



Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD)
Re-accredited with A++ Grade by NAAC, CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Department of Information Technology
B.Sc. Information Technology

Programme Outcomes

The Graduates will be able to

1. Attain and apply fundamental knowledge in basic concepts of Science
2. Gain Competence to communicate effectively
3. Develop critical thinking for innovations
4. Identify problems and suggest appropriate scientific, technological and environmental solutions.
5. Function individually or as a team in work environment
6. Acquire research skills to inquire, synthesize and articulate solution for community development.
7. Create and apply ICT tools for learning and technology development
8. Exhibit professional ethics and norms for social development
9. Implement acquired knowledge in basic sciences for self directed and lifelong learning
10. Promote entrepreneurial skills

Programme Specific Outcomes

1. Exhibit Professional skills in Planning, Analysing, Designing, Developing, Implementing and Testing to provide solutions to problems using Information Technology.
2. Inculcate in-depth knowledge in the areas of Programming languages, Web technologies, Databases, Multimedia, Open source software and state-of-the-art programming tools
3. Develop Entrepreneurs with the ability to provide software-based solutions to the requisite problem domains or facilitate to pursue post-graduation in core and allied areas of Information Technology.

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	Credit
First Semester			Theory	Practicals					
I	23BLT001/ 23BLH001/ 23BLF001	பொதுத்தமிழ்தாள் I - இக்காலஇலக்கியம்/ Prose and Non Detailed Texts/ French	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 / 4+4		3	50	50	100	6
III	Discipline Specific Core Course								
	23BITC01	Fundamentals of Information Technology	4	-	3	50	50	100	4
	23BITC01P	Basics of Information and Communication Technology - Practical I	-	4	3	50	50	100	2
	23BITC02	C Programming	4	-	3	50	50	100	4
	23BITC02P	C Programming -Practical II	-	4	3	50	50	100	2
IV	23BVBNC1/ 23BVBNS1/ 23BVBSP1	Skill Enhancement Course Value Based Course Elective-I- NCC / NSS / Sports	3/2		2	60	40	100	4/1/1
		Games – Practical	1	-	-	-	-	-	
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 Electives									
	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									
	23BITC03	Object Oriented Programming with C++ and Java	4	-	3	50	50	100	4	6
	23BITC03P	Object Oriented Programming with C++ and Java -Practical III	-	4	3	50	50	100	2	
	23BITC04	Relational Database Management Systems	4	-	3	50	50	100	4	6
23BITC04P	Database Management System using SQL-Practical IV	-	4	3	50	50	100	2		
IV	23BVBNC2/ 23BVBNS2/ 23BVBSP2	Skill Enhancement Course Value Based Course ElectiveI- NCC / NSS / Sports	3/2		2	60	40	100	4/1/1	
		Games – Practical	1	-	-	-	-	-	-	
								Total	28/25	
Third Semester										
I	23BLT003/ 23BLH003/ 23BLF003	பொதுத்தமிழ்தாள் III - சமயஇலக்கியம் /Ancient and Modern Poetry / French III	2	-	3	50	50	100	2	
	Generic Elective		Generic Elective III		5+1 / 4+4		3	50	50	100
III	Discipline Specific Core Courses									
	23BITC05	Data Structures and Algorithms	5+1	-	3	50	50	100	6	
	23BITC06	Operating Systems	4	-	3	50	50	100	4	6
23BITC06P	Operating Systems - Practical V	-	4	3	50	50	100	2		
IV	Skill Enhancement Courses									
	23BSBCS1	Skill Based Compulsory Course – I Communication Skill	-	4	3	50	50	100	2	
		Skill Based Elective Course – II	-	4	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	30/27	
Fourth Semester										
I	23BLT004/ 23BLH004/ 23BLF004	பொதுத்தமிழ்தாள்IV - சங்கஇலக்கியம் / Introduction to Functional Hindi and Journalism / French IV	2	-	3	50	50	100	2	
	Generic Elective		Generic Elective IV		5+1 / 4+4		3	50	50	100
III	Discipline Specific Core Courses									
	23BITC07	Software Engineering & Testing	4	-	3	50	50	100	4	6
	23BITC07P	Software Testing – Practical VI	-	4	3	50	50	100	2	
23BITC08	Python Programming	5+1	-	3	50	50	100	6		
IV	Skill Enhancement Courses									

