UNIVERSITY OF PETROLEUM & ENERGY STUDIES

College of Engineering Studies

Dehradun

COURSE PLAN

Programme : B.Tech (CSE+ All IBM Branches)

Course : Operating Systems

Subject Code : CSEG 2007

No. of credits : 3

Semester : III

Session : Jul 2018 – Dec 18

Batch : 2017-21

Prepared by : Dr. Amit Agarwal/Mr.Amrendra Tripathi

Email : AAGARWAL@DDN.UPES.AC.IN

Approved By

Faculty HoD

UPES Campus

"Energy Acres"

P.O. Bidholi, Via Prem Nagar, Dehradun

Tel : +91-135-2770137

Fax : +91 135- 27760904

Website : www.upes.ac.in

UPES

COURSE PLAN

A. **PREREQUISITE:**
   a. Basic Knowledge of Linux command.
   b. Basic knowledge of C.

B. PROGRAM OUTCOMES (POs) for OS:

Program Outcomes for B. Tech. CSE After completion of the program the students will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

1. Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem solving and optimizing techniques.

2. Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms.

3. Ability to understand and apply Cloud Computing architecture for scalable, secure and dynamically provisioned business oriented environment with optimized performance tuning and data reliability.

.

C. COURSE OUTCOMES FOR Operating Systems: At the end of this course student should be able to

CO1: Understand basic concepts of Operating System and its Functions
CO2. Understand the process management and CPU scheduling algorithm.
CO3. Design solution for process synchronization, inter process communication and deadlock handling

CO4.Identify how operating system allocates and manages memory along with concepts and needs of virtual memory.
CO5: Evaluate File Systems, Directory Structures and Access Control Mechanism.
CO6: Measure Performance of Disk Scheduling Technique.

.

Table: Correlation of POs v/s COs

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1	1		1								3	3	
CO2	2	1	2		1	2			1			1	3	3	
CO3	1	2	2		2	2			2			1	3	3	
CO4	2	2	2		3	1			1			1	3	3	
CO5	2		1		1							1	3	3	
CO6	2	1	2		1								3	3	

1. WEAK 2. MODERATE 3. STRONG

D. COURSE OUTLINE

Sl. No	Module	Contents
1.	Module 1	Introduction to Operating System
2	Module 2	Process Management and CPU Scheduling
3	Module 3	Process Synchronization and Deadlock

4	Module 4	Memory Management
5	Module 5	File Systems and Disk Scheduling

E. PEDAGOGY

1. **Class Test**
2. **Quiz**
3. **Assignments/ Tutorials**
4. **Digital Presentations/Video lectures**
5. **Concept diary (needs to be maintained by students-short and concise notes which include course concepts that he/she has understood.)**

F. COURSE COMPLETION PLAN

Total Class room sessions	24
Online Session	12
Total Test	02
Total Assignment	02
Total Quiz	02

One Session =60 minutes

G. EVALUATION & GRADING

S. No.	Assessment	Weightage	Schedule
1	Internal Assessment (IA)	30%	Detailed Below
2	Mid-semester Examination (MS)	20%	Academic Calendar
3	End-semester Examination (ES)	50%	Academic Calendar

I1. INTERNAL ASSESSMENT: WEIGHTAGE – 30%

Internal Assessment shall be done based on the following:

Assessment	Percentage
Tests – 2	**30%**
Quiz-2	**20%**
Assignments – 2	**40%**
Attendance & Performance	**10%**
Total	**100%**

I2. ***Internal Assessment Record Sheet (including Mid Term Examination marks)*** *will be displayed online at the end of semester i.e. last week of regular classroom teaching.*

I3. CLASS TESTS/QUIZZES: Two Class Tests based on descriptive type theoretical & numerical questions will be held after mid semester examination. Those who do not appear in Viva-Voce and quiz examinations shall lose their marks.

The marks obtained by the students will be displayed on Blackboard a week before the start of Mid Term and End Term Examinations respectively.

