and implementation ideas in the engineering of operating systems. Topics include virtual memory, threads, context switches, kernels, interrupts, system calls, interprocess communication, coordination, and the interaction between software and hardware. The main objectives of the course are to:

- Impart an inclusive and structured approach to understanding the concepts of operating systems, ensuring equitable and high-quality learning opportunities.
- Expose students to concurrent programming issues in the management of resources like processors, memory, and input-output, fostering skills for innovative and sustainable technological advancements.
- Provide practical skills required as a foundation to build solutions for real-world engineering problems, supporting sustainable infrastructure and resilient technology systems.
- Enable learners to understand and apply diverse Linux operating commands effectively, promoting technological literacy and innovation in line with sustainable development goals.

## 2. Course Learning Outcomes (CLOs)

Student should be able to:

	CLOs	Program Outcomes (PO)	NHEQF Level Description	No. of Lectures
CLO01	Understand the role and structure of operating systems and analyze their components, including process, memory, storage, and I/O management.	PO1, PO3, PO11	Q1, Q2	15
CLO02	Explain process management concepts, including process scheduling, inter-process communication, and threading models, for efficient resource utilization.	PO1, PO3, PO11	Q3, Q6	15
CLO03	Evaluate CPU scheduling algorithms to determine their suitability based on scheduling criteria and system requirements, methods for handling deadlock	PO1, PO4, PO5, PO11	Q1, Q2	28
CLO04	Analyze synchronization mechanisms and resolve synchronization issues using semaphores, monitors, and critical section solutions.	PO3, PO4, PO5, PO11, PO12	Q3, Q6	6
CLO05	Examine memory management techniques, such as paging, segmentation, and contiguous memory allocation, and their impact on system performance.	PO3, PO4, PO5, O11	Q3	10
CLO06 (Only for lab components)	Design, implement, and analyze key operating system functionalities, including process management, CPU scheduling, process synchronization, deadlock handling, and memory management, through practical programming exercises.	PO1, PO3, PO4, PO5, PO11, PO12	Q3, Q6	6
Total Contact Hours				

CLO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Type of Assessment's
CLO01	H		H								H	H	Formative, Summative
CLO02	M		H								H		Formative,

													Summative
CLO03	M			H	H						M		Formative, Summative
CLO04			H	M	L						L	H	Formative, Summative
CLO05			H	M	H						L	H	Formative, Summative
CLO06	M		H	H	H						H	H	Formative, Summative

#### CLO-PO Mapping

H=High, M=Medium, L=Low

#### 3. Recommended Books:

**B01:** Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, 9th Edition, 2018, Wiley.

**B02:** System Programming and Operating Systems, D.M. Dhamdhere, 2nd Edition, 2009, Tata McGraw Hill.

**B03:** Operating Systems: Internals and Design Principles, William Stallings, 9th Edition, 2018, Pearson.

**B04:** Modern Operating Systems, Andrew S. Tanenbaum, 4th Edition, 2016, Pearson.

**B05:** Advanced Linux Programming, Mark Mitchell, Jeffrey Oldham, and Alex Samuel, 1st Edition, 2001 Germany: New Riders.

**B06:** Linux Command Line and Shell Scripting Bible, Richard Blum and Christine Bresnahan, 3rd Edition, 2015, Wiley.

#### 4. Other readings and relevant websites:

SerialNo	Link of Journals, Magazines, websites and Research Papers
1.	<a href="https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2012/download-course-materials/">https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2012/download-course-materials/</a>
2.	<a href="http://nptel.ac.in/courses/106108101/">http://nptel.ac.in/courses/106108101/</a>
3.	<a href="http://www.ics.uci.edu/~ics143/lectures.html">http://www.ics.uci.edu/~ics143/lectures.html</a>
4.	<a href="http://www.cs.kent.edu/~farrell/osf03/oldnotes/index.html">http://www.cs.kent.edu/~farrell/osf03/oldnotes/index.html</a>
5.	<a href="http://williamstallings.com/OS/OS6e.html">http://williamstallings.com/OS/OS6e.html</a>
6.	<a href="https://learning.edx.org/course/course-v1:LinuxFoundationX:LFS101x+1T2017">https://learning.edx.org/course/course-v1:LinuxFoundationX:LFS101x+1T2017</a>
7.	<a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel.ac.in/courses/106/105/106105214/</a>

