Department of Computer Science

Bachelor of Science in Computer Science and Statistics Academic Year 2023-24

CHRIST (Deemed to be University) Bangalore
Hosur Main Road, Bengaluru, Karnataka 560029

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CHRIST (Deemed to be University)
SCHOOL OF SCIENCES

Bachelor of Science (Computer Science, Statistics/Honours/Honours with Research)
Programme Structure 2023-24

I. Programme Details:

Name of the Programme: **Bachelor of Science (Computer Science, Statistics/Honours/Honours with Research)** (As updated in the spreadsheet mentioning whether Honours / Honours with research is offered)
Previous programme title: **Bachelor of Science in Computer Science and Mathematics, and Statistics (BSc CMS)**

Offering Department: **COMPUTER SCIENCE**
Name of the School: **SCHOOL OF SCIENCES**

II. Brief description about the Programme:

The BSc (Computer Science, Statistics) is a dual major graduate programme, to nurture the confidence and skills of the students in Computer Science and Statistics. It aims to impart sound fundamentals and specialized aspects of the Computer science and Statistics. The main objective of this course is to cultivate statistical thinking among students by acquainting them with various statistical methods and their applications in different fields. First four semesters give them in-depth knowledge in theoretical aspects of the subject whereas in the last two semesters, the students are exposed to the application of the subject in various fields like industry, agriculture and population studies. Also, the students are trained in using software packages for data analysis.

III. Minimum Eligibility:

- Basic eligibility for the programme is a pass at the +2 level (Karnataka PUC / ISC / CBSE / NIOS / State Boards) from any recognized Board in India.
- It is compulsory to have studied (Mathematics / Statistics) at Class XII level.
- Students pursuing International curriculum is according to AIU stipulations:
- Applicants pursuing IB curriculum must have 3 HL and 3 SL with 24 credits.
- Applicants pursuing GCE / Edexcel must have a minimum of 3 A levels, grade not less than C.
- Candidates writing their final year examinations in March-May are also eligible to apply.

Programme Outcomes:

PO1: Understand and apply the fundamental principles, concepts and methods in key areas of science and multidisciplinary fields
PO2: Demonstrate problem solving, analytical and logical skills to provide solutions for the scientific requirements
PO3: Develop the critical thinking with scientific temper
PO4: Communicate the subject effectively

PO5: Understand the importance and judicious use of technology for the sustainable growth of mankind in synergy with nature
PO6: Develop a strong foundation in statistical theory to compete in a broad range of scientific, government, financial, health, technical and other fields.
PO7: Analyze, interpret and report the findings of experiments or studies accurately using statistical tools and models.
PO8: Acquire analytical and problem-solving skills using appropriate principles and methodologies of statistics in real life applications.

IV. Programme Structure

BSC CS Semester - 01				
Course Code	**Course**	**Type**	**Hours Per Week**	**Credits**
CSC101-1	Digital Computer Fundamentals and C Programming (CIA Only)	Major Core	6 (2+4)	4
STA101-1C	Descriptive Statistics	Major Core	4	4
MAT101-1C	Mathematics - I	Allied Core	3	3
	English	AEC	2	2
STA161-1	Computational Statistics	SEC	3	3
CSC162-1	Data analysis using Spreadsheet (CIA Only)	SEC	3	3
	Holistic Education Development (HED)	VAC	1	1
	Environmental Science (EVS)	VAC	1	1
			22	**21**
BSC CS Semester - 02				
Course Code	**Course**	**Type**	**Hours Per Week**	**Credits**
CSC102-2	Data Structures (CIA Only)	Major Core	5	4
CSC103-2	Operating systems (CIA Only)	Major Core	4	4
STA101-2C	Probability Distributions	Major Core	4	4
STA102-2C	R Programming	Major Core	5	4
MAT102-2C	Mathematics - II	Allied Core	3	3
	English	AEC	3	2
	Holistic Education Development (HED)	VAC	1	1
	Indian Constitution (IC)	VAC	1	1
			26	**23**
Summer Internship for 4 credits in case of Exit				