I4. ASSIGNMENTS: After completion of two units there will be home assignments based on theory, numerical problems and case studies. One assignment based before the mid semester exam and one after mid semester. Those who fail to submit the assignments by the due date shall lose their marks.

I5. GENERAL DISCIPLINE: Based on student's regularity, punctuality, sincerity and behavior in the class.

The marks obtained by the students will be displayed on Blackboard at the end of semester.

I6. MID TERM EXAMINATION: WEIGHTAGE – 20%

Mode of Mid Term Examination - Online

Mid Term examination shall be Two Hours duration and shall be a combination of Short and Long theory Questions.

Date of showing Mid Term Examination Answer Sheets: Within a week after completion of mid Sem examination.

I7. END TERM EXAMINATION: WEIGHTAGE – 50%

End Term Examination shall be Three Hours duration and shall be a combination of Short and Long theory/numerical Questions.

I8. GRADING:

The overall marks obtained at the end of the semester comprising all the above three mentioned shall be converted to a grade. Each faculty member will prepare individual award sheet for their respective classes. No common grading will be there.

H. DETAILED SESSION PLAN

Module/ Session	**TOPICS**	**Course Outcomes Addressed**	**Required Learning Resources (including media)**	**Pedagogy/ Discussion(s)/ Postings**	**Assessment**
Module 1 Introduction to Operating system*					
1	Introduction to operating system, Its need and operating system services, Modes of operating systems	**CO1**		**F2F Lecture**	
2	Operating system classification, Distributed system and	**CO1**		**F2F Lecture**	

	real time system(overview)				
3	System Calls, API and parameter passing mechanism, Interrupts	**CO1**	**Online**	**Readings/ brief video/ presentation**	
Module 2 Process Management and CPU Scheduling					
4	Introduction to process concept,	**CO2**		**F2F Lecture**	
5	Process state diagram, PCB, context switching	**CO2**		**F2F Lecture**	
6	Preemptive v/s Non Preemptive cases, Types of Scheduler.	**CO2**	**Online**	**Readings/ brief video/ presentations**	
7	CPU scheduling,	**CO2**		**F2F Lecture**	
8	CPU Scheduling Algorithms FCFS, SJF	**CO2**		**F2F Lecture**	
9	Multilevel feedback Queue, Multilevel queue and Threads.	**CO2**	**Online**	**Readings/ brief video/ presentations**	
10	Priority Scheduling ,	**CO2**		**F2F LECTURE**	**Quiz-1**
11	Round Robin Scheduling	**CO2**			
Module 3 Process Synchronization and Deadlock					

12	Inter process communication: message passing and shared memory model.	**CO3**	**Online**	**Readings/ brief video/ presentations**	
13	Mutual Exclusion, Busy waiting, two process solution ,	**CO3**		**F2F LECTURE**	**Test-1**
14	Cooperating processes, Race Condition, Critical section	**CO3**		**F2F LECTURE**	
15	Numerical of CPU scheduling and race condition	**CO3**	**Online**	**Readings/ brief video/ presentations**	
16	Semaphores: Binary and Counting Semaphore,	**CO3**		**F2F LECTURE**	**Assignment-1**
17	Producer Consumer and Reader Writer Problem, Monitors	**CO3**		**F2F LECTURE**	
18	Introduction to Deadlock conditions for deadlock, deadlock Prevention	**CO3**	**Online**	**Readings/ brief video/ presentations**	
19	Deadlock avoidance :Bankers algorithm , Safe and unsafe state,	**CO3**		**F2F Lecture**	**Assignment-2**
20	Deadlock detection and recovery	**CO3**		**F2F Lecture**	