#### 5. Recommended Tools and Platforms

VirtualBox 6.1.22, Ubuntu 21.04, GCC Compiler

#### 6. Course Plan: Theory+ Lab

##### Theory Plan

Lect. No.	Topic(s)
1-2	<b>Introduction:</b> Introduction to Operating systems, Operating System role, Computer system architecture: Single processor, Multiprocessor Systems, Clustered Systems, OS structure, OS operations, Components of OS: Process management, memory management, storage management, I/O management
3-5	Operating System Services, User and OS interface, System Calls/API, Types of System Call, System Program
6-7	<b>Process Concept:</b> Process Scheduling, Operations On Processes, Inter- process Communication
8-9	<b>Threads:</b> Overview of Threads, Multicore Programming, Multithreading Models, Threading issues
10-15	<b>Process Synchronization:</b> Background, The Critical-Section Problem, Two process solution, Multiple Process solution, Synchronization Hardware. Semaphores, Classic problems of Synchronization, Critical regions, Monitors
<b>ST1 (0 to 40%)</b>	
16-19	<b>CPU Scheduling:</b> Basic Concepts, Scheduling Criteria Scheduling Algorithm-, First In first Out Scheduling Algorithms (FIFO), Shortest Job First Scheduling Algorithms (SJF)
20-22	Priority Scheduling Algorithms, Scheduling Algorithms- Round-robin Scheduling Algorithms, Multilevel Queue Scheduling
23-30	<b>Deadlock:</b> System Model Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, Recovery From Deadlocks
<b>ST2 (41% to 80%)</b>	
31-35	<b>Memory Management:</b> Basics, Swapping, Contiguous memory allocation, Segmentation, Paging, Segmentation, Segmentation with paging, Introduction to Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of frames, Thrashing
36-40	<b>Mass Storage structure:</b> Overview, Disk Structure, Disk attachment, Disk Scheduling, Disk Management
<b>ST3 (0-100%)</b>	
<b>End Term Exam</b>	

##### Lab Plan

Lab No.	Topic(s)
1-8	a) <b>Installation:</b> Configuration & Customizations of Linux b) <b>Introduction to GCC compiler:</b> Basics of GCC, Compilation of program, Execution of program c) Time stamping, d) Automating the execution using make file.
9-12	Implement the commands that is used for Creating and Manipulating files: cat, cp, mv, rm, ls and its options, touch and their options, which is, where is, what is
13-14	Implement Directory oriented commands: cd, pwd, mkdir, rmdir
15-18	Implement the basic and user status commands like: su, sudo, man, help, history, who, whoami, id, uname, uptime, free, tty, cal, date, hostname, reboot, clear
19-22	Implement Process concepts using C language by Printing process Id.
23-26	Implement FCFS, SJF scheduling algorithms in C language.
27-30	Implement priority scheduling, and RR scheduling algorithms in C language.
31-34	Implement deadlock detection in C. (Banker's Algorithm)
35-36	File system: Introduction to File system, File system Architecture and File Types.
37-40	Implement File system commands: Comparing Files using diff, cmp, comm
Continuous Evaluation	