BSC CS Semester - 03				
Course Code	**Course**	**Type**	**Hours Per Week**	**Credits**
CSC201-3C	Java Programming	Major Core	5	4
STA201-3C	Statistical Inference	Major Core	3	3
STA211-3C	Statistical Inference Lab	Major Core (Practical)	2	1
	Multi Disciplinary Course	MDC	3	3
	Modern Indian Languages (MIL)	AEC	3	2
CSC261-3C	Web Application Development	SEC	3	3
	Holistic Education Development (HED)	VAC	1	1
	Summer Internship	Internship	4	4
			24	21
BSC CS Semester - 04				
Course Code	**Course**	**Type**	**Hours Per Week**	**Credits**
CSC202-4C	Database Management System and Software Engineering	Major Core	5	4
CSC203-4C	Mobile Application	Major Core	5	4
STA301-4C	Linear Regression Modelling	Major Core	3	3
STA311-4C	Linear Regression Modelling Lab	Major Core (Practical)	2	1
STA312-4C	Elements of Stochastic Processes	Major Core	4	4
	Modern Indian Languages (MIL)	AEC	3	2
	Holistic Education Development (HED)	VAC	1	1
			23	**19**
BSC CS Semester - 05				
Course Code	**Course**	**Type**	**Hours Per Week**	**Credits**
CSC301-5C	Design and Analysis of Algorithms	Major Core	4	4
CSC302-5C	Computer Networks	Major Core	5	4
CSC303-5C	Computer Science Mini Project - I	Major Core	5	4

STA401-5	Time Series Analysis and Forecasting Techniques	Major Core	4	4
STA411-5	Time Series Analysis and Forecasting Techniques Lab	Major Core (Practical)	2	1
STA402A-5 STA402B-5 STA402C-5	Applied Statistics Statistical Quality Control Categorical Data Analysis	Major Core (Electie)	4	4
STA481-5	Statistics Project-I	Major Core (Project)	3	3
			27	**24**

BSC CS Semester - 06

Course Code	Course	Type	Hours Per Week	Credits
CSC304-6C	Artificial Intelligence	Major Core	5	4
CSC305-6C	Cloud Computing	Major Core	5	4
CSC381-6C	Computer Science Project I	Major Core (Project)	5	4
STA401-6	Design of Experiments	Major Core	4	4
STA402A-6 STA402B-6 STA402C-6	Survival Analysis Actuarial Statistics Operations Research	Major Core (Elective)	4	4
STA412-6	Design of Experiments Lab	Major Core (Practical)	2	1
STA481-6	Statistics Project-II	Major Core (Project)	3	3
			28	**24**

STREAM - I : Fourth Year

Stream A : BSC Computer Science - Honors (Tentative)

BSC Computer Science Honors : Semester - 07

Course Code	Course	Type	Hours Per Week	Credits
CSC401-7C	Data mining and datawarehouse	Major Core	5	4
CSC402-7C	Research Methodology	Major Core	5	4
CSC403-7C	Machine Learning	Major Core	5	4
CSC404-7C	Internet of Things	Major Core	5	4
CSC481-7C	Specialization Project – I	Dissertation	8	6

			28	**22**

BSC Computer Science Honors : Semester - 08

Course Code	Course	Type	Hours Per Week	Credits
CSC405-8C	Neural Networks and Deep Learning	Major Core	5	4
CSC406-8C	Computer Vision	Major Core	5	4
CSC407-8C	User Interface and Experience Design (UI/UX)	Major Core	5	4
CSC408-8C	Data Analytics	Major Core	5	4
CSC482-8C	Specialization Project – II	Dissertation	8	6
			28	**22**

Stream B : BSC Computer Science - Honors with Research (Tentative)

BSC Honors with Research : Semester - 07

Course Code	Course	Type	Hours Per Week	Credits
CSC401-7C	Data Mining and Data warehouse	Major Core	5	4
CSC403-7C	Machine Learning	Major Core	5	4
CSC411-7C	Research Methodology/Essentials of Data Collection Ethics	Major Core	5	4
CSC412-7C	Research – Problem Identification	Major Core	5	4
CSC483-7C	RESEARCH PROJECT 01 Research – Data collection	Research / Dissertation	8	6
	Total		**28**	**22**

BSC Honors with Research : Semester - 08

Course Code	Course	Type	Hours Per Week	Credits
CSC408-8C	Data Analytics	Major Core	5	4
CSC405-8C	Neural Networks and Deep Learning	Major Core	5	4
CSC415-8C	Research : Computational Modeling	Major Core	5	4
CSC416-8C	Research : Implementation	Major Core	5	4
CSC484-8C	RESEARCH PROJECT 02	Research / Dissertation	8	6
	Total		**28**	**22**