	23BSBSS1	Skill Based Compulsory Course – III Soft Skill	-	4	3	50	50	100	2		
		Skill Based Elective Course – IV	-	4	3	50	50	100	2		
	23BVBNC4/ 23BVBNS4/ 23BVVSP4	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									30/27	
	Internship during summer vacation for 1 month										
	Fifth Semester										
III	Discipline Specific Core Courses										
	23BITC09	Introduction to Augmented Reality and Virtual Reality	4	-	3	50	50	100	4	6	
	23BITC09P	Multimedia - Practical VII	-	4	3	50	50	100	2		
	23BITC10	Data Science	4	-	3	50	50	100	4	6	
	23BITC10P	Data Science - Practical VIII	-	4	3	50	50	100	2		
	Discipline Specific Elective Courses										
	23BITDE1-6	DSE – I									
		Theory + Practical / Theory + Tutorial	4+4/5+1		3	50	50	100	6		
	23BITDE1-6	DSE – II									
		Theory + Practical / Theory + Tutorial	4+4/5+1		3	50	50	100	6		
	Skill Enhancement Courses										
IV	23BVBNC5/ 23BVBNS5/ 23BVVSP5	Value Based Course Elective I – NCC / NSS / Sports	3/2		2	-	-	-	4/1/1		
	Total									28/25	
	Sixth Semester										
III	Discipline Specific Core Courses										
	23BITC11	Mobile Communications	4	-	3	50	50	100	4	6	
	23BITC11P	Mobile Application Development - Practical IX	-	4	3	50	50	100	2		
	23BITC12	Data Communications and Networks	5+1	-	3	50	50	100	6		
	Discipline Specific Elective Courses										
	23BITDE7-10	DSE – III									
		Theory + Practical / Theory + Tutorial	4+4 / 5+1		3	50	50	100	6		
	23BITDE11	DSE – IV Project and Internship	6			100		100	6		
	Skill Enhancement Course										
IV	23BVBNC6/ 23BVBNS6/ 23BVVSP6	Value Based Course Elective I – NCC / NSS / Sports	3/2		2	-	-	-	4/1/1		
	Total									28/25	
	Over all 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 course I – 23BSBCS1 – Communication Skill during 3rd semester**
- **Skill Based Compulsory course III - 23BSBSS1 – Soft Skill during 4th semester**
- **Skill Based Courses offered by Information Technology department**

S.No	Skill Based Elective Courses (II / IV)	Semester	Hours of Instruction	Credit/Course
1.	23BITSE1- Data Structures and Algorithmswith C++ - Practical	III	4P	2
2.	23BITSE2-Python Programming - Practical	IV	4P	2

- **Value Based Courses - Elective I**

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

- **Value Based Courses - Elective II /III offered by Information Technology Department**

Value Based Courses Elective II	Subject Code	Semester	Hours of Instruction	Credit / Course
-	-	-	-	-

➤ **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 4hours of practical or 5 hours of theory and 1 hour of Tutorials.

S. No.	DSE Courses	Semester	Hours of Instruction		Credits
			Theory + Practical / Theory + Tutorial		
1.	23BITDE1 Internet Technologies	V	4		6
	23BITDE1P Internet Technologies - Practical	V	4		
2.	23BITDE2 Cryptography and Network Security	V	5+1		6
3.	23BITDE3 Basics of Cyber Security	V	5+1		6
4.	23BITDE4 Introduction to Internet of Things	V	5+1		6
5.	23BITDE5 E - Commerce	V	5+1		6
6.	23BITDE6 .Net Programming	V	4		6
	23BITDE6P .Net Programming - Practical	V	4		
7.	23BITDE7 Introduction to Artificial Intelligence	VI	5+1		6
8.	23BITDE8 Introduction to Machine Learning	VI	5+1		6
9.	23BITDE9 Cloud Computing	VI	5+1		6
10.	23BITDE10 Digital Fundamentals and Architecture	VI	5+1		6
11.	23BITDE11 Project and Internship	VI	6		6

➤ **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		Credits
			Theory + Practical / Theory + Tutorial		
1.	23BITGE1 Computer Ethics	I	5+1		6
2.	23BITGE2 Python for Beginners	III	5+1		6
3.	23BITGE3 Introduction to Data Science	IV	5+1		6

Total credits to earn the degree

1. Part I Components - 8 Credits (Languages)
2. Part II Components - 32 Credits (Ability Enhancement Compulsory 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 Credits (Skill Enhancement Courses - Skill Based Courses – 8 Credits, Value Based Courses Elective I (NCC/NSS/Sports) –24 / 6 / 6, Value Based Elective Courses 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 .