## 7. Delivery/Instructional Resources Theory

### Plan:

Lect. No.	Topics	CLO	Book No, CH No, Page No	TLM	ALM	Web References	Audio-Video
1-2	<b>Introduction:</b> Introduction to Operating systems, Operating System role, Computer system architecture: Single processor, Multiprocessor Systems, Clustered Systems, OS structure, OS operations, Components of OS: Process management, memory management, storage management, I/O management	CLO01	B02, CH 11.1, 11.2, Page no 412-422  B01, CH 1.1-1.8, Page no 4-29	Lecture	Quiz, Test questions	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/106108101</a>	Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106105/106105214/">https://nptel.ac.in/courses/106105/106105214/</a> <a href="https://www.youtube.com/watch?v=BURTt97EkA">https://www.youtube.com/watch?v=BURTt97EkA</a>
3-5	Operating System Services, User and OS interface, System Calls/API, Types of System Call, System Program	CLO01	B01, CH 2.2-2.5, Page no 58-74  B05, CH 1, Page no 3-10	Lecture	Brainstorming Sessions, Focused Listing	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/106108101</a>	<a href="https://www.youtube.com/watch?v=TWERTMoKbl">https://www.youtube.com/watch?v=TWERTMoKbl</a> Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106105/106105214/">https://nptel.ac.in/courses/106105/106105214/</a>
6-7	<b>Process Concept:</b> Process Scheduling, Operations On Processes, Inter-process Communication	CLO02	B02, CH 11.1, 11.2, Page no 423-428  B01, CH 3.1-3.5, Page no 105-128  B05, CH 5.1-5.3, Page no 95-105	Lecture	Focused Listing	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/106108101</a>	<a href="https://www.youtube.com/watch?v=OrM7nZcxXZU">https://www.youtube.com/watch?v=OrM7nZcxXZU</a> Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106105/106105214/">https://nptel.ac.in/courses/106105/106105214/</a>
8-9	<b>Threads:</b> Overview of Threads, Multicore Programming, Multithreading	CLO01,	B03, CH 4.1, Page no 160-174	Lecture		<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/106108101</a>	<a href="https://www.youtube.com/watch?v=L">https://www.youtube.com/watch?v=L</a>



	Models, Threading issues	CLO02	B01, CH 4.3-4.6, Page no 169-185  B05, CH 41.-4.4, Page no 61-88		Brainstorming Sessions		<a href="https://www.youtube.com/watch?v=ph2awKa8r5Y&amp;list=PLBlnK6fEygRiVhbXDGLXDk_OQAeuVcp2O&amp;index=57">OfGlcVnvA k</a> Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel. ac.in/cour ses/106/105/ 10610521 4/</a>
10-12	<b>Process Synchronization:</b> Background, The Critical-Section Problem, Two process solution, Multiple Process solution, Synchronization Hardware.	CLO04	B01, CH 5.1-5.4, Page no 203-210	Lecture,	Quiz, Peer Review, Brainstorming Sessions	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/ 106108101</a>	Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel. ac.in/cour ses/106/105/ 10610521 4/</a>  <a href="https://www.youtube.com/watch?v=ph2awKa8r5Y&amp;list=PLBlnK6fEygRiVhbXDGLXDk_OQAeuVcp2O&amp;index=57">https://www. youtube.com /watch?v=ph 2awKa8r5Y &amp;list=PLBln K6fEygRiV hbXDGLXD k_OQAeuVc p2O&amp;index= 57</a>
13-15	Semaphores, Classic problems of Synchronization, Critical regions, Monitors	CLO03, CLO04	B03, CH 5.1-5.4, Page no 207-232	Lecture,	Quiz, Peer Review	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/ 106108101</a>	Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel. ac.in/cour ses/106/105/ 10610521 4/</a>  <a href="https://www.youtube.com/watch?v=XDIOC2EY5JE&amp;list=PLBlnK6fEygRiVhbXDGLXDk_OQAeuVcp2O&amp;index=61">https://www. youtube.com /watch?v=X DIOC2EY5J E&amp;list=PLB lnK6fEygRi VhbXDGLX Dk_OQAeu Vcp2O&amp;ind ex=61</a>
16-19	<b>CPU Scheduling:</b> Basic Concepts, Scheduling Criteria Scheduling Algorithms- , First In first Out Scheduling Algorithms (FIFO), Shortest Job First Scheduling Algorithms (SJF)	CLO02, CLO03	B01, CH 6.1-6.6, Page no 261-290	Lecture	Leading Question, Quiz, Brainstorming Sessions	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/ 106108101</a>	<a href="https://www.youtube.com/watch?v=bWHFY8-rL5I&amp;list=PLBlnK6fEygRiVhbXDGLXDk_OQAeuVcp2O&amp;index=40">https://www. youtube.com /watch?v=b WHFY8-rL5 I&amp;list=PLB lnK6fEygRi VhbXDGLX Dk_OQAeu Vcp2O&amp;ind ex=40</a> Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel. ac.in/cour ses/106/105/ 10610521 4/</a>
20-22	Priority Scheduling Algorithms, Scheduling	CLO02,	B03, CH 9.1-9.2, Page	Lecture	Quiz, Peer	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/ 106108101</a>	Introduction to Operating



