Annexure 15.3

Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University under Category "A" by MHRD, Estd. u/s 3 of UGC Act 1956)
Re-accredited with A++ Grade by NAAC. Recognized by UGC Under Section 12 B
Coimbatore-6410043, Tamilnadu, India

Department of Computer Science

Bachelor of Computer Applications

Programme Outcomes

PO1. Attain and apply fundamental knowledge in basic concepts of Science.

PO2. Gain Competence to communicate effectively.

PO3. Develop critical thinking for innovations.

PO4. Identify problems and suggest appropriate scientific, technological and environmental solutions

PO5. Function individually or as a team in a work environment.

PO6. Acquire research skills to inquire, synthesize and articulate solution for community development.

PO7. Create and apply ICT tools for learning and technology development.

PO8. Exhibit professional ethics and norms for social development.

PO9. Implement acquired knowledge in basic sciences for self-directed and lifelong learning.

PO10. Promote entrepreneurial skills.

Programme Specific Outcomes

PSO1: Create computational knowledge base and acquires skill sets in diversified fields of computer applications.

PSO2: Inculcate professional, social, ethical skills and entrepreneurial practices towards holistic development while applying computer concepts

PSO3: Acquire competent skills for thriving career and higher studies in applications of computers.

Scheme of Instruction & Examinations
(for students admitted from 2023-2024 & onwards)

Part	Subject Code	Name of paper/Component	Hours of instruction/ week	Scheme Examination				
				Duration of exam	CIA	CE	Total	Credits
First Semester								
I	23BLT001/ 23BLH001/ 23BLF001	பொதுத்தமிழ்தாள் I - இக்காலஇலக்கியம்/ Prose and Non Detailed Texts/ French I	2	3	50	50	100	2
II	23BAEEC1	**Ability Enhancement Compulsory Course - I** English for Communication	4	3	50	50	100	4
	Generic Elective							
		Generic Elective I	5+1	3	50	50	100	6
III	**Discipline Specific Core Courses**							
	23BCAC01	Computer System Architecture	5+1	3	50	50	100	6
	23BCAC02	Problem Solving using C	4	3	50	50	100	4 6
	23BCAC02P	Problem Solving using C Laboratory	4	3	50	50	100	2
IV	**Skill Enhancement Courses**							
	23BVBNC1/ 23BVBNS1/ 23BVBSP1	**Value Based Course Elective I** NCC/NSS/Sports	3/2	2	60	40	100	4/1/1
	Professional Development Course							
	23BCAPD1	Office Automation	3	-	100	-	100	Remarks
		Games–Practical	1		-	-	-	
		Total	**30**				**Total**	**28/25**
Second Semester								
I	23BLT002/ 23BLH002/ 23BLF002	பொதுத்தமிழ்தாள் II அறஇலக்கியம்/ Grammar, Translation and General Essay /French II	2	3	50	50	100	2
II	23BAEES1	**Ability Enhancement Compulsory Course - II** Environmental Studies	4	3	50	50	100	4
	Generic Elective							
	23BENGE2A/ 23BENGE2B/ 23BENGE2C/ 23BENGE2D	**Generic Elective II Introduction to Literature /British Literature/Modern Indian Literature /New Literatures in English**	5+1	3	50	50	100	6
III	**Discipline Specific Core Courses**							
	23BCAC03	Data Structures	4	3	50	50	100	4 6
	23BCAC03P	Data Structures Laboratory	4	3	50	50	100	2
	23BCAC04	Numerical Analysis and Statistical Methods	5+1	3	50	50	100	6
IV	**Skill Enhancement Courses**							
	23BVBNC2/ 23BVBNS2/ 23BVBSP2	**Value Based Courses Elective I** NCC/NSS/Sports	3/2	2	60	40	100	4/1/1
	Professional Development Course							
	23BCAPD2	Quantitative Aptitude and Reasoning	3	-	100	-	100	Remarks
		Games–Practical	1		-	-	-	
		Total	**30**				**Total**	**28/25**
Internship during Summer Vacation for 15 days								

Part	Subject Code	Name of paper/Component	Hours of instruction /week	Scheme Examination				
				Duration of exam	CIA	CE	Total	Credits
Third Semester								
I	23BLT003/ 23BLH003/ 23BLF003	பொதுத்தமிழ்தாள் III சமயஇலக்கியம்/ Ancient and Modern Poetry/ French III	2	3	50	50	100	2
II	**Generic Elective**							
		Generic Elective III	5+1	3	50	50	100	6
III	**Discipline Specific Core Courses**							
	23BCAC05	Operating Systems	5+1	3	50	50	100	6
	23BCAC06	Programming in Java	4	3	50	50	100	4
	23BCAC06P	Programming in Java Laboratory	4	3	50	50	100	2
IV	**Skill Enhancement Courses**							
	23BSBCS1	**Skill Based Compulsory Course - I** Communication Skill	4P	3	50	50	100	2
		Skill Based Elective Course - II	4P	3	50	50	100	2
	23BVBNC3/ 23BVBNS3/ 23BVBSP3	**Value Based Course Elective I NCC/NSS/Sports**	3/2	2	60	40	100	4/1/1
		Value Based Course Elective II	2	-	100	-	100	2
		Total	**32**				**Total**	**30/27**
Fourth Semester								
I	23BLT004/ 23BLH004/ 23BLF004	பொதுத்தமிழ்தாள் IV - சங்கஇலக்கியம்/Introduction to Functional Hindi/French IV	2	3	50	50	100	2
II	**Generic Elective**							
		Generic Elective IV	5+1/4+4	3	50	50	100	6
III	**Discipline Specific Core Courses**							
	23BCAC07	Computer Networks	5+1	3	50	50	100	6
	23BCAC08	Programming in .NET	4	3	50	50	100	4
	23BCAC08P	Programming in .NET Laboratory	4	3	50	50	100	2
IV	**Skill Enhancement Courses**							
	23BSBSS1	**Skill Based Compulsory Course - III** Soft Skill	4P	3	50	50	100	2
		Skill Based Elective Course - IV	4P	3	50	50	100	2
	23BVBNC4/ 23BVBNS4/ 23BVBSP4	**Value Based Course Elective I NCC/NSS/Sports**	3/2	2	60	40	100	4/1/1
		Value Based Course Elective III	2	-	100	-	100	2
		Total	**32**				**Total**	**30/27**
Internship during Summer Vacation for 15 days								

Part	Subject Code	Name of Paper/ Component	Hours of instruction /week	Scheme Examination					
				Duration of exam	CIA	CE	Total	Credits	
	Fifth Semester								
III	**Discipline Specific Core Courses**								
	23BCAC09	Relational Database Management Systems	4	3	50	50	100	4	6
	23BCAC09P	Relational Database Management Systems Laboratory	4	3	50	50	100	2	
	23BCAC10	Programming in Python	4	3	50	50	100	4	6
	23BCAC10P	Programming in Python Laboratory	4	3	50	50	100	2	
	Discipline Specific Elective Courses								
	23BCADE1-23BCADE7	**DSE - I** Theory+ Practical/Theory+Tutorial	5+1/ 4+4	3	50	50	100	6	
	23BCADE1-23BCADE7	**DSE - II** Theory+ Practical/Theory+Tutorial	4+4/ 5+1	3	50	50	100	6	
IV	**Skill Enhancement Courses**								
	23BVBNC5/ 23BVBNS5/ 23BVBSP5	**Value Based Courses Elective I NCC/NSS/Sports**	3/2	2	60	40	100	4/1/1	
		Total	**30**				**Total**	**28/25**	
	Sixth Semester								
III	**Discipline Specific Core Courses**								
	23BCAC11	Software Engineering	5+1	3	50	50	100	6	
	23BCAC12	Open Source Technology	4	3	50	50	100	4	6
	23BCAC12P	Open Source Technology Laboratory	4	3	50	50	100	2	
	Discipline Specific Elective Courses								
	23BCADE1-23BCADE7	**DSE - III** Theory+ Practical/Theory+Tutorial	5+1/ 4+4	3	50	50	100	6	
	23BCADE8	**DSE – IV** Project and Internship	4+4	3	50	50	100	6	
IV	23BVBNC6/ 23BVBNS6/ 23BVBSP6	**Value Based courses Elective I** NCC/NSS/Sports	3/2	2	60	40	100	4/1/1	
	Professional Development Course								
	23BCAPD3	Professional IT Skills	2	-	100	-	100	Remarks	
		Total	**30**				**Total**	**28/25**	
	Overall Total							**172/154**	