STREAM - II : Fourth Year				
Stream A : BSC Statistics - Honors (Tentative)				
BSC Statistics Honors: Semester - 07				
Course Code	**Course**	**Type**	**Hours Per Week**	**Credits**
STA501-7	Measure and Probability theory	Major Core	4	4
STA502-7	Distribution theory	Major Core	4	4
STA503A-7 STA503B-7 STA503C-7	Multivariate Reliability Bayesian Statistics	Major Core	4	4
STA504-7	Research Methodology and Elements of LaTeX	Major Core	4	4
STA581-7	Project	Project	12	6
	Total		**28**	**22**
BSC Statistics Honors: Semester - 08				
Course Code	**Course**	**Type**	**Hours Per Week**	**Credits**
STA501-8	Advanced Statistical Inference	Major Core	4	4
STA502-8	Stochastic Modeling	Major Core	4	4
STA503A-8 STA503B-8 STA503C-8	High Dimensional Statistics Clinical trails Actuarial methods	Major Core (Elective)	4	4
STA504A-8 STA504B-8 STA504C-8	Statistical Machine Learning Optimization Techniques Non parametric methods	Major Core	4	4
STA581-8	Research	Research project	12	6
	Total		**28**	**22**
Stream B : BSC Statistics - Honors with Research (Tentative)				
BSC Statistics Honors with research : Semester - 07				
Course Code	**Course**	**Type**	**Hours Per Week**	**Credits**
STA501-7	Measure and Probability theory	Major Core	4	4
STA505-7	Advanced Distribution theory	Major Core	4	4

STA506-7	Numerical Methods and Monte Carlo Simulation	Major Core	4	4
STA504-7	Research Methodology and Elements of LaTeX	Major Core	3	3
STA511-7	Numerical Methods and Monte Carlo Simulation Lab	Major Core(P)	2	1
STA581-7	Project	Project	12	6
	Total		**29**	**22**

BSC Statistics Honors with research : Semester - 08

Course Code	Course	Type	Hours Per Week	Credits
STA501-8	Advanced Statistical Inference	Major Core	4	4
STA502-8	Stochastic Modeling	Major Core	4	4
STA507A-8 STA507B-8 STA507C-8	Multivariate Reliability Bayesian Statistics	Major Core (Elective)	4	4
STA504A-8 STA504B-8 STA504C-8	Statistical Machine Learning Optimization Techniques Non parametric methods	Major Core	4	4
STA581-8	Research project and Publication	Research project	12	6
	Total		**28**	**22**

V. Summary of the programme structure

Category of Course as per UGC	**Minimum Credit requirement**	
	3 Year UG	**4 Year UG**
Major (Core)	96	96+32
Minor	6	6
Multidisciplinary	9	9
Ability Enhancement Course (AEC)	8	8
Skill Enhancement Courses (SEC)	9	9
Value Added Courses common for all UG	6	6
Summer Internship	4	4
Research Project / Dissertation		12
Total	**135**	**176**

Minimum Credits to Graduate	
Levels	**Minimum Credits**
UG Certificate	43
UG Diploma	84
3-year UG Degree	132
4-year UG Degree (Honours)	172
4-year UG Degree (Honours with Research)	176

I Semester

CSS101-1 - DCF and C Programming

Total Teaching Hours for Semester: 90 **Max Marks: 100**
Credits: 04

Course Objectives

The course provides the fundamentals of C programming, number systems, Boolean algebra and logic gates. The C programming helps the students to solve problems through logical thinking and basic digital logic helps the students to understand the concepts of number systems and Boolean algebra.

Course Learning Outcomes

CO1: Understand the fundamentals of structured programming, number systems, Boolean algebra.
CO2: Learn to implement the concepts of arrays, functions and pointers.
CO3: Learn to implement the concepts of recursion and structures
CO4: To create programs with ethical coding standards.

Unit -1

Teaching Hours: 12

Introduction to Computers & Number systems

Different number systems and their conversions (Decimal, Binary, Octal and Hexadecimal) Binary arithmetic - Addition, subtraction, multiplication and division of binary numbers, 1's and 2's complement, Coding – BCD, Gray and ASCII. Boolean Algebra -Boolean operations and expressions, Laws and rules of Boolean algebra, DE Morgan's Theorem, Boolean expressions, Simplification of Boolean expression.