Fundamentals of Information Technology

Semester I
23BITC01

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. To observe the fundamental concepts of Computer, Arithmetic Circuits and Logic Gates.
2. To Express the Intellectual Property Rights and Communication Process
3. To Illustrate Networks and various types of Networks
4. To Devise Multimedia and Virtual Reality
5. To Order fundamental concepts of New Technologies

Unit I Introduction to Computer Systems, Logic Gates and Arithmetic circuits Introduction to Computers – Classification – Anatomy of a Digital Computer – Memory Units – Auxiliary storage devices – Input Devices – Output Devices. Basic Gates, NOR, NAND, XOR Gates. Half adder, Full adder, Half subtractor, Full subtractor, Parallel binary adder, Parallel binary subtractor, BCD adder.	14
Unit II Social Impact of IT and Telecommunication Privacy, Security and Integrity of Information, Intellectual Property Rights, Careers in IT, Telecommunication System, Communication Process, Communication Media, Characteristics of Communication Media, Telecommunication Software.	12
Unit III Networks Introduction, Types of Networks, Network Topologies, Network Protocols, LAN, WAN, MAN, OSI Reference model, TCP/IP, Internet and World Wide Web, Intranets, Extranets.	13
Unit IV Multimedia and Virtual Reality Introduction to Multimedia, Multimedia Tools, Introduction to virtual Reality, History of Virtual Reality, Use of Virtual reality, Features.	10
Unit V New Technologies of Information Technology E-Commerce, Hypermedia, OLAP, Cloud: Introduction, Service Models, Deployment Models, IoT-Introduction and Applications of IoT: Smart Irrigation – Data Analytics: Introduction.	11

Text Book:

Total Hours:60

1. *Alexis leon and Mathew leon (2012), "Introduction to Information Systems", Second Edition, Vijay Nicole Pvt Limited.*

Reference Books:

1. *V. Rajaraman (2018). "Introduction to Information Technolog", Third Edition Prentice Hall of India Pvt Limited.*
2. *Ralph M.Stair and George W.Reynolds (2017), "Principles of Information Systems", 13th Edition.*
3. *Achyut S Godbole and Atul Kahate (2017), "Data Communication and Networks", Second Edition, Mc Graw Hill, Newyork.*
4. *S. Salivahanan and S. Arivazhagan (2018), "Digital Circuits And Desig", Fifth Edition. Vikas publishing house Pvt ltd.*
5. *M.Morris Mano (2006), "Computer System Architecture", Third Edition. Prentice Hall of India.*

Web References:

1. <https://in.coursera.org/learn/digital-systems>
2. <https://nptel.ac.in/courses/117105078>
3. <https://www.udemy.com/course/digital-design-fundamentals/>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Understand Basic Gates and Circuits.
2. Identify Social Impact of IT and Telecommunication.
3. Explain Network Topologies and Internets.
4. Articulate Multimedia Tools and Virtual Reality.
5. Apply E-Commerce, Cloud and IOT.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	-	-	-	-	-	-	-	-	-	-	-	L	L
CO 2	-	-	-	-	-	-	L	-	L	-	-	L	L
CO 3	-	-	L	L	-	L	L	-	L	-	-	L	L
CO 4	-	-	L	L	-	L	L	-	M	-	-	L	L
CO 5	-	-	L	L	-	L	L	-	M	-	-	L	L

Basics of Information and Communication Technology - Practical I

Semester I
23BITC01P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To describe fundamental computer literacy curriculum to prepare students for constant learning of Computer concepts and skills.
2. To provide students an extensive understanding of significance of Computers in business, Education and society.
3. To provide hands-on training on office automation software.
4. To develop an intuitive knowledge on basic Internet Technologies
5. To develop familiarity with email operations and use of World Wide Web.

List of Exercises:

Internet:

1. Create an Email-id using any ISP and perform the following.
E-mail Operations:
 - (a) Compose and send a mail with and without attachments, downloading attachments using CC and BCC options
 - (b) Forwarding and replying for a mail
2. To search a topic using various web browsers and search engines
 - (i) Apply basic Internet Search Techniques and Search Logic
 - (ii) Perform Image Search and Reverse Image Search
 - (iii) Perform Voice Search

Office Automation:

I. Word

3. Creating documents, font setting, paragraph setting, style setting, editing, formatting and page layout options.
4. Inserting pictures, shapes and symbols, header and footer in the document.
5. Table creation and formatting.

II. Excel

1. (i) Creating spreadsheets and add sample data into it. Performing formatting, AutoFill, AutoSum, Sort and Filter and numeric formats.
(ii) Working with formulas, Inserting different charts, Pivot Table.
2. Using Built-in functions.

III. PowerPoint

3. Creating presentation with different slide layouts and designs by including slide transition, date and time, slide number
4. Insert table, chart, image, shapes and SmartArt, audio, video and animations in the slides.