- **Ability Enhancement Compulsory Courses**
  - English for Communication
  - Environmental Studies

➢ **Skill Enhancement courses**, are Skill Based and / or Value Based which are aimed at providing hands on training, competencies, skills etc. and may be opted by the students from the electives offered by the departments or from SWAYAM MOOCs / NPTEL

Skill Based courses

- **Skill Based Compulsory courses I – 23BSBCS1 – Communication Skill during 3rd semester**
- **Skill Based Compulsory courses III - 23BSBSS1 – Soft Skill during 4th semester**

- **Skill Based courses** offered by Computer Science department

S.No	Skill Based Elective Courses (II/ IV)	Semester	Hours of Instruction/Week	Credits
			Practical	
1	23BCASE1 Web Designing Laboratory	3	4P	2
2	23BCASE2 Graphics and Multimedia Laboratory		4P	
3	23BCASE3 PHP and MySQL Laboratory	4	4P	
4	23BCASE4 Software Testing Laboratory		4P	

- **Value Based Courses - Elective I**

Value Based Courses Elective I	Subject Code	Semester	No of .Credits
NCC/	23BVBNC1-6/	1-6	24 Credits
NSS/	23BVBNS1-6/		6 Credits
Sports	23BVBSP1-6		6 Credits

* **Discipline Specific Elective Courses** should be related to their own core which may be from SWAYAM MOOCs / NPTEL also

- All the courses have 6 credits with 4 hours of theory and 4 hours of practicals or 5 hours of theory and 1 hour of Tutorials.

S.No.	Discipline Specific Elective Courses	Semester	Hours of Instruction/Week	Credits
			Theory+Practical/Theory+Tutorial	
1	23BCADE1 Mobile Applications Development	5&6	4+4	6
2	23BCADE2 Cyber Security		5+1	
3	23BCADE3 Data Mining and Warehousing		5+1	
4	23BCADE4 R Programming		4+4	
5	23BCADE5 Cloud Computing		5+1	
6	23BCADE6 Internet of Things		5+1	
7	23BCADE7 Artificial Intelligence		5+1	
8	23BCADE8 Project and Internship		4+4	

Generic Elective Courses offered for other disciplines / departments

- A Core Course offered in a Discipline / Subject may be offered as a Generic Elective for other departments.

S.No.	Generic Elective Courses	Semester	Hours of Instruction/Week Theory+Tutorial	Credits
1	**23BCAGE1 Internet Basics**	1	5+1	6
2	**23BCAGE2 Computer Fundamentals**		5+1	
3	**23BCAGE3 Industry4.0**	3	5+1	
4	**23BCAGE4 Digital Marketing**		5+1	
5	**23BCAGE5 Fundamentals of Data Science**	4	5+1	
6	**23BCAGE6 Introduction to Artificial Intelligence**		5+1	

Total credits to earn the degree

1. Part I components - 8 Credits (Languages)
2. Part II components – 32 Credits (Ability Enhancement Courses – 8 Credits and Generic Elective courses – 24 Credits)
3. Part III components - 96 Credits (Discipline Specific Core Courses – 72 Credits and Discipline Specific Elective Courses - 24 Credits)
4. Part IV Components –36/18(Skill Enhancement Courses-Skill based courses-8 Credits, Value Based Courses Elective I(NCC/NSS/Sports) –24 / 6 / 6, Value Based Elective courses Elective II & III-4 Credits)
5. **Minimum One Course should be from SWAYAM MOOCs/ NPTEL.**

One to 4 Courses may be from SWAYAM MOOCs/NPTEL for Credit Transfer in DSE/Generic Elective.

Computer System Architecture

Semester I **Hours of Instruction/Week: 5+1**

23BCAC01 **No. of Credits: 6**

Objectives:

1. To make students understand the basic structure, operation and characteristics of digital computer.
2. To familiarize the students with process or instruction handling with parallelism and control implementation
3. To familiarize the students with hierarchical memory system and Input-output transfer schemes

UNIT I: Fundamentals of Digital Electronics **18 hrs**

Data Types, Complements, Fixed-Point Representation, Floating-Point Representation, Other Binary Codes, Error Detection Codes, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip-Flops, Sequential Circuits, Registers, Counters, Multiplexer, Demultiplexer, Decoder, Encoder.

UNIT II: Register Transfer and Micro-operations **18 hrs**

Register Transfer Language, Register Transfer, Bus & Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operation.

UNIT III: Basic Computer Organization **18 hrs**

Instruction codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycles, Memory Reference Instruction, Input-Output & Interrupts, complete Computer Description & Design of Basic Computer.

UNIT IV: Processor and Control Unit **18 hrs**

Hardwired versus Micro programmed Control Unit, General Register Organization, Stack Organization, Instruction Format, Data Transfer and Manipulation, Program Control, RISC and CISC. Pipelining–Pipelined data path and control, Handling Data hazards & Control hazards.

UNIT V: Memory and I/O Systems **18 hrs**

Peripheral Devices, I/O Interface, Data Transfer Schemes, Program Control, Interrupt, DMA Transfer, I/O Processor. Memory Hierarchy, Processor vs. Memory Speed, High-Speed Memories, Cache Memory, Associative Memory, Interleave, Virtual Memory, Memory Management

Total Hours: 90

Text Books:

1. ***M.Morris Mano(2012), Digital Logic and Computer Design,*** PHI. Third Edition.

2. ***David A. Patterson and John L. Hennessey(2014),Computer Organization and Design,*** Morgan Kauffman, Elsevier, Fifth Edition.

Reference Books:

1. ***JohnL.Hennessy,David A.Patterson(2012),Computer Architecture :A Quantitative Approach***, Fifth Edition.

2. ***William Stallings(2016), Computer Organization and Architecture***, Prentice Hall. Tenth Edition

E-learning Resources:

1. http://nptel.ac.in/courses/106102062/
2. https://www.tutorialspoint.com/computer_organization/index.asp
3. https://www.studytonight.com/computer-architecture/

Course Outcomes:

CO1: Explore the basic components of digital computer with representation of data and Instructions.

CO2: Familiarity in micro operations and instruction classification.

CO3: Apprehend the functional units of processor as control, bus and data flow.

CO4: Responsive on memory types, mapping and performance.

CO5: Clarity on Input–Output data transfer and different modes.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	H	M	M	M	-	L	M	L	L	L	H	M	L
CO2	H	M	M	M	-	-	-	L	L	-	L	-	-
CO3	M	L	M	L	L	L	L	L	M	-	L	L	-
CO4	M	L	L	-	-	L	L	L	M	-	M	L	L
CO5	L	L	L	L	L	M	-	-	M	L	H	M	M

Problem Solving using C

Semester I **Hours of Instruction/Week:4**

23BCAC02 **No. of Credits:4**

Objectives:

1. To learn the basic concepts of Programming.
2. To know the methodology of writing programs using C for different applications.
3. To develop skills in C Programming.

Unit I: Problem Solving using Computers **12 hrs**

Introduction- Steps involved in Problem Solving using Computers- Algorithms-Characteristics of Algorithms-Examples of Algorithms-Advantages and Disadvantages of Algorithms-Flow Charts – Symbols used in Flow Charts, Examples of Flow Charts, Advantages and Disadvantages of Flow Charts- Pseudo code – Sequence, Selection and Iteration, Examples of Pseudo code, Advantages and Disadvantages of Pseudocode.

Unit II: Introduction to C **12 hrs**

History of C- Structure of a C program- Simple C program- executing a C program- Character set in C- C Tokens- Keywords and Identifiers in C- Constants- Variables in C-,Basic Data Types-Type declaration- Operators and Expressions- Managing Input and output operation-Control statements.