Unit-2

Teaching Hours: 18

Introduction to C and Control Structure

Data type Declaration. The Decision Control Structure - The if - if-else- Nested if-else statements. Decisions Using switch - The Loop Control Structure While Loop - for Loop - break Statement - continue Statement- do-while Loop.

Lab Exercises: -

Program to implement conditional statements.
Program to implement the concepts of while loop, for and do while loops.
Program to implement the switch and nested switch statements

Unit-3

Teaching Hours: 20

Arrays

A Simple Program Using Array - Array Initialization - Two Dimensional Arrays- Initializing a 2-Dimensional Array - Memory Map of a 2-Dimensional Array – Strings - Standard Library String Functions - strlen( ) - strcpy( ) - strcat() - strcmp() - Two-Dimensional Array of Characters.

Lab Exercises: -

Program to implement 1D array concept and 2D array concepts
program to implement multidimensional array

Program based on string concepts.

Unit-4

Teaching Hours: 20

Functions & Pointers

Function - Passing Values between Functions - Scope Rule of Functions - Calling Convention - Return Type of Function - Call by Value and Call by Reference - An Introduction to Pointers - Pointer Notation – Recursion.

Lab Exercises: -

Program to implement functions.
Program demonstrating recursion functions.
Program to implement pointer expression

Unit-5

Teaching Hours: 20

Macros and Structures

Introduction to macros, Structures - Declaring a Structure - Accessing Structure Elements - Storing structure elements and Unions.

Lab Exercises: -

Program to demonstrate call by value and call by reference.
Program to demonstrate structures and union.
Program to implement nested structures

Essential Reading

[1] Yashavant P. Kanetkar, *Let Us C*, 15th Edition, BPB Publications, 2012.

Recommended Reading

Byron Gottfried and Jitender Chhabra, *Programming with C*, 3rd Ed, Tata McGrawHill, 2010.
Balagurusamy E, *Programming in ANSI C,* 4th Edition, Tata-McGraw-Hill, 2007.
Deitel H M and Deitel P J, C - *How to Program*, 7th Edition, Prentice-Hall, 2012.
Susant K Rout, *Cimple,C,* Tata-McGraw-Hill Publishing Company Ltd., 2016.

Web Resources:

www.w3cschools.com
https://archive.ics.uci.edu
www.programiz.com

CO – PO Mapping

(please take up the strength mapping here, map your COs to POs at -, 1, 2, and 3)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	2	1	1	2	1
CO2	3	3	3	2	1	2	1	2

CO3	3	3	3	1	1	2	1	2
CO4	2	3	3	2	2	3	2	2

CSS163-1 – DATA ANALYSIS USING SPREADSHEET

Total Teaching Hours for Semester: 45
Max Marks: 50 **Credits: 2**

Course Objectives
This course will provide students with hands-on experience and skills with a spreadsheet. Students will learn the various functions and commands of the spreadsheet as well as how to plan, create, and program spreadsheets for common business applications. It is appropriate for accounting and business majors, programmers and spreadsheet application developers.

Course Outcomes
CO1: To use and leverage on the functionalities of spreadsheet
CO2: To familiarize the students with process and techniques of data analysis with the use of spreadsheet
CO3: To enable students to apply and take logical decisions

Unit-1 **Teaching Hours: 8**
BASICS OF EXCEL
Exploring Data Types - Number Formatting - Working with Rows and Columns - Cells and Ranges - Working with Tables - Sorting and filtering a table - Applying a theme - Using AutoRecover -Password-Protection - Exploring Excel Templates
Lab Exercises:
Simple arithmetic
Text functions, Date and Time functions

Unit-2 **Teaching Hours: 8**
FORMULAS AND FUNCTIONS
Using operators in formulas - Using functions in formulas - Using Formulas in Tables - Text Functions - Advanced Text Formulas - Date-Related Worksheet Functions - Time-Related Worksheet Functions - Working with Single-Cell Array Formulas
Lab Exercises:
Logical operations
Decision making conditional statements

Unit-3 **Teaching Hours: 9**
VISUALIZATION
Creating and Customizing a Chart - Choosing a chart type - Experimenting with different styles - Experimenting with different layouts - Line charts - Pie charts - XY (scatter) charts - Bubble charts - Radar charts - Histogram charts - Pareto charts - Waterfall charts - Box & whisker charts - Treemap charts
Lab Exercises:
Look up functions
Working with arrays