	Algorithms- Round-robin Scheduling Algorithms, Multilevel Queue Scheduling	CLO03	no 405-430		Review		Systems   Coursera <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel.ac.in/courses/106/105/106105214/</a>
23-30	<b>Deadlock:</b> System Model Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, Recovery From Deadlocks	CLO04	B01, CH 7.1-7.7, Page no 315-338	Lecture	Quiz, Peer Review	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/106108101</a>	Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel.ac.in/courses/106/105/106105214/</a>  <a href="https://www.youtube.com/watch?v=7bnpFpYZtVk&amp;list=PLBlnK6fEyqRiVhbXDGLXdk_OQAeuVcp2O&amp;index=73">https://www.youtube.com/watch?v=7bnpFpYZtVk&amp;list=PLBlnK6fEyqRiVhbXDGLXdk_OQAeuVcp2O&amp;index=73</a>
30-35	<b>Memory Management:</b> Basics, Swapping, Contiguous memory allocation, Segmentation, Paging, Segmentation, Segmentation with paging, Introduction to Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of frames, Thrashing	CLO05	B02, CH 12.1-12.5 Page no 434-460	Lecture	Quiz, Peer Review	<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/106108101</a>	Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel.ac.in/courses/106/105/106105214/</a>  <a href="https://www.youtube.com/watch?v=d9WyerblWQc&amp;list=PLBlnK6fEyqRiVhbXDGLXdk_OQAeuVcp2O&amp;index=74">https://www.youtube.com/watch?v=d9WyerblWQc&amp;list=PLBlnK6fEyqRiVhbXDGLXdk_OQAeuVcp2O&amp;index=74</a>
36-40	<b>Mass Storage structure:</b> Overview, Disk Structure, Disk attachment, Disk Scheduling, Disk Management		B03, CH 12.1-12.7, Page no 521-579			<a href="https://nptel.ac.in/courses/106108101">https://nptel.ac.in/courses/106108101</a>	Introduction to Operating Systems   Coursera <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel.ac.in/courses/106/105/106105214/</a>  <a href="https://www.youtube.com/watch?v=syq56cLrWdI&amp;list=PLBlnK6fEyqRiVhbXDGLXdk_OQAeuVcp2O&amp;index=78">https://www.youtube.com/watch?v=syq56cLrWdI&amp;list=PLBlnK6fEyqRiVhbXDGLXdk_OQAeuVcp2O&amp;index=78</a>