Unit III: Arrays and String Handling **12 hrs**

Introduction to array- advantages of arrays- array declaration-array initialization-Types of arrays-Single and Multidimensional arrays, Character Arrays-Strings.

Unit IV: Functions **12 hrs**

Introduction to functions - advantages of functions- declaring a function- calling a function-passing arguments for a function- Categories of functions - nesting of functions- Recursion –Structures and Union.

Unit V: Pointers and File Management **12 hrs**

Introduction to Pointers- Pointers and Arrays- Function returning pointers- Pointers to functions-Introduction to Files- Defining and Opening a File, Closing a File- Input/ Output operations on File-command line arguments.

Total Hours: 60

Text Books:

1. ***Behrouz A. Forouzan, (2017), Foundations of computer science,*** Thomson Course Technology, Fourth Edition.
2. ***JeriR.Hanly,Elliot B.Koffman,(2015) Problem Solving and Program Design in C,*** Pearson Education, Eighth Edition.
3. ***E.Balagurusamy(2011), Programming in ANSI C,***TataMcGraw Hill Publishing Company Ltd,Fifth Edition.

Reference Books:

1. ***Yashwant P.Kanetkar(2010),Let us C***, BPBPublications,SixthEdition.
2. ***ReemaThareja (2014), Fundamentals of Computers,***Oxford University Press.
3. ***Brian W. Kernighan / Dennis Ritchie (2015), The C Programming Language***, Second Edition, Pearson Publication

E-learning Resource:

1. https://www.cprogramming.com/tutorial/c-tutorial.html?inl=nv

Course Outcomes:

CO1: Understands programming methodologies by learning algorithm and flowcharts.

CO2: Obtain knowledge about the fundamentals of C programming.

CO3: Implement different operations on arrays.

CO4: Understand use of functions, pointers, structures and unions.

CO5: Gain knowledge about the basics of file handling mechanism.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	L	L	L	-	L	M	L	L	M	H	M	L
CO2	M	L	L	L	-	L	H	L	L	L	L	L	L
CO3	L	-	L	L	-	L	M	M	L	-	M	-	M
CO4	M	-	M	M	-	M	H	M	M	M	L	L	L
CO5	M	-	M	M	-	M	L	M	M	M	-	M	L

Problem Solving using C Laboratory

Semester I **Hours of Instruction/Week:4**

23BCAC02P **No. of Credits:2**

List of Programs:

1. Program using control statements.
2. Program using looping statements.
3. Program using single dimensional arrays.
4. Program using two dimensional arrays.
5. Program using strings.
6. Program using call by value and call by reference.
7. Program using nested function.
8. Program using recursive functions.
9. Program using pointers.
10. Program using files.

Total Hours : 60

Course Outcomes:

CO1: Construct programs that demonstrate effective use of C features.

CO2: Read, understand and trace the execution of programs written in C language.

CO3: Develop programs using control statements, arrays and Strings.

CO4: Understand code reusability with the help of user defined functions and pointers.

CO5: Apply programming constructs to develop simple applications.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	H	L	-	L	L	-	L	L	L	-	L	-	M
CO2	L	-	L	L	L	L	L	L	M	L	L	-	L
CO3	L	L	L	M	-	L	M	M	L	L	M	L	L
CO4	M	-	M	L	M	M	M	M	L	L	M	M	-
CO5	M	M	M	L	-	M	L	M	H	M	M	L	M

Professional Development Course

Office Automation

Semester I **Hours of Instruction/Week: 3**

23BCAPD1

Objectives:

1. To provide an in-depth training in use of office automation packages, internet etc.
2. To understand how to use software packages in day to day activities
3. To promote the intensive and extensive application of ICT

Unit I : Word Processing **9 hrs**

Typing, Editing, Proofing & Reviewing, Formatting Text & Paragraphs, Automatic Formatting and Styles, Working with Tables, Graphics and Frames, Mail Merge, Automating Your Work & printing Documents

Unit II: Excel Spreadsheet **9 hrs**

Working & Editing In Workbooks, Creating Formats & Links, Formatting a Worksheet & creating graphic objects, Creating Charts, formatting and analyzing data, Organizing Data in a List , Sharing & Importing Data, Printing.

Unit III: PowerPoint Presentations **9 hrs**

Getting started in PowerPoint, Creating a presentation, Creating & editing slides, Previewing a slide show, Adding picture & graph, Adding sound & video, Adding auto shape, Animating objects

Unit IV: MS Access **9 hrs**

Introduction to MS Access: Planning a Database,Creating a New Database, Creating Tables, Working with Forms, Creating queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing & Print Preview – Importing data from other databases viz. MS Excel etc.

Unit V: Introduction to Internet **9 hrs**

Intranet tools: E-mail: Anatomy of e-mail, e-mail address, finding e-mail address, adding signature, attaching files, opening attachments, managing e-mail account, Web mail, and Case study: Google Mail, Outlook express. FTP, ftp commands, ftp software, Telnet, using telnet, Web pages, HTML, basics of HTML, computer virus and antivirus software, Voice and Video chat, web browsers etc

Total Hours : 45

Text Book:

1. ***Lisa. A. Bucki, John Walkenbach, Michael Alexander (2013). Microsoft Office 2021 Bible,*** Fourth Edition, Wiley.

Reference Books:

1. ***Guy Hart- Davis (2010). Beginning Microsoft Office 2010***, Apress.
2. ***Gary B. Shelly, Philip. J. Pratt, (2010). Microsoft Access 2010: Complete***, Cashman Series.
3. ***Cronan (2010). Microsoft Office Access 2010 Quick Steps***, Tata McGraw Hill.

E-Learning Resources:

1. https://learn-u.com › using-technology-in-the-classroom
2. https://www.spreadsheet.com
3. https://edu.gcfglobal.org › access
4. https://www.niu.edu › citl › guides › instructional-guide

Course Outcomes:

CO1: Basic Knowledge of Word Processing, their usage, details of word processing screen.

CO2: Basic Knowledge of Spreadsheet Processing, their usage, details of Spreadsheet screen.

CO3: Basic Knowledge of presentations.

CO4: Understand and apply the basic concepts of database management system.

CO5: Enhance the knowledge about Internet.

Data Structures

Semester II **Hours of Instruction/Week:4**

23BCAC03 **No. of Credits:4**

Objectives:

1. To understand the different methods of data organization like linear and non-linear forms.
2. To learn different sorting and searching techniques.
3. To develop a clear understanding of the various file organizations and storage management.

Unit I: Introduction **12 hrs**

Overview of Algorithms- analyzing Algorithms, time and space comparisons, Notations- Big Oh, Omega and Theta-Primitive Data structures, Arrays-ADT for arrays, Ordered list, operations, representation of arrays.

Unit II: Linear Data Structures **12 hrs**

Stacks and Queues - operations on queues and stacks, evaluation of expression, infix to post fix conversions, application- recursion. Singly Linked list- operations, applications.

Unit III: Non-linear Data Structures **12 hrs**

Trees-basic concepts, Binary tree traversals, representation. Threaded binary trees-representation, traversal. Graphs-basic concepts, representation, search techniques, Applications of graphs and trees.

Unit IV: Sorting and Searching **12 hrs**

Sorting-Insertion Sort, Bubble Sort, Quick Sort, Heap Sort, Search- Sequential, Binary Search-Applications

Unit V: File Structures and Dynamic Storage Management **12 hrs**

File organizations -Sequential, Index sequential, Direct file organization and access methods. Hashing-Hash Tables and hash functions.

Total Hours: 60

Text Books:

1. ***Sahni Horowitz and Anderson Freed(2008),Fundamentals of Data Structure in C,*** University Press, Second Edition.
2. ***Lipschutz and Pai(2010),Schaum's Outline Series DataStructures,*** Tata McgrawHill.

Reference Book:

1. ***Jean Paul Tremblay and Paul Anderson(2005),An introduction to Data Structures with Applications,*** McGrawHill, SecondEdition.