IV. MS Access

5. Construct Database using MS-Access
6. Create a table using wizard mode in MS-Access.

Google Workspace

12. Create and manage events, share calendars, and make your schedule searchable using Google Calendar
13. Create and Collaborate on Online Documents using Google Docs

14. Organize, Protect, and Share files using Google Drive
15. Explore actions, settings, and features that help to better organize the inbox and compose more engaging emails using Gmail.
16. Create video meetings and collaborating using instant messages using Google Meet and Chat
17. Create, edit, and collaborate on spreadsheets using Google Sheets
18. Create and collaborate on professional presentations using Google Slides
19. create online forms and surveys with multiple question types using Google Forms
20. Build a simple website using Google sites.

Total Hours:60

Web References:

1. www.coursera.org
2. <https://ict.iitk.ac.in/>
3. <https://www.wikihow.com>
4. <https://www.tutorialspoint.com>
5. <https://spokentutorial.com>
6. <http://www.openlearningworld.com>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Use Office applications to accomplish with professional excellence.
2. Complete basic operations necessary to use Internet and email independently.
3. Organize and Categorize data into logical format using spreadsheet.
4. Prepare a well-constructed presentation using PowerPoint.
5. Practice creation of tables using MS-Access.
6. Utilize google workspace that helps to understand the basic usage of google.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M	L	M	-	M	-	H	-	H	L	-	L	L
CO 2	M	L	M	-	H	-	H	-	H	L	-	L	L
CO 3	M	L	M	-	L	-	H	-	H	L	-	L	L
CO 4	M	L	M	-	L	-	H	-	H	L	-	L	L
CO 5	M	L	M	-	L	-	H	-	M	L	-	L	L

C Programming

Semester I
23BITC02

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. To define basic programming and know the C control structures.
2. To understand and use the arrays and strings
3. To gain knowledge about the functions and structures of C Programming.
4. To recite about the pointers and memory management.
5. To devise advanced features of C specifically I/O and File Management.

Unit I Introduction to C & Control Structure

Basic structure of C program, executing a program, constants, variables, data types, operators and expressions, IF statement, IF ELSE, conditional operators, FOR, WHILE, Do statements, SWITCH, GOTO statement.

14

Unit II Arrays & Strings

Arrays: Introduction, One dimensional array, Two dimensional array, Multidimensional arrays, String Manipulations: Declaring and initializing strings, string manipulation, read, write, compare and concatenate, count, sub string.

12

Unit III Functions & Structures

User defined functions, category of functions, Nesting of functions, Recursion, Function with arrays, Structures and unions, Introduction, Arrays within structures, Structures within structures, structures and functions, union.

12

Unit IV Pointers

Introduction, Pointer expression, Pointers and arrays, Pointers and functions, Pointers and structures, Application of Pointers and Structures.

12

Unit V Files

Introduction, opening and closing a file, I/O operations on files, command line arguments, random access files, error condition.

10

Text Book:

Total Hours:60

1. E. Balagurusamy (2016), "Programming in Ansi C", 7th Edition, Tata McGraw Hill Publishers

Reference Book:

1. Yashwant Kanetkar (2017), "Let us C Solutions", 15th Edition BPB Publications.

Web References:

1. <https://www.coursera.org/specializations/c-programming>
2. <https://www.coursera.org/learn/c-for-everyone>
3. https://onlinecourses.nptel.ac.in/noc19_cs42
4. https://onlinecourses.swayam2.ac.in/cec20_cs02

Course Outcomes:

On successful completion of this course, the student will be able to

1. Read, understand and trace the C program execution.

2. Implement programs using arrays and strings.
3. Extend the C programming through functions, structures and arguments.
4. Relate and apply pointers and memory management into programs.
5. Demonstrate using file management in C.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	L	L	M	-	-	L	L	-	-	-	H	-	M
CO 2	L	L	M	L	-	L	L	-	-	-	H	-	M
CO 3	M	L	M	L	-	L	L	-	-	-	H	-	M
CO 4	M	L	M	L	-	L	L	-	-	-	H	-	M
CO 5	M	L	M	L	-	L	L	-	-	-	H	-	M

C Programming - Practical II

Semester I
23BITC02P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To define basic programming concepts and be familiar with programming environment.
2. To understand the problem solving techniques.
3. To learn to write, test and execute C programs.
4. To apply functions, pointers and structures.
5. To experiment I/O and File Management and related preprocessors.

