

PART A: Introduction			
Program: Degree		Class: B.Sc.	Year: III Year
Session: 2023-24			
Subject: Computer Science			
1.	Course Code	S3-COSC1D	
2.	Course Title	Operating System (Group A – Paper I) (Theory)	
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational)	Discipline Specific Elective	
4.	Pre-Requisite (if any)	This course can be opted as an elective by the students of Computer Science.	
5.	Course Learning Outcomes (CLO)	<p>After the completion of this course, a student shall be able to do the following:</p> <ul style="list-style-type: none"> • Describe the importance of computer system resources and the role of operating system in their management policies and algorithms. • Specify objectives of modern operating systems and describe how operating systems have evolved over time. • Understand various process management concepts and can compare various scheduling techniques, synchronization, and deadlocks. • Describe the concepts of multithreading and memory management techniques. • Identify the best suited memory management technique for any process. • Describe various file operations, file allocation methods and disk space management. • To understand and identify potential threats to operating systems and the security features design to guard against them. • Learn to operate the Linux system, along with its administration and Shell programming • Getting to know the Android OS and its application framework. 	
6.	Credit Value	Theory - 4 Credits	
7.	Total Marks	Max. Marks : 30+70	Min. Passing Marks: 35
PART B: Content of the Course			
No. of Lectures (in hours per week): 2 Lectures per week			
Total No. of Lectures: 60 Hrs.			
Module	Topics		No. of Lectures
I	Introduction to Operating System: What is Operating System? History and Evolution of OS, Basic OS functions, Resource Abstraction, Types of Operating Systems– Multiprogramming Systems, Batch Systems, Time Sharing Systems; Operating Systems for Personal Computers, Workstations and Hand-held Devices, Process Control & Real time Systems.		4

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	Keywords: <i>Functions of OS, resource abstractions, multiprogramming, time sharing, workstation.</i>	
II	<p>Process Management: Process Concepts, Process states & Process Control Block.</p> <p>Process Scheduling: Scheduling Criteria, Scheduling Algorithms (Preemptive & Non-Preemptive) – FCFS, SJF, SRTN, RR, Priority, Multiple-Processor, Real-Time, Multilevel Queue and Multilevel Feedback Queue Scheduling.</p> <p>Deadlock - Definition, Deadlock Characterization, Necessary and Sufficient Conditions for Deadlock.</p> <p>Deadlock Handling Approaches: Prevention, Avoidance, Detection and Recovery.</p> <p>Keywords: <i>process states, preemptive and non-preemptive scheduling, FCFS, SJF, RR, deadlock.</i></p>	10
III	<p>Memory Management: Introduction, Address Binding, Logical versus Physical Address Space, Swapping, Contiguous & Non-Contiguous Allocation, Fragmentation (Internal & External), Compaction, Paging, Segmentation, Virtual Memory, Demand Paging, Performance of Demand Paging, Page Replacement Algorithms.</p> <p>File Management: Concept of File System (File Attributes, Operations, Types), Functions of File System, Types of File System, Access Methods (Sequential, Direct & other methods), Directory Structure (Single-Level, Two-Level, Tree-Structured, Acyclic-Graph, General Graph), Allocation Methods (Contiguous, Linked, Indexed).</p> <p>Keywords: <i>swapping, fragmentation, paging, virtual memory, file management, directory structure.</i></p>	10
IV	<p>Disk Management: Structure, Disk Scheduling Algorithms (FCFS, SSTF, SCAN, C-SCAN, LOOK), Swap Space Management, Disk Reliability, Recovery.</p> <p>Security: Security Threats, Security policy mechanism, Protection, Trusted Systems, Authentication and Internal Access Authorization, Windows Security.</p> <p>LINUX: Introduction, History and features of Linux, advantages, hardware requirements for installation, Linux architecture, file system of Linux - boot block, super block, inode table, data blocks.</p> <p>Linux standard directories, Linux kernel, Partitioning the hard drive for Linux, installing the Linux system, system - startup and shut-down process, init and run levels. Process, Swap, Partition, fdisk, checking disk free spaces.</p> <p>Difference between CLI OS & GUI OS, Windows v/s Linux, Importance of Linux Kernel, Files and Directories. Concept of Open Source Software.</p> <p>Keywords: <i>disk scheduling, recovery, authorization, boot block, kernel, partitioning, open source.</i></p>	10
V	<p>Linux Administration:</p> <p>Types of user-Root and normal user, Multiple logins at same time (Ctrl + Alt + F1, F2..F6), who command.</p> <p>Help: whatis, --help, man command.</p> <p>Basic Commands:</p> <p>For displaying current directory, files and directories of current/absolute/relative location(s), creating, removing, renaming, copying and moving files or directories.</p> <p>For comparing, and editing file content, displaying file content(s) with tr, head, tail, last, grep, sort, piping.</p>	14