**Lab Plan:**

Lab No.	Experiment	CLO	TLM	ALM	Web References	Audio-Video
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1-8	<b>Installation:</b> Configuration & Customizations of Linux <b>Introduction to GCC compiler:</b> Basics of GCC, Compilation of program, Execution of program, Time stamping, Automating the execution using Make file.	CLO01	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="https://ubuntu.com/tutorials/install-ubuntu-server#1-overview">https://ubuntu.com/tutorials/install-ubuntu-server#1-overview</a>	<a href="https://www.youtube.com/watch?v=oLjN6jAg-sY">https://www.youtube.com/watch?v=oLjN6jAg-sY</a>
9-12	Implement the commands that is used for Creating and Manipulating files: cat, cp, mv, rm, ls and its options, touch and their options, which is, where is, what is	CL006	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="http://tldp.org/LDP/abs/html/basic.html">http://tldp.org/LDP/abs/html/basic.html</a>	<a href="https://www.youtube.com/watch?v=YHFzr-aK0as">https://www.youtube.com/watch?v=YHFzr-aK0as</a>
13-14	Implement Directory oriented commands: cd, pwd, mkdir, rmdir	CLO06	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="http://litux.nl/Reference/Books/7213/ddu0082.html">http://litux.nl/Reference/Books/7213/ddu0082.html</a>	<a href="https://www.youtube.com/watch?v=YHFzr-aK0as">https://www.youtube.com/watch?v=YHFzr-aK0as</a>
15-18	Implement the basic and user status commands like: su, sudo, man, help, history, who, whoami, id, uname, uptime, free, tty, cal, date, hostname, reboot, clear	CLO04	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="https://techlog360.com/basic-ubuntu-commands-terminal-shortcuts-linux-beginner/">https://techlog360.com/basic-ubuntu-commands-terminal-shortcuts-linux-beginner/</a>	<a href="https://www.youtube.com/watch?v=2iVv1LKSGSM&amp;t=8s">https://www.youtube.com/watch?v=2iVv1LKSGSM&amp;t=8s</a>
19-22	Implement Process concepts using C language by Printing process Id.	CLO02, CLO03	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="https://linuxhint.com/fork-system-call-linux/">https://linuxhint.com/fork-system-call-linux/</a>	<a href="https://www.youtube.com/watch?v=oLjN6jAg-sY">https://www.youtube.com/watch?v=oLjN6jAg-sY</a>
23-26	Implement FCFS, SJF scheduling algorithms in C language.	CLO03	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="https://www.tutorialspoint.com/c-program-for-fcfs-scheduling">https://www.tutorialspoint.com/c-program-for-fcfs-scheduling</a> <a href="https://www.javatpoint.com/round-robin-program-in-c">https://www.javatpoint.com/round-robin-program-in-c</a>	<a href="https://www.youtube.com/watch?v=mSwS1QLpdB8">https://www.youtube.com/watch?v=mSwS1QLpdB8</a>
27-30	Implement priority scheduling, and RR scheduling algorithms in C language.	CLO03	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="https://www.tutorialspoint.com/c-program-for-fcfs-scheduling">https://www.tutorialspoint.com/c-program-for-fcfs-scheduling</a> <a href="https://www.javatpoint.com/round-robin-program-in-c">https://www.javatpoint.com/round-robin-program-in-c</a>	<a href="https://www.youtube.com/watch?v=mSwS1QLpdB8">https://www.youtube.com/watch?v=mSwS1QLpdB8</a>
31-34	Implement deadlock detection in C. (Banker's Algorithm)	CLO04	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="https://www.codingninjas.com/codestudio/library/deadlock-detection-algorithm">https://www.codingninjas.com/codestudio/library/deadlock-detection-algorithm</a>	<a href="https://www.youtube.com/watch?v=XVZMxXBBqtc">https://www.youtube.com/watch?v=XVZMxXBBqtc</a>
35-36	File system: Introduction to File system, File system Architecture and File Types	CLO05, CLO06	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="https://tldp.org/LDP/intro-linux/html/sect_03_01.html">https://tldp.org/LDP/intro-linux/html/sect_03_01.html</a>	



37-40	Implement File system commands: Comparing Files using diff, cmp, comm	CLO06	Discussion, Demonstration method, Questioning	Brainstorming Sessions, Think / Pair / Share	<a href="https://www.geeksforgeeks.org/cmp-command-in-linux-with-examples/">https://www.geeksforgeeks.org/cmp-command-in-linux-with-examples/</a>  <a href="https://www.geeksforgeeks.org/diff-command-in-linux-examples/">https://www.geeksforgeeks.org/diff-command-in-linux-examples/</a>	<a href="https://www.youtube.com/watch?v=YHFzrakOas">https://www.youtube.com/watch?v=YHFzrakOas</a>
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#### 8. Remedial Classes

After every sessional tests, different types of learners will be identified, and special discussions will be planned and scheduled accordingly.