List of Exercises:

1. Programs based on different if statements
2. Programs for using conditional operator
3. Programs to use while and do-while loops
4. Programs using for loop
5. Programs using switch-case statement
6. Programs based on arrays (single and two dimensional)
7. Programs based on strings and array of strings
8. Programs based on Functions
9. Programs based on nested functions
10. Programs on function and arrays
11. Programs based on structures
12. Programs on Unions
13. Programs using structure and functions
14. Programs based on Recursive functions
15. Programs based on Pointers
16. Programs based on array of pointers
17. Programs using pointers and functions
18. Programs for pointers and structures
19. Programs using files
20. Programs using command line arguments

Total Hours:60

Text Book:

1. *E. Balagurusamy (2016), "Programming in Ansi C", 7th Edition, Tata McGraw Hill Publishers*

Reference Book:

1. *Yashwant Kanetkar (2017), "Let us C Solution", 15th Edition BPB Publications.*

Web References:

1. <https://www.coursera.org/specializations/c-programming>
2. <https://www.coursera.org/learn/c-for-everyone>
3. https://onlinecourses.nptel.ac.in/noc19_cs42
4. https://onlinecourses.swayam2.ac.in/cec20_cs02

Course Outcomes:

On successful completion of this course, the student will be able to

1. Read, understand and trace the C program execution.

2. Implement programs using control structures, pointers and arrays.
3. Relate and apply arrays and strings into programs.
4. Extend the C programming through functions and arguments.
5. Demonstrate using pointers and memory management in C.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	L	L	M	L	-	L	L	-	-	-	H	-	M
CO 2	L	L	M	L	-	L	L	-	-	-	H	-	M
CO 3	M	L	M	L	-	L	L	-	-	-	H	-	M
CO 4	H	L	M	L	-	L	L	-	-	-	H	-	M
CO 5	H	L	M	L	-	L	L	-	-	-	H	-	M

Object Oriented Programming with C++ and Java

Semester II
23BITC03

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. To understand the fundamental concepts of object oriented programming and C++.
2. To perceive knowledge on C++ inheritance and pointers.
3. To describe the basic concepts of java.
4. To learn about methods, interfaces, packages and thread.
5. To handle error using exception handling and develop applications using applet & AWT.

Unit-I Fundamentals of object oriented programming and C++

12

Key Concepts of OOP, Advantages, OO Languages, C++ **Classes and Objects:** Declaring objects, Defining member functions, Static data member and member functions, arrays of objects, Object as function arguments, inline function, function overloading, Friend functions, Constructor and Destructors. Defining Operator overloading, Overloading unary, Binary operators, Rules for overloading Operators, Type conversion

Unit-II C++ Inheritance & Pointers

12

Inheritance: Inheritance, Single, Multilevel, Multiple, Hierarchical, Hybrid inheritance, Virtual Base classes, Abstract Classes. Declaration, Pointer to class, object, THIS pointer, Pointer to derived classes, Virtual functions, and pure virtual functions.

Unit III Overview of Java

12

Java Features, Java program syntax, program structure, Tokens, statements, JVM, command line arguments, constants, variables, data types, scope of variables, symbolic constants, type casting. Operators and Expressions: Arithmetic, Relational, Logical, Assignment, Increment, Decrement, conditional, bitwise, special operators, type conversions, mathematical functions, Arrays, Strings.

Unit IV Methods, Interfaces, Packages and Thread

12

Method Overloading, Inheritance, Overriding Methods, Final Variables, Final Methods and Final Classes, Finalize Method- Abstract Methods and Abstract Classes. Interfaces: Defining Interface- Extending Interfaces-Implementing Interfaces-Accessing Interface variables. Packages: Creating Packages and Accessing-Using a package. Multithreaded Programming: Creating Threads-Thread Life Cycle – Thread Priority-Synchronization-Inter thread communication.

Unit V Exception Handling, Applet and AWT

12

Exception Handling: Types of Errors – Exceptions- Syntax of Exception Handling Code- Throwing own Exception - Multiple Catch Statements - Using Finally Statements. Applet: Applet Lifecycle-Development and Execution of a Simple Applet. AWT: Event Handling Methods- Labels- Button Control- Check Box Control- Radio Button Control- Choice Control- List Control.

Total Hours:60

Text Book:

1. *Ashok N Kamthane(2011).Object Oriented Programming with ANSI and Turbo C++.* Pearson Education Publications.
2. *E. Balagurusamy, "Programming with JAVA"(2019),* Sixth edition, Tata McGraw Hill, New Delhi.
3. *C. Muthu, "Programming with JAVA"(2008),* Second Edition, Vijay Nicole Imprints Private Limited, Chennai.