	<p>Searching file content or searching file within different directories based on particular search criteria.</p> <p>For implementing general purpose utilities – calendar, date, calculator, basic arithmetic expressions, compression and extraction of file/directory.</p> <p>Text editors: vi, joe, vim, gedit, atom, nano etc. Command mode & Insert mode, cut, yank, undo.</p> <p>Managing multiple processes: connecting processes with pipes, tee, redirecting input output, changing process priority with nice, cron commands, kill, ps.</p> <p>Managing user accounts- Sudo, users: useradd, usermod, userdel, passwd.</p> <p>Group: Primary & Secondary Group, chgrp, chown, groupadd, groupdel.</p> <p>Permissions: adding and removing permissions.</p> <p>Package installation through GUI/ apt-get/yum/dnf.</p> <p>Keywords: <i>head, tail, grep, sort, piping, yank, kill, chgrp, chown, groupadd.</i></p>	
VI	<p>Shell Programming: Types of Shells, Shell Meta Characters - \$#, \$*, \$?, Shell Variables, Shell Scripts, Debugging scripts, echo, read, operators, keywords, Integer Arithmetic and String Manipulation, Functions, I/O Redirection and Piping.</p> <p>Decision Making: if-else-elif-fi, case-esac.</p> <p>Loop Control: while, for, until, break & continue.</p> <p>Automation and Exception Handling: Creating shell programs for automating tasks, file handling, trapping signals etc.</p> <p>Android Operating System: Introduction, Development Framework, Application Architecture, Process Management and File System, Small Application Development using Android Development Framework.</p> <p>Indian contribution to the field – the BOSS operating system, open source softwares, growth of LINUX, Aryabhata Linux, contributions of innovators – Rajen Sheth, Sunder Pichai etc.</p> <p>Keywords: <i>shell programming, exception handling, Android development framework. BOSS OS, Linux, Arya Bhatt, Rajen Sheth, Sunder Pichai.</i></p>	12

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

Textbooks:

- A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, John Wiley Publications.
- A.S. Tanenbaum, Modern Operating Systems, Pearson Education.
- J.L.Peterson, Operating System Concepts.
- Sumitabh Das, Linux, TMH.

Reference Books:

- G. Nutt, Operating Systems: A Modern Perspective, Pearson Education.
- W. Stallings, Operating Systems, Internals & Design Principles, Pearson Education.
- M. Milenkovic, Operating Systems- Concepts and Design, Tata McGraw Hill.