E-learning Resources:

1. https://www.w3schools
2. https://www.programiz.com/dsa
3. https://nptel.ac.in/courses/106102064/1

Course Outcomes:

CO1: Analyzing the complexity of algorithms.

CO2: Applying linear and non-linear data structures to simple applications.

CO3: Application of appropriate sorting, searching and indexing techniques.

CO4: Ability to choose the appropriate file structures and access methods in real time applications.

CO5: Formulate new solutions for programming problems.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	M	H	M	L	L	M	M	L	M	M	L	H
CO2	M	M	M	M	M	M	M	M	L	M	H	L	M
CO3	M	M	L	M	M	M	M	M	M	M	M	L	M
CO4	M	M	L	M	L	M	M	M	L	M	M	L	M
CO5	M	M	M	M	M	M	M	M	L	M	M	L	M

Data Structures Laboratory

Semester II **Hours of Instruction/Week:4**

23BCAC03P **No.of Credits:2**

List of Programs

1. Write a Program to implement arrays.
2. Write a Program to implement Stack.
3. Write a Program using recursion for stack elements.
4. Write a Program to implement in fix to postfix.
5. Write a Program to evaluate expression using stack.
6. Write a Program to implement simple queue.
7. Write a Program to implement linear linked list.
8. Write a Program to implement the tree traversal methods.
9. Write a Program to sort the given list.
10. Write a Program to search an element.

Total Hours:60

Course Outcomes:

CO1: Construct programs that demonstrate effective use of arrays.

CO2: Applying linear data structures to solve simple problems.

CO3: Applying non-linear data structures for simple problems.

CO4: Ability to choose the appropriate traversal techniques to access the elements.

CO5: Apply searching and sorting techniques for simple applications.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	M	M	L	-	L	L	L	L	L	M	M	L
CO2	M	M	M	M	-	M	L	L	M	L	M	L	M
CO3	H	M	M	M	-	M	L	L	M	L	M	L	M
CO4	H	M	M	M	-	M	L	L	M	M	H	L	M
CO5	H	M	M	M	-	M	L	L	M	M	H	L	M

Numerical Analysis and Statistical Methods

Semester II **Hours of Instruction/Week: 5+1**

23BCAC04 **No. of Credits: 6**

Objectives:

1. To enable the students to gain knowledge about concepts of matrices, interpolation methods and solve system of equations.
2. To educate the students about the basic statistical measures such as the measure of central tendency and dispersion.
3. To train the students on the topics such as correlation, regression, time series analysis and analysis of variance to be done for the given set of data.

Unit I: Matrices and Finite Differences **18 hrs**

Matrices: Determinants of a square matrix, properties of Determinants, inverse of a Matrix and its properties, method of finding Inverse of a Matrix, Verification of Cayley- Hamilton theorem. Finite Differences: Operators, difference tables, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Unit II: Linear Equation & Numerical Integration **18 hrs**

Linear Equation: Solution of simultaneous linear algebraic equations using Gauss-Elimination method and Gauss - Seidel method of Iteration. Numerical Integration: Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule and simple problems.

Unit III: Measures of Central Tendency and Dispersion **18hrs**

Measures of Central Tendency - Mean, Median, Mode. Measures of Dispersion – Standard Deviation, Variance.

Unit IV: Correlation Analysis and Regression Analysis **18 hrs**

Correlation Analysis: Types of Correlation, Methods of studying Correlation, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient. Regression Analysis: Difference between Correlation and Regression, Regression Coefficients, Regression Equations - X on Y and Y on X.

Unit V: Analysis of Time Series & Analysis of Variance **18 hrs**

Introduction – Utility of Time Series Analysis – Components of Time Series – Method of Least Squares- Measurement of Trend. Analysis of Variance: One-Way Classification and Two- way Classification.

List of Exercises:

1. Newton Forward Interpolation.
2. Simultaneous Equation-Gauss Elimination/Seidel method.
3. Measures of central tendency and measures of Dispersion using SPSS.
4. Correlation and Regression using SPSS.
5. Analysis of Variance (ANOVA) One – way and two –way Classification using SPSS.

Total Hours: 90

Text Books:

1. ***Goel and Mittal (2012), Numerical Analysis in Engineering***, Pragati Prakashan, Merut.
2. ***S.P. Gupta(2014),Statistical Methods, Sultan Chand and Sons, New Delhi,*** Forty Fourth Revised Edition.
3. ***P.Radha Muthu and T.Santha (2011), Mathematics for Computer Science and Applications***, Kalaikathir Achchagam, Coimbatore, India.

Reference Books:

1. ***M.K.Venkatraman(2009), Engineering and Mathematics***,Vol II, National Pub Company.
2. **S.S.Sastry(2011), Introductory Methods of Numerical *Analysis*,** Prentice Hall of India, New Delhi.
3. ***Goon A.M., GuptaM.K and Das GuptaB (2002),Fundamentals of Statistics***, World Press, Calcutta, Eighth Edition.
4. ***Mood A.M, Graybill F.A and Boes D.C (2007), Introduction to the theory of Statistics***, McGraw Hill, Third Edition.

E-learning Resources:

1. http://cec.nic.in/E- Content / Pages/Result.aspx ? p=Paper16&s=MATH&Name =Mathematics & PaperName =Numerical% 20Analysis.
2. https://www.elearninglearning.com/statistics/
3. https://www.statistics.com/
4. https://www.tutorialspoint.com/statistics/index.htm

Course Outcomes:

CO1: Work with matrices and finite differences.
CO2: Solve linear equations and apply numerical integration using various rules.
CO3: Compare measures of Central Tendency and Dispersion for a given set of data and discuss the nature of the sample.
CO4: Computer correlation and regression for given data.
CO5: Perform Time Series Analysis and Analysis of Variance for a given data.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	M	L	L	L	M	M	L	L	M	M	M	L
CO2	L	L	M	L	L	L	M	L	L	M	M	L	M
CO3	M	M	L	L	M	H	M	M	L	M	M	L	L
CO4	M	L	L	M	L	M	M	L	L	M	M	M	L
CO5	M	M	M	M	M	M	L	M	L	M	M	M	M

Professional Development Course
Quantitative Aptitude and Reasoning

Semester II **Hours of Instruction / Week: 3**

23BCAPD2

Objectives:

1. To understand various principles involved in solving mathematical problems.
2. To understand the abstract principle that works beneath the findings.
3. To evaluate various real life situations by resorting to analysis of key issues and factors.

Unit I: Numerical Aptitude on Ages, Profit and Ratio **9 hrs**

Simple Equations, Numbers, Average, Problems on Ages, Percentage, Profit & Loss, Ratio &Proportions.

Unit II: Numerical Aptitude on Time, Work, Interest Rates **9 hrs**

Time & Work, Time & Distance, Problems on Trains, Simple Interest, Compound Interest, Calendar &Clocks, Permutations & Combinations.

Unit III: Data Interpretation and Data Sufficiency **9hrs**

Tabulation, Graphs Bar Graphs, Pie Graphs, Line Graphs, Venn Diagrams, Cubes, Deductions, Connectives, Data Sufficiency Concepts.

Unit IV: Verbal & Logical Reasoning **9hrs**

Verbal- Reading Comprehension, Text Completion, Sentence Equivalance, Synonyms and Antonyms. Logical–Statement-Arguments, Statement-Assumptions, Statement-Conclusions.

Unit V: Non–Verbal Reasoning **9hrs**

Coding & Decoding, Blood Relations, Analytical Reasoning Puzzles, Direction Sense Test, Decision Making, Assertion & Reasons, Completion of Patterns.

Total Hours: 45

Text Books:

1. ***Dr.R.S.Agarwal,(2017),Quantitative Aptitude*** ,S.Chand Publishing.
2. ***Dr. R. S. Agarwal,(2017), A Modern Approach to Verbal & Non-Verbal Reasoning,*** S. Chand Publishing.