Reference Books:

1. **Bjarne Stroustrup(2014). Programming – Principles and Practice using C++,** Second Edition. Addison Wesley publications.
2. **Herbert Schildt(2012). C ++ The Complete Reference.** Osborne McGraw Hill Publications.
3. **E.Balagurusamy(2014). Object Oriented Programming with C++.** Sixth Edition.Tata McGraw Hill Publications.
4. **Patric Naughton and Herbert Schildt, Java-The Complete Reference(2020), Eleventh Edition,** Tata McGraw Hill Publishers.
5. **John R. Hubbard, Schaum’s Outline of Programming With Java (2020), Second Edition,** Tata McGraw Hill Publishers.

Web References:

1. <https://www.coursera.org/specializations/object-oriented-programming>
2. <https://spoken-tutorial.org/watch/C+and+Cpp/>
3. <https://spoken-tutorial.org/watch/Java/>
4. <https://nptel.ac.in/courses/106105191>
5. <https://www.javatpoint.com/>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Articulate the Object oriented programming concepts and apply it in C++ programming language.
2. Describe the concepts of inheritance and pointers.
3. Use JVM and basic java programming elements.
4. Demonstrate the concepts of Methods, Interface, Packages and Thread.
5. Handle errors and develop java applications using AWT and Applet Programming.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M	-	L	M	M	M	M	-	M	M	L	H	L
CO 2	M	-	L	M	M	M	M	-	M	M	H	H	M
CO 3	M	-	M	H	M	M	M	-	M	M	H	H	H
CO 4	M	-	M	H	M	M	M	-	M	M	H	H	H
CO 5	M	-	M	H	M	M	M	-	M	H	H	H	H

Object Oriented Programming with C++ and Java - Practical III

Semester II
23BITC03P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To recognize object oriented programming environment to create, debug & run C++ and java programs.
2. To understand fundamentals of programming such as variables, conditional and iterative exec.
3. To develop the concepts of inheritance, Interfaces, Packages and Thread.
4. To apply the concepts of interfaces, packages and thread.
5. To handle error using exception handling and develop applications using applet programming.

List of Exercises

1. C++ program based on control structures.
2. C++ program based on class and objects
3. C++ program based on constructors.
4. C++ program based on virtual base class.
5. C++ program based on virtual functions.
6. C++ program based on pointers.
7. Java program to implement arrays.
8. Java program for method overloading.
9. Java program for implementing inheritance.
10. Java program for method overriding.
11. Java program using abstract classes.
12. Java program for string handling functions.
13. Java program using interfaces.
14. Java program for creating packages.
15. Java program for multithreading.
16. Java program for inter thread communication.
17. Java program for exception handling.
18. Java program for user defined exceptions.
19. Program using AWT.
20. Program using applets.

Web References:

Total Hours:60

1. <https://www.coursera.org/specializations/object-oriented-programming>
2. <https://spoken-tutorial.org/watch/C+and+Cpp/>
3. <https://spoken-tutorial.org/watch/Java/>
4. <https://nptel.ac.in/courses/106105191>
5. <https://spoken-tutorial.org>
6. <https://www.javatpoint.com/>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Identify classes, objects, members of a class and the relationships among them for a specific problem
2. Know about new ideas and advances, techniques, and tools and to use them effectively.
3. Develop programs using appropriate packages for Inter –thread Communication and Synchronization
4. Construct GUI applications to handle events.
5. Design, develop, test and debug Java programs using object – oriented principles in conjunction with development tools including integrated development environments

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M	-	L	M	H	M	H	-	M	M	L	H	L
CO 2	M	-	L	M	H	M	H	-	M	M	H	H	M
CO 3	M	-	M	H	H	M	H	-	M	M	H	H	H
CO 4	M	-	M	H	H	M	H	-	M	M	H	H	H
CO 5	M	-	M	H	H	M	H	-	M	H	H	H	H

Relational Database Management Systems

Semester II
23BITC04

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. To Understand the fundamental concept of DBMS
2. To Perceive knowledge on Database Design and ER Diagram
3. To Understand integrity constraints, views and calculation over relation using algebra and calculus
4. To Apply SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS
5. To Analyze and apply various Normalization schema refinement in database design

Unit I Overview of Database Systems

12

Managing data, Historical perspective, File system versus DBMS, Advantages of a DBMS, Describing and storing data in a DBMS, Queries in a DBMS, Transaction Management, Structure of a DBMS.

Unit II Database Design & ER Diagrams

12

Entities, attributes and entity sets, relationships and relationship set, additional feature of the ER model, conceptual database design with ER Model.

Unit III Relational Model

12

Integrity constraints over relations, enforcing integrity constraints, relational data, logical database design, ER to relational. Introduction to views, destroying / altering Tables and views. Relational algebra and calculus.