Suggestive digital platform web links

<https://web.iitd.ac.in/~minati/MTL458.html>

<https://www.cse.iitb.ac.in/~mythili/os/>

<https://www.youtube.com/watch?v=aCJ3YgoolHQ>

Suggested equivalent online courses

<https://nptel.ac.in/courses/106/102/106102132/>

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PART D: Assessment and Evaluation

Suggested Evaluation Methods:

Maximum Marks: 100

Continuous Comprehensive Evaluation (CCE): 30 Marks

University Exam (UE): 70 Marks

Internal Assessment: Continuous
Comprehensive Evaluation (CCE)

Class Tests/ Presentation /
Assignment

30 Marks

External Assessment:

University Exam (UE):

Time : 03.00 Hours

Section (A) : Very Short
Questions
Section (B) : Short Questions
Section (C) : Long Questions

70 Marks

Any remarks/suggestions:



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Chairman, Central Board of Studies, Computer Science

PART A: Introduction			
Program: Degree		Class: B.Sc.	Year: III Year
Session: 2023-24			
Subject: Computer Science			
1.	Course Code	S3-COSC1Q	
2.	Course Title	Operating System Lab (Group A – Paper I) (Practical)	
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational)	Discipline Specific Elective	
4.	Pre-Requisite (if any)	This course can be opted as an elective by the students of Computer Science.	
5.	Course Learning Outcomes (CLO)	<p>After the completion of this course, a student shall be able to do the following:</p> <ul style="list-style-type: none"> • Operate the Linux system, along with its administration and Shell programming. • Understand and be familiar with the Linux environment. • Learn and run the various Linux commands. • Use vi editor for programming. • Learn and run the shell scripting programs. 	
6.	Credit Value	Practical – 2 Credits	
7.	Total Marks	Max. Marks : 100	Min. Passing Marks: 35
PART B: Content of the Course			
No. of Lab. Practicals (in hours per week): 1 Lab. per week			
Total No. of Lab.: 30 Hrs.			
Suggestive List of Practicals			No. of Labs.
<p>I. Linux:</p> <p>a) Linux Directory Commands: pwd, mkdir, rm -rf, ls, cd, cd /, cd ~</p> <p>b) Linux File Commands: touch, cat, cat >, cat >>, rm, cp, mv, rename</p> <p>c) Linux Permission Commands: su, id, useradd, passwd, groupadd, chmod, groupdel, chown, chgrp</p> <p>d) Linux File Content & Filter Commands: head, tail, tac, more, less, grep, cat, cut, grep, comm, sed, tee, tr, uniq, wc, od, sort, diff.</p> <p>e) Linux Utility Commands: find, bc, locate, date, cal, sleep, time, df, mount, exit, clear, gzip, gunzip.</p> <p>f) Linux Networking Commands: ip, ssh, mail, ping, host</p> <p>g) Edit Crontab file: to wall message on system on particular time automatically.</p> <p>h) Vi editor: Create file, edit, save and quit. Highlighting the searched term within a file, cut, yank, undo.</p> <p>II. Shell Scripting:</p> <p>a) Write a shell script to print a message.</p>			30

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	b) Write a shell script to access arguments passed on command line. c) Write a shell script to create files with the names passed on command line. d) Write a shell script to input number from user and display its factorial. e) Write a shell script to input file name and create multiple directories individually for the name in the file given. f) Write a shell script to input number from user and display whether it is prime number or not. g) Write a shell script to list all the files in any directory given by the user h) Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory.	
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PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

- Richard Peterson, Linux: The Complete Reference, TMH
- Sumitabh Das , Linux , McGraw Hill
- Jason Cannon, Linux for Beginners, Createspace Independent Publishing Platform
- William E. Shotts Jr., The Linux Command Line: A Complete Introduction, O'Reilly Media, Inc.