21	Security mechanism and Policy, Domain of Protection , Access Matrix	**CO3**	**Online**	**Readings/ brief video/ presentations**	
Module 4 Memory Management					
22	Logical versus Physical Address space, Swapping,	**CO4**		**F2F Lecture**	
23	Multiprogramming with fixed and variable partitions.	**CO4**		**F2F Lecture**	
24	Memory management with bit maps, linked list, buddy system-allocation of swap space.	**CO4**	**Online**	**Readings/ brief video/ presentations**	
25	Paging, page tables,	**CO4**		**F2F Lecture**	
26	associative memory inverted page tables.	**CO4**		**F2F Lecture**	
27	Segmentation	**CO4**	**ONLINE**	**Readings/ brief video/ presentations**	
28	Virtual memory and Allocation algorithm**,**	**CO4**		**F2F Lecture**	**Quiz-2**
29	Page replacement algorithm, Thrashing,	**CO4**		**F2F Lecture**	

	techniques to avoid thrashing				
Module 5 File Systems and Disk Scheduling					
30	File systems and I/O files, File concepts, access methods	**CO5**	**Online**	**Readings/ brief video/ presentations**	
31	File system implementation, file allocation techniques	**CO5**		**F2F Lecture**	
32	Directory Structure	**CO5**	**Online**	**Readings/ brief video/ presentations**	
33	Introduction to disk structure,	**CO5**		**F2F Lecture**	**Class Test-2**
34	Disk Scheduling algorithm: FCFS , SSTF, C scan , look scan . c- look	**CO6**		**F2F Lecture**	
35	Principles of IO, IO devices, device controller, DMA	**CO6**	**ONLINE**	**Readings/ brief video/ presentations**	
36	Revision	**CO6**		**F2F Lecture**	

Suggested Readings:

Text Book

T1. SILBERSCHATZ, Galvin (2010) , Operating System Concepts 8e , Wiley India.
T2. William Stallings, "Operating systems", Pearson Education, Fifth edition.
T3. D.M. Dhamdhere, "Operating Systems", 2nd Edition, Tata McGraw-Hill.

Reference book:

R1. Garry Nutt, "Operating Systems – A Modern perspective ", Third Edition, Pearson
Education.
R2. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall.
R3. Bach, M.J., "Design of UNIX Operating System", Prentice Hall.
R4. Charles Crowley, "Operating systems – A Design Oriented Approach", Tata Mc Grawhill, 1997.
R5. Michel Palmer "Guide o Operating Systems", Vikas Thomson Learning Publishing,
NewDelhi.

GUIDELINES

***Cell Phones and other Electronic Communication Devices*:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the class room.

E-Mail and online learning tool: Each student in the class should have an e-mail id and a pass word to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments preferably should be uploaded on online learning tool. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.

Attendance: Students are required to have **minimum attendance of 75%** in each subject. Students with less than said percentage shall **NOT** be allowed to appear in the end semester examination.

Course outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the

student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.

Passing criterion: Student has to secure minimum 30%/40% marks of the "highest marks in the class scored by a student in that subject (in that class/group class)" individually in both the 'End-Semester examination' and 'Total Marks' in order to pass in that paper.

- Passing Criterion for B. Tech: minimum 40% of the highest marks in the class
- Passing Criterion for M. Tech: minimum 40% of the highest marks in the class

Sample format for Indirect Assessment of Course outcomes

NAME:
ENROLLMENT NO:
SAP ID:
COURSE:
PROGRAM:

Please rate the following aspects of course outcomes of Operating Systems

Use the scale 1-4*

Sl. No.		1	2	3	4
1	**CO1**: Understand basic concepts of Operating System and its Functions				
2	**CO2**. Understand the process management and CPU scheduling algorithm.				
3	**CO3.**Design solution for process synchronization, inter process communication and deadlock handling				
4	**CO4**.Identify how operating system allocates and manages memory along with concepts and needs of virtual memory.				
5	**CO5:** Evaluate File Systems, Directory Structures and Access Control Mechanism.				
6	**CO6:** Measure Performance of Disk Scheduling Technique.				

* 1 Below Average 3 Good

2 Average 4 Very Good