Unit-4 **Teaching Hours: 10**

ANALYSING DATA WITH EXCEL

Importing Data - Data Cleanup Techniques - Exporting Data - Creating a Pivot Table Automatically Creating a Pivot Table - Manually Working with Nonnumeric Data - Creating Pivot Charts - Types of What-If Analyses - Data Sources for Get & Transform

Lab Exercises:

Exploring different types of charts
Working with Pivot table

Unit-5 **Teaching Hours: 10**

PROGRAMMING EXCEL WITH VBA

Introducing VBA Macros - Creating VBA Macros - Recording VBA macros - Examining the macro - Testing the macro - Editing the macro - Writing VBA code - How VBA works? - Objects and collections - Properties - Methods - Variables

Lab Exercises:

Data analysis for a use case
Creation of VBA Macro

Text Book

Excel 2016 Bible, , Wiley, 1st Edition, 2015.

Recommended Reading

Excel 2019 All-in-One for Dummies, Greg Harvey, For Dummies, 1st edition, 2018.
Slaying Excel Dragons, Mike Girvin, Holy Macro! Books, 1st edition, 2016.

Web Resources:

https://www.pdfdrive.com/excel-2019-bible-e184084426.html
https://web.spcollege.edu/instructors/uploads/481c6941b2/CGS1515_Syllabus_Section_0165.pdf
https://www.srcc.edu/sites/default/files/SEC_26922.pdf

CO – PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	-	3	1	2	-	-
CO2	3	3	2	2	2	2	-	1
CO3	2	3	3	3	2	2	1	1

II Semester

CSS102-2 - Data Structures

Total Teaching Hours for Semester: 75
Max Marks: 100 **Credits: 4**

Course Objectives

The course is designed to develop skills to design and analyze simple linear and nonlinear data structures. It strengthens the ability to identify and apply the suitable data structure for the given real-world problem. It enables students to gain knowledge in practical applications of data structures.

Course Learning Outcome

CO1: To understand fundamentals of data structures and their applications essential for programming and problem solving.
CO2: To demonstrate linear representation of data structures: Stack, Queues, Lists, Trees and Graphs.
CO3: To demonstrate sorting and searching algorithms
CO4: To analyze and decide suitable data structure during application development and Problem Solving.

Unit-1 **Teaching Hours: 9+6**

ARRAYS

Introduction to data structures- Abstract Data Type - Arrays – Introduction -Array Operations, Linear Search - Iterative Binary Search – Recursions - Recursive Binary Search.

Lab Exercises:

1. Menu driven program for Inserting, deleting an element into one dimensional array
2. Menu driven program to implement linear search (sentinel) and binary search

Unit-2 **Teaching Hours: 9+6**

Linked List

Introduction: Pointers - Using Dynamically Allocated Storage - Singly Linked Lists - Polynomials, Representing Polynomials as Singly Linked Lists - Circularly Linked Lists - Doubly Linked Lists.

Lab Exercises:

1. Menu driven program to implement singly linked list insertion.
2. Menu driven program to implement singly linked list deletion.

Unit-3 **Teaching Hours: 9+6**

Stack & Queue

Introduction: Stack Operations using arrays and linked lists - Infix to Prefix - Queue Operations using array and linked list.

Applications: Evaluation of Expressions, Evaluating Postfix Expressions, Infix to Postfix.

Lab Exercises:

1. Menu driven program to implement stack operations using an array and linked list
2. Menu driven program to implement queue operations using an array and linked list

Unit-4 **Teaching Hours: 9+6**

Trees

Introduction - Binary Trees- Properties of Binary Trees - Binary Tree Representations - Binary Tree Traversals.

Binary Search Trees: Introduction - Searching a Binary Search Tree - Inserting, Deleting an Element - Limitations of Binary Search Tree.

Lab Exercises:

1. Menu driven program for Binary Tree creation and Traversals

Unit-5 **Teaching Hours: 9+6**

Sorting techniques and Graphs

Sorting: Bubble Sort – Selection Sort – Insertion Sort – Quick Sort.

Graphs: Introduction – Definitions and terminology – Graph representations – Depth First Search – Breadth First Search

Lab Exercises:

1. Menu driven program to implement bubble sort and Selection sort.
2. Menu driven program to implement Insertion sort
3. Menu driven program to implement Quick sort.

Essential Reading

[1] Yashwant Kanetkar, *Data Structures through C*, BPB Publication, 2nd edition, reprint 2016.

Recommended Reading

[1] Horowitz Sahni Anderson-Freed, *Fundamental of Data Structures in C*, Universities Press, Reprint 2009.