Unit IV SQL

12

Queries, programming, triggers, The form of a basic SQL query, UNION, INTERSECT and EXCEPT, nested queries, aggregate operations, null values, complex integrity constraints in SQL triggers and active data bases.

Unit V Schema Refinement and Normal Forms

12

Introduction to Schema refinement, Functional dependencies, reasoning about functional dependencies, Normal forms, properties of decompositions, Normalization schema refinement in database design, other kinds of dependencies

Text Book:

Total Hours:60

1. *Raghu Ramakrishnan, Johannes Gehrke (2014), "Database Management Systems", Third Edition. McGraw Hill Higher Education.*

Reference Books:

1. *Silberschatz, Korth, Sudharshan (2019), "Database System Concepts", Seventh Edition. McGraw Hill Higher Education.*
2. *Elmasri Ramez, Navathe Shamkant (2017), "Fundamentals of Database Systems", Seventh Edition. Pearson Education.*
3. *C.J.Date (2010), "An Introduction to Database Systems", Addison Wesley. Eight Edition*

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs51/preview
2. <https://www.geeksforgeeks.org/dbms/>
3. <https://www.codecademy.com/article/what-is-rdbms-sql>
4. <https://www.coursera.org/courses?query=relational%20database>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Understand the basic concepts of the database management system.
2. Acquire the knowledge to design a database using ER diagrams
3. Acquire the knowledge on integrity constraints, views and calculation over relation using algebra and calculus.
4. Able to develop relational DBMS using SQL commands
5. Able to Develop a simple database using normalization schema refinement in database

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	H	L	L	L	L	-	L	-	L	L	L	L	L
CO 2	M	L	L	L	L	-	L	-	L	L	L	L	L
CO 3	M	L	M	L	L	-	M	-	M	L	L	M	M
CO 4	L	L	M	M	M	-	H	-	M	M	L	H	M
CO 5	L	L	M	M	M	-	H	-	H	M	M	H	M

Database Management System using SQL - Practical IV

Semester II
23BITC04P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To give the students an experience in working with Database system
2. To provide extensive hands-on training on SQL and PL/SQL
3. To understand and use data manipulation language to query, update, and manage a database
4. To Familiarize the students with PL/SQL
5. To design and build a simple database system

List of Exercises:

1. Creating tables using constraints
2. Altering, Updating and deleting the tables
3. Queries using DML commands.
4. Queries using Date functions
5. Queries for sorting the data in the table.
6. Queries using Aggregate functions
7. Queries using set operators
8. Queries using joins.
9. Queries using group by and Having.
10. Queries using sub queries.
11. PL/SQL program using Procedures
12. PL/SQL program using Functions
13. PL/SQL program using cursors
14. PL/SQL program using triggers
15. PL/SQL program for Exception handling

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2. https://onlinecourses.swayam2.ac.in/aic20_sp36/preview
3. <https://study.com/academy/course/sql-tutorial-training.html>
4. <https://www.udemy.com/course/sql-for-absolute-beginners/>
5. <https://www.educba.com/software-development/courses/free-sql-course/>

Total Hours:60

Course Outcomes:

On successful completion of this course, the student will be able to

1. Identify Structure Query Language statements used in creation and manipulation of Database
2. Write queries using various DML commands.
3. Construct complex queries using joins and group by and test.
4. Experiment PL/SQL cursors, functions, triggers, procedures and Exception handling.
5. Analyze and design a database application.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	H	H	M	M	M	M	M	M	M	M	M	M	M
CO 2	M	M	M	M	M	M	M	M	M	M	M	M	M
CO 3	M	M	M	M	M	M	M	M	M	M	M	M	M
CO 4	H	H	M	M	M	H	H	M	M	M	M	H	H
CO 5	H	H	M	M	M	H	H	M	M	M	H	H	H

Data Structures and Algorithms

Semester III
23BITC05

Hours of Instruction/week: 5+1
No of credits: 6

Course Objectives:

1. To Create and Analysis of algorithm, its representation and time complexity
2. To understand the linear and non linear data structures and its application
3. To develop the skill set to utilize data structure techniques in problem solving
4. To have a comprehensive knowledge of Memory management, Tree and its implementation
5. To understand the algorithm behind searching and sorting.