Suggestive digital platform web links

- <https://web.iitd.ac.in/~minati/MTL458.html>
<https://www.cse.iitb.ac.in/~mythili/os/>
<https://www.youtube.com/watch?v=aCJ3YgodlHQ>

Suggested equivalent online courses

- <https://nptel.ac.in/courses/106/102/106102132/>
<https://www.youtube.com/watch?v=QHCMfsNpgCc>

PART D: Assessment and Evaluation

Internal Assessment :		External Assessment :	
Class Interaction/Quiz	30	Viva voce practical	70
Attendance		Practical record file	
Assignments (Charts/ Model)/ Technology Dissemination/ Excursion/ Lab visit/ Industrial Training		Table work / Experiments	

Total Marks: 100

Any remarks/ suggestions:



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 Chairman, Central Board of Studies, Computer Science

PART A: Introduction			
Program: Degree	Class: B.Sc.	Year: III Year	Session: 2023-24
Subject: Computer Science			
1.	Course Code	S3-COSC2D	
2.	Course Title	Programming with Python (Group A – Paper II) (Theory)	
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational)	Discipline Specific Elective	
4.	Pre-Requisite (if any)	To study this course, a student must have successfully completed the course on Programming at Certificate/Diploma Levels. This course can be opted as an elective by the students of Computer Science.	
5.	Course Learning Outcomes(CLO)	<p>After studying this subject, students shall be able to –</p> <ul style="list-style-type: none"> ● Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. ● Express proficiency in the handling of strings, functions and file handling. ● Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. ● Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python with class, modules and packages. ● Identify the commonly used operations involving database connectivity and use of tkinter for GUI programming. 	
6.	Credit Value	Theory - 4 Credits	
7.	Total Marks	Max. Marks : 30+70	Min. Passing Marks: 35
PART B: Content of the Course			
No. of Lectures (in hours per week): 2 Lectures per week			
Total No. of Lectures: 60 Hrs.			
Module	Topics		No. of Lectures
I	<p>Python Basics : Python interpreter, Python idle, dynamically typed and strongly typed features, basic data types, variables, expressions, statements, operators, flow of execution. Input and Output statements, Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration: while, for, break, continue, pass, implementing 'for' through range(), 'in' and 'not in' operators for sequence traversal. Creating and executing .py scripts.</p> <p>Keywords: <i>interpreter, while, for, break, continue, scripts.</i></p>		12
II	<p>Data Structures: Lists- append, extend, insert, index, remove, pop, count, sort, reverse, slicing, list comprehension, Copying a list: deep copy, shallow copy. Tuples- index, count, usage, use of tuples as a swap function. Dictionaries-keys, values, tuples, nested dictionaries, dictionary</p>		12

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	comprehension. Strings- Single line and multi-line strings, formatter, isdigit, isalpha, isalnum, islower, istitle, isspace, title, lower, upper, strip, split, splitlines, join etc. Sets – union, intersection, subset, superset, difference, symmetric difference, copy, add, remove, discard etc. Keywords: <i>index, sort, deep copy, tuples, dictionary, sets, strings.</i>	
III	Functions & File Handling: Inbuilt Functions- id, len, chr, ord etc., defining and calling a function, arguments, global versus local variables, defining and using lambda functions, the map(), filter(), reduce() functions. Working with files : read, write and append modes: r, w, a, x, r+, w+, a+, x+, reading-read(), readline(), readlines(), writing-write(), writelines(), seek(), tell(). Word count, copy file scripts through file handling concepts. Keywords: <i>function, calling a function, arguments, global variables, read, write, copy, seek.</i>	12
IV	Classes, modules and exceptional handling: Classes: Introduction, Member variables and defining methods, constructor, destructor, data encapsulation, inheritance, multiple inheritance, diamond problem solving technique of python. Modules: inbuilt modules- sys, random, time etc. import, from...import, from...import*. Constructing packages, role of __init__.py Exceptional Handling: The try-except-else-finally block, the raise statement, the hierarchy of exceptions, adding exceptions Keywords: <i>class, constructor, destructor, encapsulation, inheritance, exception, modules.</i>	12
V	Database & GUI Programming: Importing sqlite, connecting to database, creating table, insert, select, update, delete, drop tables, accessing and modifying tables through python. Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes – sizes, fonts, colors layouts, nested frames. Keywords: <i>GUI, tables, database, insert, update, drop tables, event- driven programming, dialogs, frames.</i>	12

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

Textbooks:

- Taneja Sheetal & Kumar Naveen, “Python Programming: A modular approach”, Pearson.
- Liang Y. Daniel, “Introduction to Programming Using Python”, Pearson.