#### Action Plan for different types of learners:

Learner Type I	Learner Type II	Learner Type III
Remedial Classes, and Guided Tutorials	Doubt Sessions, Guided Tutorials	Guided Tutorials

#### 9. Self-Learning

Assignments to promote self-learning, survey of contents from multiple sources.

S.No	Topics	CLO	ALM	References/MOOCs
1	Mobile Operating Systems Features of Android and iOS	CLO06	Think – Pair- Share	

#### 10. Delivery Details of Content Beyond Syllabus

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

S.No	Advanced Topics, Additional Reading, Research papers and any	CLO	POs	ALM	References/MOOCs
1.	Cloud Computing  Cloud OS Internals: Resource Virtualization in AWS, Azure	-	-	Shadowing	

#### 11. Evaluation Scheme & Components:

Assessment Type	Evaluation Component	Type of Component	No. of Assessments	% Weightage of Component	Max. Marks	Mode of Assessment	CLO
Formative	Component 1	Continuous Evaluation 1	01*	20%	20	Offline	CLO01-CLO06
Summative	Component 2	Sessional Tests (STs)	03**	30%	30	Offline	CLO01-CLO06
Summative	Component 3	End Term Examination	01***	50%	50	Offline	CLO01-CLO06
Total			100%				

\*Continuous Evaluation (CE) is a mandatory evaluation taken once in a semester; it is considered a CE based on lab practical (file), viva, and written.

\*\*Out of 03 STs, the system automatically picks the average of best 02 STs marks for evaluation of the STs as final marks. ST to be held in STs weeks as per Academic Schedule.

\*\*\*As per Academic Guidelines minimum 75% attendance is required to become eligible for appearing in the End Semester Examination.

**12. Syllabus of the Course:**

Subject: Operating System			
S.No.	Topic(s)	No. of Lectures	Weightage %
1-2	<b>Introduction:</b> Introduction to Operating systems, Operating System role, Computer system architecture: Single processor, Multiprocessor Systems, Clustered Systems, OS structure, OS operations, Components of OS: Process management, memory management, storage management, I/O management	2	5%
3-5	Operating System Services, User and OS interface, System Calls/API, Types of System Call, System Program	3	5%
6-7	<b>Process Concept:</b> Process Scheduling, Operations On Processes, Inter- process Communication	2	5%
8-9	<b>Threads:</b> Overview of Threads, Multicore Programming, Multithreading Models, Threading issues	2	5%
10-15	<b>Process Synchronization:</b> Background, The Critical-Section Problem, Two process solution, Multiple Process solution, Synchronization Hardware, Semaphores, Classic problems of Synchronization, Critical regions, Monitors	6	20%
16-19	<b>CPU Scheduling:</b> Basic Concepts, Scheduling Criteria Scheduling Algorithms-, First In first Out Scheduling Algorithms (FIFO), Shortest Job First Scheduling Algorithms (SJF)	4	10%
20-22	Priority Scheduling Algorithms, Scheduling Algorithms- Round-robin Scheduling Algorithms, Multilevel Queue Scheduling	3	10%
23-30	<b>Deadlock:</b> System Model Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, Recovery From Deadlocks	8	20%
31-35	<b>Memory Management:</b> Basics, Swapping, Contiguous memory allocation, Segmentation, Paging, Segmentation, Segmentation with paging, Introduction to Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of frames, Thrashing	5	10%
36-40	<b>Mass Storage structure:</b> Overview, Disk Structure, Disk attachment, Disk Scheduling, Disk Management	5	10%

**13. Academic Integrity Policy:**

Education at Chitkara University builds on the principle that excellence requires freedom where Honesty and integrity are its prerequisites. Academic honesty in the advancement of knowledge requires that all students and Faculty respect the integrity of one another's work and recognize the importance of acknowledging and safeguarding intellectual property. Any breach of the same will be tantamount to severe academic penalties.

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Dr. Monika Sethi	
Program Incharge	Dr. Preetinder Brar	
Pro. Vice Chancellor	Dr. Jaiteg Singh	
Date(DD/MM/YYYY)	10/01/2025	