Reference Books:

1. ***Dr.R.S.Agarwal ,(2017), A Modern Approach to Logical Reasoning***, S.Chand Publishing.
2. ***Abhijit Guha, (2016), Quantitative Aptitude,*** Tata McGraw Hills Publishing, Sixth Edition

E-learning Resources:

1. https://www.talentsprint.com/blog/2016/04/18-websites- for-competitive-exams-you.html
2. .https://www.tutorialspoint.com/quantitative_aptitude/index.htm

Course Outcomes:

CO1: Acquires time management for competitive examinations.
CO2: Makes calculation successfully, interprets data, communicate results, evaluates an issue and solve a problem in real-world context.
CO3: Develops critical thinking by analyzing complex issues using information from credible sources.
CO4: Procures the ability to read between the lines and understand various language structures.
CO5: Comprehends quick decision making.

Operating Systems

Semester III **Hours of Instruction/Week: 5+1**

23BCAC05 **No. of Credits: 6**

Objectives:

1. Gain knowledge about the functionalities of operating system.
2. To understand the various resources managed by operating system.
3. Explore on case studies and security of operating systems.

Unit 1: Introduction and Process Management **18 hrs**

Introduction to Operating system -operations. Process concepts- Process State Transition, Process Control Block, and Operation on Processing. Parallel Processing -Mutual Exclusion, Critical Section, and Semaphores.

Unit II: Storage Management **18 hrs**

Real Storage - Storage Organization, Storage Management, Storage Hierarchy, Management Strategies, Storage Allocation, Storage Protection. Virtual Storage -Blocking, Paging, Segmentation.

Unit III: Processor Management and Distributed Computing **18 hrs**

Scheduling levels - Deadline Scheduling, First-In-First Out Scheduling, Round Robin Shortest Job First Scheduling, Shortest Remaining Time, Highest Response Ratio Next Scheduling. Classification of sequential and parallel processing – Array Processors – Dataflow Computers – Multiprocessing – Fault Tolerance. Processor Interconnection Schemes, Multiprocessor Operating System Organizations.

Unit IV: Deadlock and File Management **18 hrs**

Deadlock - Conditions for Deadlock, Major Areas of Deadlock, Deadlock Prevention, Avoidance and Detection, Recovery from Deadlock. File System - File System Functions, File Organization, Database Models.

Unit V: Operating System Security & Protection **18 hrs**

Security Environment, Design Principles of Security, User Authentication, Protection Mechanism: Protection Domain, Access Control List. Case study of Linux and Windows Operating System.

Total Hours: 90

Text Books:

1. ***Abraham Silberschatz, Peter B. Galvin and Greg Gagne (2018), Operating System Concepts,*** John Wiley and Sons Inc, Tenth Edition.
2. ***H.M.Deitel, (2004), Operating Systems,*** Pearson Publications, Second Edition.

Reference Books:

1. ***Andrew S. Tanenbaum (2014), Modern Operating Systems,*** Pearson Prentice Hall of India, Fourth Edition.
2. ***William Stallings(2006),Operating Systems,*** Prentice Hall of India, Fifth Edition.

E-learning Resources:

1. nptel.ac.in/courses/106108101/
2. w3schools.in/operating-system-tutorial
3. https://swayam.gov.in/course/237-operating-system

Course Outcomes:

CO1: Recall the concepts of file management.

CO2: Apply security aspects in appropriate situations.

CO3: Apply knowledge gained through processor scheduling to other applications.

CO4: Analyze features and limitations of operating systems.

CO5: Explore various other operating systems.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	L	H	H	M	M	M	L	H	L	M	M	H
CO2	M	L	M	H	H	H	M	M	H	M	M	H	H
CO3	H	L	M	M	L	M	M	L	M	L	M	M	M
CO4	H	L	M	H	M	M	H	L	M	L	M	M	M
CO5	M	L	L	M	M	M	L	L	M	-	L	M	L

Programming in Java

Semester III **Hours of Instruction / Week: 4**

23BCAC06 **No. of Credits: 4**

Objectives:

1. To learn the Java programming language syntax, idioms, patterns and styles.
2. To become comfortable with other special features of Java.
3. To introduce event driven and Graphical User Interface (GUI) programming.

Unit I: Java Fundamentals **12 hrs**

Introduction - Java Evolution, Features of Java, Java structure, Java Virtual Machine, Command line arguments - Constant and Variables, Data types, Scope of variables, Operators, Control statements, break and continue statement.

Unit II: Class and Methods **12 hrs**

Class and Methods, Creation of objects, Constructor, Constructor overloading, Method overloading, Static members, Arrays, Strings, String Buffer Class, Vectors, Wrapper Classes.

Unit III: Inheritance **12 hrs**

Types of Inheritance, Extending a Class, Method Overriding, Final Variables and Methods, Final class, Finalize Method, Abstract Method, Visibility control.

Unit IV: Interfaces and Packages **12 hrs**

Interfaces - extending interface, implementing interface, accessing interface variable, Packages - creating and accessing package, package hierarchy, import statement, access modifiers, Hiding Classes.

Unit V: Exception Handling and Applets **12 hrs**

Exception handling Mechanisms - try-catch, throw and Throws, Multiple catch statement, finally statement, user-defined exceptions, Applets - Applet Life cycle, Graphic Programming - Event Handling.

Total Hours: 60

Text Book:

1. ***E.Balaguruswamy (2019), Programming with Java A Primer,*** Tata McGraw Hill Publications, Sixth Edition.

Reference Books:

1. ***Schildt (2017), The Complete Reference Java,*** Tata McGraw Hill Publications,Nineth Edition.
2. ***C. Xavier (2010), Programming with JAVA 2,*** SciTech Publication.

E-learning Resources:

1. https://swayam.gov.in/course/3482-spoken-tutorials-java
2. http://spoken-tutorial.org/tutorial-search/?search_foss=Java&search_language=English

Course Outcomes:

CO1: Understand the concepts of OOP, Java features, types, control structures and arrays.

CO2: Identify classes, objects, members of a class and relationship among them to solve a specific problem.

CO3: Learned the implementation of packages to solve the complex problems and applying exception handling mechanisms.

CO4: Learned the various methods in string and string buffer class.

CO5: Knows how to develop the client side programming using Applet and AWT.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	H	M	M	L	M	M	L	L	L	M	M	M	L
CO2	M	M	L	L	H	L	M	M	-	M	M	L	M
CO3	M	M	M	M	M	L	M	M	L	L	M	L	L
CO4	L	M	M	L	L	M	L	M	L	M	M	L	L
CO5	M	M	L	M	M	L	L	M	M	H	L	H	L

Programming in Java Laboratory

Semester III **Hours of Instruction/Week: 4**

23BCAC06P **No. of Credits: 2**

List of Programs

1. Program using Classes and Objects.
2. Program using Constructor.
3. Program using Method overloading.
4. Program using Inheritance.
5. Program using Method overriding.
6. Program using Interfaces.
7. Program using Packages.
8. Program using Exception handling mechanism.
9. Program using Applets.
10. Program using Event Handling mechanism.

Total Hours: 60

Course Outcomes:

CO1: Develop Java applications using OOP concepts with appropriate program structure.

CO2: Demonstrate the concepts of polymorphism and inheritance.

CO3: Use and create packages and interfaces in a Java program.

CO4: Implement exception handling in Java.

CO5: To develop an applet program using AWT.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	H	H	M	L	L	M	L	L	L	M	L	M	L
CO2	M	M	M	L	M	L	L	M	L	M	M	L	M
CO3	M	M	L	M	M	L	L	M	L	L	L	M	L
CO4	M	H	M	-	M	M	M	M	L	M	L	M	L
CO5	M	M	L	L	M	M	L	M	M	M	M	L	L

Computer Networks

Semester IV **Hours of Instruction/Week: 5+1**

23BCAC07 **No. of Credits: 6**

Objectives:

1. To understand the concepts of Computer Networks.
2. To learn the functionalities of different layers in Network Architecture.
3. To know the applications of Computer Networks.