[2] Seymour Lipschultz: *Data Structures*, Schaum series TMH, 2010.

Web Resources:

https://www.programiz.com/dsa

https://in.coursera.org/specializations/data-structures-algorithms

CO – PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	1	1	2	3	3
CO2	2	2	2	2	2	1	2	2
CO3	3	3	3	1	1	2	3	3
CO4	2	2	1	1	3	3	3	3

CSS103-2 – OPERATING SYSTEMS

Total Teaching Hours for Semester: 75
Max Marks:100 **Credits: 4**

Course Objectives

The objective of this course is to provide a comprehensive knowledge of operating system concepts, System structure, Process management, Deadlock, Memory management and File system along with the practical exposure by using C – Programming language for the working principles of operating system.

Course Outcomes

CO1: Understand the fundamental principles of operating system and system structure.
CO2: To evaluate the process scheduling, deadlock system and effective memory management.
CO3: To analyse the file structure, directory structure, allocation methods and system security.
CO4: Implement the Operating System concepts by using C – Programming.

Unit-1 **Teaching Hours:9+6**

INTRODUCTION

Introduction - What Operating Systems - Computer-System Organization - Computer-System Architecture - Operating-System Operations - Resource Management - Security and Protection - Virtualization - Distributed Systems - Kernel Data Structures - Computing Environments - Free and Open -Source Operating Systems

OPERATING – SYSTEM STRUCTURES

Operating-System Services - User and Operating-System Interface - System Calls - System Services - Linkers and Loaders - Why Applications Are Operating-System Specific - Operating-System Design and Implementation - Operating-System Structure - Building and Booting an Operating System - Operating-System Debugging

Lab Exercises:

Basic system calls.
Inter-process communication using pipes.

Unit-2 **Teaching Hours: 9+6**

PROCESS MANAGEMENT

Process Concept - Process Scheduling - Operations on Processes – Inter process Communication - IPC in Shared-Memory Systems - IPC in Message-Passing Systems - Examples of IPC Systems - Communication in Client – Server Systems

CPU SCHEDULING

Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Thread Scheduling -Multi-Processor Scheduling - Real-Time CPU Scheduling - Operating-System Examples - Algorithm Evaluation

Lab Exercises:

First-Come, First-Served (FCFS) Scheduling

Shortest-Job-Next (SJN) Scheduling

Unit-3 **Teaching Hours: 9+6**

PROCESS SYNCHRONIZATION

Synchronization Tools: Background - The Critical-Section Problem - Peterson's Solution - Hardware Support for Synchronization - Mutex Locks – Semaphores Deadlocks: System Model - Deadlock in Multithreaded Applications - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock

Lab Exercises:

Priority Scheduling

Shortest Remaining Time

Unit-4 **Teaching Hours:9+6**

MEMORY MANAGEMENT

Main memory: Background - Contiguous Memory Allocation - Paging - Structure of the Page Table - Swapping Virtual Memory: Background - Demand Paging - Copy-on-Write - Page Replacement - Allocation of Frames – Thrashing - Memory Compression

Lab Exercises:

Round Robin(RR) Scheduling

Critical Section problem – Process synchronization

Unit-5 **Teaching Hours: 9+6**

FILE SYSTEM AND SECURITY

File-System Interface: File Concept - Access Methods - Directory Structure File-System Implementation: File-System Structure - File-System Operations - Directory Implementation - Allocation Methods - Free-Space Management - Efficiency and Performance Security: The Security Problem - Program Threats - System and Network Threats Cryptography as a Security Tool - User Authentication

Lab Exercises:

Memory Management

File system

Text Books and Reference Books

Essential Reading

Operating System Concepts, Silberschatz, P.B. Galvin and G. Gagne, Wiley India, New Delhi, 10th Edition, 2018.

Recommended Reading

Operating system Internals and Design Principles, William Stallings, Prentice Hall, 7th Edition, 2017.

Modern Operating Systems, Andrew S. Tanenbaum and Herbert Bos, Pearson Education, 4th Edition, 2014.

Operating Systems, H.M. Deitel, P. J. Deitel, D. R. Choffnes, Pearson Education, 3rd Edition, 2007

CO – PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	2	2	1	1	1	1
CO 2	2	2	1	1	1	1	1	1
CO 3	1	2	2	3	3	1	3	1
CO 4	1	1	2	2	3	3	2	2