Reference Books:

- Zed A. Shaw, “Learn Python the Hard Way”, Zed Shaw's Hard Way Series.
- Charles Dierbach, “Introduction to Computer Science using Python”, Wiley.
- Michael T. Goodrich, “Data Structures and Algorithms in Python”, Wiley.

Suggestive digital platform web links

<https://www.guru99.com/how-to-install-python.html>
<https://www.udemy.com/course/pythonforbeginnersintro/>



https://www.python.org/about/gettingstarted/ https://spoken-tutorial.org/media/videos/89/Python-3.4.3-Instruction-Sheet-English.pdf		
Suggested equivalent online courses		
https://nptel.ac.in/courses/106/106/106106145/ https://www.youtube.com/watch?v=rfs0Vt1bw https://onlinecourses.swayam2.ac.in/aic20_sp33/preview		
PART D: Assessment and Evaluation		
Suggested Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE): 30 Marks University Exam (UE): 70 Marks		
Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Tests/ Presentation / Assignment	30 Marks
External Assessment: University Exam (UE): Time : 03.00 Hours	Section (A) : Very Short Questions Section (B) : Short Questions Section (C) : Long Questions	70 Marks
Any remarks/suggestions:		



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Session: 2023-24			
Subject: Computer Science			
1.	Course Code	S3-COSC2Q	
2.	Course Title	Python Programming Lab (Group A – Paper II) (Practical)	
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational)	Discipline Specific Elective	
4.	Pre-Requisite (if any)	To study this course, a student must have successfully completed the course on Programming at Certificate/Diploma Levels. This course can be opted as an elective by the students of Computer Science.	
5.	Course Learning Outcomes(CLO)	After studying this subject, students shall be able to – <ul style="list-style-type: none"> • Understand the python environment and its text editor. • Code and run the programs. • Debug the program. • Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. • Identify the commonly used operations involving database connectivity and use of tkinter for GUI programming. 	
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Total No. of Lab.: 30 Hrs.			
Suggestive List of Practicals			No. of Labs.
<ol style="list-style-type: none"> 1. Find all numbers which are multiple of 17, but not the multiple of 5, between 2000 and 2500. 2. Print the first 2 and last 3 characters in a given string. Use the string slicing. 3. Write a program that eliminates duplicates in a list. 4. Implement shallow copy and deep copy of a list. 5. Find the largest of n numbers, using a user defined function largest() 6. Write a function that capitalizes all vowels in a string. 7. Read a line containing digits and letters. Write a program to give the count of digits and letters. 8. Write a function myReverse() which receives a string as an input and returns the reverse of the string. 9. Use the list comprehension methodology in python, to generate the squares of all odd numbers in a given list. 10. Generate a dictionary and print the same. The keys of the dictionary should be integers between 1 and 10 (both inclusive). The values should be the cubes of the corresponding keys. 			30



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- James E Smith, Ravi Nair, "Virtual Machines", Morgan Kaufmann Publishers.

Suggestive digital platform web links

https://www.tutorialspoint.com/cloud_computing/cloud_computing_tutorial.pdf

<https://www.cse.iitb.ac.in/~cs695/>

https://www.cse.iitb.ac.in/~convergence/workshops/Intro_to_Virtualization.pdf

Suggested equivalent online courses

<https://nptel.ac.in/courses/106/105/106105167/>

PART D: Assessment and Evaluation

Internal Assessment :

Class Interaction/Quiz

Attendance

Assignments (Charts/
Model)/ Technology

Dissemination/ Excursion/

Lab visit/ Industrial Training

30

External Assessment :

Viva voce practical

Practical record file

Table work / Experiments

70

Total Marks: 100

Any remarks/ suggestions:



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