UNIT I: Introduction to Computer Networks and the Physical Layer **18 hrs**

Layering and Protocols, Reference Models-OSI, TCP/IP, Comparison of OSI and TCP/IP. Theoretical basis for data communications - Guided Transmission Media-Twisted Pairs, Coaxial Cable, Fiber Optics. Wireless Transmission- Electromagnetic Spectrum, Radio transmission, Microwave Transmission.

UNIT II: The Data Link Layer **18 hrs**

Design Issues - Services Provided to the Network Layer, Framing, Error Control, Flow Control. Error Detection and Correction- Error Correcting Codes, Error Detecting Codes. Elementary Data Link Protocols – Utopian Simplex Protocol, A Simplex Stop-and-Wait Protocol for and Error-Free Channel, A Simplex Stop-and-Wait Protocol for a Noisy Channel. Sliding Window Protocols – A One-bit Sliding Window Protocol, A Protocol Using Go-Back-N, A Protocol Using Selective Repeat.

UNIT III: The Medium Access Sub Layer **18 hrs**

Channel Allocation Problem – Static and Dynamic Channel Allocation. Ethernet – Classic Ethernet, MAC Sublayer Protocol, Ethernet Performance and types. Wireless LAN – The 802.11, Services. Bluetooth. RFID - Data Link Layer Switching and components.

UNIT IV: The Network Layer **18 hrs**

Design Issues, Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connection – Oriented and Connectionless Service, Comparison of Virtual-Circuit and Datagram Networks, Routing Algorithms - Shortest Path Algorithm - Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing. Addressing: The Network Layer in the Internet-IP Addresses, IPv4, IPv6.

UNIT V: The Transport Layer **18 hrs**

Transport Services: Services provided to the upper layers, Elements of Transport Protocols, QoS, The Internet Transport Protocols –Introduction to UDP, Introduction to TCP, TCP connection establishment, TCP connection release, TCP transmission policy, TCP congestion control. Real time applications in application layers.

Total Hours: 90

Text Book:

*1.Andrew S.Tanenbaum (2011), Computer Networks,*PearsonPrentice Hall, Fifth Edition.

Reference Books:

1.*John L. Hennessy, DavidA. Patterson (2012), Computer Architecture: A Quantitative Approach*, Fifth Edition.

2.*William Stallings (2016),Computer Organization and Architecture*, Prentice Hall. Tenth Edition

E-learning Resources:

1. http://nptel.ac.in/courses/106105081/
2. https://www.studytonight.com/computer-networks/
3. https://swayam.gov.in/courses/4066-computer-networks

Course Outcomes:

CO1: Discuss the basic rudiments of networking concepts.

CO2: Analyze in detail and understood the basic idea of different protocols.

CO3: Analyze routing, packet switching and routing algorithms concepts.

CO4: Recognize the services of connectionless and connection oriented protocols.

CO5: Assess the internet domains and its services.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	H	M	M	M	L	L	M	L	L	L	H	M	L
CO2	H	M	M	M	M	L	L	L	L	L	M	L	M
CO3	H	L	M	M	M	L	L	L	M	L	M	L	L
CO4	M	L	M	M	M	L	L	L	M	L	M	L	L
CO5	M	L	M	L	L	L	M	L	M	L	M	L	L

Programming in .NET

Semester IV **Hours of Instruction/Week: 4**

23BCAC08 **No. of Credits: 4**

Objectives:

1. To learn the technologies of the .NET framework.
2. To learn the platforms used in framework to build dynamic web applications.
3. To integrate the software package with the database.

Unit I : .NET Framework **12 hrs**

Introduction to Microsoft .NET - .Net Framework, Architecture- Managed Components in .Net - Characteristics of .NET Framework - Building Net Applications-IDE-MSIL -.Net Framework Class Library- Building .Net Assemblies - Event driven programming.

Unit II : Introduction to VB.NET **12 hrs**

Overview of Visual Studio.NET -Visual Basic: Variables, Constants and Operators, Functions, Subroutines, Control statements. - Arrays- String functions- Procedures and Functions-variable number of arguments –optional arguments –Byval and Byref keywords. Handling Errors and Exception.

Unit III : Controls and Events **12 hrs**

Windows common controls - Window forms- Multiple Document Interface (MDI) Applications--Menus and Tool bars-Responding to user events-Collecting User Input- types of events.

Unit IV:Introduction to ASP.NET **12 hrs**

Overview of ASP.NET –Features of ASP.NET- web form-State management - basic web controls-Validation and rich controls- Calendar control, AdRotator control - Navigation controls- Treeview control- Menu control - Database controls –Data List Control.

Unit V: ADO.NET **12 hrs**

Introduction to ADO.NET framework-Characteristics of ADO.NET-basic ADO.NET features-Connection-Command-Data Reader-Data Adapter-Data Set-Data Source Controls-Sql Data Source – Object Data Source-Details View and Form View control- Repeater, Data Grid and Data List Control-Working with XML.

Total Hours: 60

Text Books:

1. ***Matthew MacDonald(2018), ASP.NET The Complete Reference,***McGraw Hill Education, Indian Edition, ISBN: 978-07-049536-4
2. ***Steven Holzner,(2018),"Visual Basic .Net Programming Black Book ",***Paraglyph Press
3. ***Jeffrey R.Shapiro,(2004) The Complete Reference Visual Basic .Net*** , McGraw–Hill/Osborne ISBN: 9780070495111
4. ***Paul Deitel, Harvey Deitel and Abbey Deitel (2013),Visual Basic 2012 How to Program,*** Prentice Hall, Sixth Edition.
5. ***Kogent Learning Solutions Inc (2010), .NET3.5 Programming Black Book,*** DreamtechPress.

Reference Books:

1. ***StephenWalther (2010), ASP.NET3.5 Unleashed,****SAMS Publishing, Kindle Edition.*
2. ***Kogent Learning Solutions Inc (2010), ASP.NET 4.0: Covers C#10 and VB 2010 Codes Black Book,*** *Dreamtech Press.*

E-learning Resources:

1. http://vb.net- informations.com/framework/framework_tutorials.htm.
2. https://www.javatpoint.com/asp-net-tutorial.

Course Outcomes:

CO1: Knowledge of major elements of the .NET framework.

CO2: Ability to analyze the basic structure of a VB.NET application.

CO3: Programming skills using event handling in VB.NET.

CO4: Design and develop Web based applications using ASP.NET.

CO5: Capable of integrating applications using ADO.NET.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	H	M	M	H	H	M	H	M	H	H	M	M	H
CO2	H	L	H	M	H	H	H	M	H	M	H	M	H
CO3	H	L	H	H	M	M	M	L	H	M	M	M	H
CO4	M	M	M	M	M	M	H	M	M	H	M	M	H
CO5	H	H	M	M	M	H	H	H	M	M	M	H	H

Programming in .NET Laboratory

Semester IV **Hours of Instruction/Week: 4**

23BCAC08P **No. of Credits: 2**

List of Programs

1. Create a form using basic window controls.
2. Create a form using keyboard events and mouse events.
3. Create a form using string functions.
4. Create a form using Menu and Common dialog controls.
5. Design a web page using request and response objects.
6. Design a web page using validation controls.
7. Design a web page using ad rotator control.
8. Design a web page using Tree view and Repeater control.
9. Design a web page using Grid view control and XML & MS Access
10. Create a form using ADO.NET.

Total Hours: 60

Course Outcomes:

CO1: Design and develop programs with GUI interfaces.

CO2: Code programs and develop interface using VB.NET.

CO3: Explore Visual studio framework to create windows and web based applications.

CO4: Apply ASP.NET controls in web applications.

CO5: Able to build database driven applications.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	-	H	H	M	M	M	L	H	L	M	H	H
CO2	H	L	H	H	H	H	H	M	H	L	M	H	H
CO3	H	-	H	H	H	H	M	L	H	L	M	H	H
CO4	M	L	M	H	M	H	M	L	L	M	M	M	H
CO5	M	L	M	H	M	H	M	M	M	H	M	M	H

Relational Database Management Systems

Semester V **Hours of Instruction/Week: 4**

23BCAC09 **No. of Credits: 4**

Objectives:

1. To learn the fundamentals of database and Relational Database Management System.
2. To make a study of SQL and relational database design.
3. To understand how to manipulate data using PL/SQL block.

Unit I: Database Systems Concepts and Architecture **12 hrs**

Introduction to databases, data models, schemas and instance, Three-schema architecture and data independence, database languages and interfaces, the database system environment, centralized and client/server architectures for DBMSs, classification of DBMS, Entity types, entity sets, attributes and keys, relationship types, relationship sets, roles and structural constraints, weak entity types, E-R diagrams, naming conventions and design issues.

Unit II: Normalization and Concurrency control **12 hrs**

Informal design guidelines for relational schemas, functional dependencies, normal forms based on primary keys, general definitions of second and third normal forms, Boyce-Codd normal form, Concurrency control techniques-Two phase locking, Time stamp ordering.

Unit III: SQL **12 hrs**

Introduction to Oracle, SQL Features, Types of SQL Commands: DDL, DML and TCL commands. Integrity Constraints, Operators, GROUP BY and HAVING Clause, Sub Queries, Joins, Character Functions, Numeric Functions, Date Functions, Conversion Functions, Aggregate Functions, Roles and Privileges, Data Control Language: GRANT, REVOKE.

Unit IV: PL/SQL **12 hrs**

Overview of PL/SQL, Advantages of PL/SQL, PL/SQL Character Set, Data Types, Basic Structure, Variables, Constants, If-then-else Structure, Attribute: %type,%rowtype. Iteration in PL/SQL: For loop,While loop. Cursors: Basics, Using a cursor for a multi-row SQL query.

Unit V: Stored Procedures **12 hrs**

Procedures, Functions, Exception Handling: Predefined and User defined. Triggers.

Total Hours: 60

Text Books:

1. ***RamezElmasri and Shamkant B. Navathe (2016), Fundamentals of Database Systems,*** Tata McGraw Hill Publications, Sixth Edition.
2. ***Alexis Leon, Mathews Leon (2008), SQL: A Complete Reference,*** Tata McGraw Hill, Sixth edition.

Reference Books:

1. ***Abraham Silberschatz, Henry F.Korth and S.Sudarshan (2011), Database System Concepts,*** Tata McGraw Hill Publications, Fifth Edition.
2. ***C.J.Date (2006), An Introduction to database systems,*** AddisonWesley, Third Edition.
3. ***P. S. Deshpande (2008), SQL/PL SQL forOracle9i,*** Dream Tech Press, Reprint Edition.
4. ***James.R.Groff and Paul.N.Weinberg (2008), The Complete Reference SQL,*** Tata McGraw Hill, Second Edition.

E-learning Resources:

1. www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. beginnersbook.com/2015/04/rdbms-concepts/
3. beginnersbook.com/2015/04/dbms-tutorial/
4. www.tutorialspoint.com/dbms/index.htm

Course Outcomes:

CO1: Become familiar with the database management systems.

CO2: Describe the functional dependencies and design of the relational database.

CO3: Master the basics of SQL and construct queries using SQL.

CO4: Design a relational database schema using SQL for a given problem-domain.

CO5: Recognize the concept of concurrency control of database processing.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	L	L	L	L	L	M	M	L	M	M	M	M
CO2	L	L	M	L	L	L	M	L	L	M	M	L	M
CO3	M	L	M	M	M	H	L	M	L	M	M	L	L
CO4	M	L	L	M	L	M	M	L	L	M	M	L	L
CO5	L	M	M	L	M	M	L	M	M	L	M	M	M

Relational Database Management Systems Laboratory

Semester V **Hours of Instruction / Week: 4**

23BCAC09P **No. of Credits: 2**

List of Programs:

1. SQL queries using DDL using constraints,
2. SQL queries using DML and TCL commands.
3. SQL queries using built in and group functions.
4. SQL queries using advanced SQL operators, multiple and correlated sub query.
5. PL/SQL block using %type attribute, %row type attribute.
6. PL/SQL block using conditional statements and loops.
7. PL/SQL block using implicit cursors and explicit cursors.
8. PL/SQL block using procedures and functions.
9. PL/SQL block using predefined exception and custom defined exception.
10. PL/SQL block using triggers before and after updating records.

Total Hours: 60

Course Outcomes:

CO1: Design and implement a database schema for a given problem-domain.

CO2: Implement a data base query language.

CO3: Create and maintain tables using PL/SQL.

CO4: Demonstrate exception handling mechanism

CO5: Apply row and column level triggers on tables.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	L	M	M	L	L	M	M	M	L	M	M	M	M
CO2	M	M	M	M	L	L	M	L	L	M	M	L	M
CO3	M	M	M	M	M	H	M	M	L	M	M	L	L
CO4	M	M	L	M	L	M	M	L	L	M	M	L	L
CO5	M	M	L	L	M	M	M	M	M	L	M	M	M

Programming in Python

Semester V **Hours of Instruction / Week: 4**

23BCAC10 **No. of Credits: 4**

Objectives:

1. To make students understand the concepts of Python programming.
2. To apply the OOPs concept in Python programming.
3. To make the students learn best practices in Python programming

Unit I: Introduction to Python **12 hrs**

History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation-Operators-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods.

Unit II: Python Statements **12 hrs**

Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.

Unit III: Functions and Modules **12 hrs**

Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.

Unit IV: Built-in Data Structures **12 hrs**

Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.

Unit V: File Handling **12 hrs**

Python File Handling: Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.

Total Hours: 60

Textbooks:

1. ***Reema Thareja(2017), "Python Programming using problem solving approach"***, First Edition, Oxford University Press.
2. ***Dr. R. Nageswara Rao(2017), "Core Python Programming"***, First Edition, Dream tech Publishers.

Reference Books:

1. ***Vamsi Kurama(2018), "Python Programming: A Modern Approach",*** Pearson Education.
2. ***Fabio Nelli(2018), "Python Data Analytics***", A Press publication, Second Edition
3. ***Kenneth A. Lambert(2019), "Fundamentals of Python – First Programs***", Cengage Learning India Pvt. Ltd., Second Edition.

E-learning Resources:

1. https://www.programiz.com/python-programming
2. https://www.guru99.com/python-tutorials.html
3. https://www.w3schools.com/python/python_intro.asp
4. https://www.geeksforgeeks.org/python-programming-language/
5. https://en.wikipedia.org/wiki/Python_(programming_language)

Course Outcomes:

CO1: Learn the basics of python programming constructs.
CO2: Develop program using control statements in Python.
CO3: Express the concept of function, strings and modules.
CO4: Illustrate with List, tuples and dictionary.
CO5: Usage of File handlings concepts in Python.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	L	M	M	L	L	L	L	M	L	H	M	M
CO2	H	L	L	M	L	M	L	L	M	M	M	L	M
CO3	H	M	L	L	M	M	M	L	M	L	M	L	M
CO4	M	L	M	M	L	M	M	L	M	L	M	L	H
CO5	M	L	L	M	L	L	L	L	M	L	M	L	M

Programming in Python Laboratory

Semester V **Hours of Instruction / Week: 4**

23BCAC10P **No. of Credits: 2**

List of Programs:

1. Program using Control statements
2. Program using Functions.
3. Program using Recursion.
4. Program using Arrays.
5. Program using Strings.
6. Program using Modules.
7. Program using Lists.
8. Program using Tuples.
9. Program using Dictionaries.
10. Program for File Handling.

Total Hours: 60

Course Outcomes:

CO1: Demonstrate the understanding of syntax and semantics of Python language.

CO2: Identify the problem and solve using Python programming techniques.

CO3: Identify suitable programming constructs for problem solving.

CO4: Analyse various data structure of Python to solve the problem in an efficient way.

CO5: Develop a Python program for a given problem and test for its correctness.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	M	L	M	L	L	L	M	L	M	L	M	L	M
CO2	M	M	M	M	L	M	L	L	M	L	H	L	M
CO3	H	L	M	M	L	L	M	L	M	L	M	L	H
CO4	M	L	M	M	L	L	M	L	H	L	M	M	H
CO5	H	L	H	L	M	L	L	M	M	L	M	L	M

Software Engineering

Semester VI **Hours of Instruction /Week: 5+1**

23BCAC11 **No. of Credits: 6**

Objectives:

1. Understand the various processes and understanding requirements and concepts
2. Discuss the quality concepts and software quality assurance
3. Demonstrate the software testing strategies

Unit I: Process Models **18 hrs**

A Generic Process Model – Process Assessment and Improvement –. Prescriptive Process Models- Personal and Team Process Models - Process Technology – Product and Process. Agile Process-Extreme Programming-Agile process models.

Unit II: Software Engineering Practice **18 hrs**

Software Engineering Practice, Communication Practices, Planning Practices, Modeling Practices, Construction Practices. Requirements Engineering Tasks - Inception, Elicitation, Elaboration, Negotiation, Specification, Validation, Requirements Management. Initiating the Requirements Engineering process – Identifying the stakeholders, recognizing multiple viewpoints, working toward collaboration.

Unit III: Requirement Modeling and Design Concepts **18 hrs**

Requirements Analysis - Requirement Modeling approaches –Data modeling concepts- The Design Process – Software Quality Guidelines and Attributes - The Evolution of Software Design – Design Concepts – Abstraction, Architecture, Patterns, Modularity, Information Hiding, Functional Independence, Refinement, Refactoring. The Design Model- Data Design Elements - Architectural Design Elements. Architectural Design - Software Architecture.

Unit IV: Software Quality Assurance & Testing Strategies **18 hrs**

Elements of Software Quality Assurance – SQA Tasks, Goals and Metrics – Formal Approaches to SQA – Statistical Software Quality Assurance – Software Reliability. Software Testing strategies – A strategic approach to software testing - Verification and Validation - System Testing – Recovery Testing, Security Testing, Stress Testing, Performance Testing and deployment testing. Software Testing Fundamentals, Black Box Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing.

Unit V: Project Scheduling and Risk Management **18 hrs**

Project Scheduling - Scheduling - Software Risks - Risk Identification – Assessing Overall Project Risk - Risk Components and Drivers - Risk Projection – Developing a Risk Table - Assessing Risk Impact - Risk Refinement – Risk Mitigation, Monitoring and Management – The RMMM Plan.

Total Hours: 90

Text Book:

1. ***Roger S. Pressman (2016), Software engineering-A Practioner's Approach***, McGraw Hill Higher Education, Seventh Edition.

Reference Books:

1. ***Richard Fairley (2017), Software Engineering Concepts***, Tata McGraw Hill.
2. ***Ian Sommerville (2021), Software Engineering***, Pearson Education, Tenth Edition,
3. ***Shooman (2005), Software Engineering***, Tata McGraw Hill, Sixth Edition.

E-learning Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3schools.in/c-tutorial/
3. http://www.learn-c.org/en/Welcome

Course Outcomes:

CO1: Acquire fundamental knowledge in software engineering and differentiate the various processes.

CO2: Effectively demonstrate competence in communication, planning, analysis, design, construction, testing and deployment.

CO3: Describe the basic requirements and issues in design concept.

CO4: Gain knowledge in software quality assurance and formulate the software testing strategies.

CO5: Analyse the project scheduling and risk management.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PS02	PS03
CO1	L	M	M	L	M	M	L	L	M	H	M	L	L
CO2	L	H	M	M	H	L	M	L	M	L	L	L	M
CO3	M	L	L	M	L	L	M	L	L	L	H	H	M
CO4	L	M	M	M	H	M	L	M	L	L	H	L	M
CO5	M	H	H	M	M	L	L	L	L	H	M	M	L

Open Source Technology

Semester VI **Hours of Instruction /Week: 4**

23BCAC12 **No. of Credits: 4**

Objectives:

1. To provide a basic idea of open source technology.
2. Understand the policies, licensing procedures and ethics of FOSS.
3. Awareness about open source tools like Ruby, Perl and Joomla.

Unit I: Introduction to Open Source **12 hrs**

Introduction– Why Open Source–Open Source–Principles, Standards Requirements, Successes Free Software – FOSS–Internet Application Projects

Unit II: Principles and Open Source Methodology **12 hrs**

Open source – Initiatives, Principles, Methodologies, Philosophy, Platform, Freedom, OSSD, Licenses- Copyright, Copyleft, Patent, Zero Marginal Technologies, Income generation opportunities, Internalization.

Unit III: Ruby **12 hrs**

Introduction to Ruby-Features-Installation of Ruby-variables in Ruby-Ruby methods-Arithmetic and relational operators-logical and other operators-control statements-for and each looping statements-while and until looping statements-object oriented concept in Ruby-object oriented programming methods

Unit IV: Perl **12 hrs**

Installation of Perl-variables in Perl-comments in Perl-for each loops-while do while loops-conditional statements-data structures-arrays-array functions-hash in Perl-functions in Perl-blocks in Perl-access modifiers in Perl-referencing and dereferencing-special variables in Perl-file handling-exception and error handling-including files or modules

Unit V: Content Management System **12 hrs**

Overview of Joomla-Installing Joomla-creating articles in Joomla-article options in Joomla-formatting article in Joomla-categories in Joomla-menus in Joomla.

Total Hours: 60

Text Books:

1. ***Kailash Vadera, Bhavyesh Gandhi (2012)***, "***Open Source Technology***", Laxmi Publications Pvt Ltd ,First Edition.
2. ***David Flanagan, Yukihiro Matsumoto (2008), "The Ruby Programming Language",*** O'Reilly Media, Inc.
3. ***Tom Christiansen, brian d foy, Larry Wall, Jon Orwant (2012), "Programming Perl",*** O'Reilly Media, Inc.

Reference Book:

1. ***Fadi P. Deekand James A.M.McHugh (2007)***, "**Open Source: Technology and Policy**", Cambridge Universities Press

E-learning Resources:

1. https://www.coursera.org/learn/open-source-software-development-methods
2. https://www.tutorialspoint.com/ruby/ruby_overview.htm
3. https://www.geeksforgeeks.org/perl-tutorial-learn-perl-with-examples/

Course Outcomes:

CO1: Apply the principles of open source software.

CO2: Design real time applications using open source.

CO3: Develop skill sets in open source tools Ruby.

CO4: Apply the concepts of open source tool Perl in solving problems.

CO5: Create and manage a website using Joomla.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	H	M	M	H	L	H	H	L	L	H	H	M	H
CO2	H	M	M	M	H	H	L	L	L	L	L	L	L
CO3	M	L	M	L	L	L	L	L	M	L	L	L	L
CO4	M	L	L	L	M	L	L	L	M	M	M	L	L
CO5	L	L	L	L	L	M	L	M	M	L	H	M	M

Open Source Technology Laboratory

Semester VI **Hours of Instruction /Week: 4**

23BCAC12P **No. of Credits: 2**

List of Programs:

1. Ruby program using control statements.
2. Ruby program using looping statements.
3. Ruby program using array statements.
4. Perl program using functions.
5. Perl program using hash functions.
6. Perl program using exception handling.
7. Perl program using file handling.
8. Creating articles in Joomla.
9. Creating modules in Joomla.
10. Creating menus in Joomla.

Total Hours: 60

Course Outcomes:

CO1: Develop programs that demonstrate effective use of Ruby control statements.

CO2: Demonstrate the ability to analyze, use and create Ruby programs.

CO3: Construct programs that demonstrate the effective use of Perl features.

CO4: Apply hash functions to develop application in Perl.

CO5: Develop website using the features of Joomla.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	H	L	H	M	L	L	M	L	L	M	L	M	M
CO2	L	M-	L	H	L	M	L	L	M	H	L	L	L
CO3	H	L	L	M	M	L	M	M	L	L	M	L	L
CO4	L	M	M	L	M	M	M	M	L	L	M	M	L
CO5	M	M	M	L	L	L	L	H	H	M	M	L	M