Unit I Introduction

Overview, creating programs, analyzing programs, Big O Notations, Arrays, Ordered lists, representation of arrays. 15

Unit II Stacks, Queues and Linked List

Definition, concepts, operations in queues and stacks, evaluation of expression, multiple stacks and queues, Linked Lists, Singly linked lists, linked stacks and queues, storage pool, polynomial addition, sparse matrices, doubly linked lists. 18

Unit III Dynamic Storage Management and Trees

Garbage collection and compaction, Trees, Terminology, binary tree, representation of trees, binary tree traversal, threaded binary trees, minimum spanning tree algorithms. 19

Unit IV Graphs and Sorting

Terminology, representations, shortest paths, transitive closure. Sorting, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Shell Sort, Heap sort. 19

Unit V Searching and Algorithm Design

Searching, Sequential Search and Binary search, Algorithm Design, Greedy algorithms, Divide and conquer, Dynamic programming, Knapsack problem, backtracking, branch and bound. 19

Text Books:

Total Hours:90

1. Eillis Horowitz, Sartaj Sahni, Susan Anderson-Freed (2008). *Fundamentals of Data Structure using C*. Galgotia publications Pvt.Ltd. Second Edition
2. Eillis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran "Fundamentals of Computer Algorithm"

Reference Book:

1. Jean Paul Tremblay and Paul Anderson(2005). *An introduction to Data Structures with Applications*. McGraw Hill International Student Edition.
2. E.Horowitz and S.Shani(2015). *Fundamentals of Data Structures in C++*. Galgotia Publication

Web References:

1. <http://nptel.ac.in/courses/106103069/>
2. https://lecturenotes.in/materials/11971-data-structure-using-c?utm_source=subjectpage&utm_medium=web&utm_campaign=materialpage

Course Outcomes:

On successful completion of this course, the student will be able to

1. Write and analyze efficient algorithm for a given problem and to analyze its time complexity
2. Apply the suitable data structure to a given problem.
3. Utilize data structure techniques in problem solving.
4. Gain Knowledge on Memory management, Tree and its implementation.
5. Apply data structures and algorithms for different type of searching and sorting.

CO-PO Mapping and Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	H	M	M	-	-	M	M	-	-	M	H	M	M
CO 2	M	M	M	M	-	H	H	-	L	M	H	L	L
CO 3	H	M	M	L	-	H	-	M	-	-	M	L	L
CO 4		M	M	-	-	H	L	-	-	-	-	L	-
CO 5	M	M	M	L	-	H	H	-	-	M	M	-	-

Operating Systems

Semester III
23BITC06

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. To understand about the basics of Operating Systems, Process and interrupts.
2. To recognize Asynchronous Concurrent Processes and Concurrent Programming
3. To have an in-depth understanding of deadlock and processor management
4. To illustrate Real and Virtual Storage Organization and Management.
5. To infer File System and to provide an exposure to Linux Operating System

Unit I Introduction to Operating Systems & Process Concepts : Operating System: 12
Definition - Core Operating System components and goals – Types of Operating System - Key Architectural Trends - Hardware, Software, Firmware - Process Concepts: Definition of Process - Process States - Process Management - Interrupt – Interprocess communication.

Unit II Thread concepts, Asynchronous Concurrent Processes and Concurrent Programming: Definition of Thread – Thread operations – Threading models - Parallel Processing - Mutual Exclusion - Critical Sections – Semaphores - Introduction to Concurrent Programming - Critical Regions – Monitors – Java Monitors - Message Passing. 12

Unit III Deadlock and Indefinite Postponement and Processor Management 12
Introduction - Deadlock examples - Indefinite Postponement - Resource Concepts - Conditions for Deadlock - Prevention, Avoidance, Detection, and Recovery of deadlock – Introduction to Job and Processor Scheduling: scheduling levels - Preemptive Vs Non-preemptive scheduling – Priorities – Deadline scheduling.

Unit IV Memory Organization and Management 12
Storage Management : Real Storage Management Strategies – Contiguous versus Non-contiguous storage allocation – Single User Contiguous Storage allocation- Fixed partition multiprogramming – Variable partition multiprogramming - Virtual Storage: Virtual Storage Management Strategies – Page Replacement Strategies – Working Sets – Demand Paging – Page Size

Unit V File System and Introduction to Linux Operating System 12
File and Database Systems: File System – File Organization – File Allocation – Free Space Management – File Access Control – Linux Operating System: Structure Of Linux Operating System - Logging In And Logging Out - Directory Structure - Naming Files and Directory- Shell Scripting Basics - Advanced Shell Scripting

Total Hours:60

Text Book:

1. *Harvey M.Deital (2007), "Operating Systems".* Pearson India. Third Edition, Publishing Company.
2. *Richard Peterson (2008), "Linux - The complete reference",* Sixth Edition, TMH Publications

Reference Books:

1. *S Scott Harvey (2017), "Linux: Beginners Guide for Learning Linux & Shell Scripting",* Createspace Independent Pub.

Web References:

1. https://onlinecourses.swyam2.ac.in/cec22_cs23/preview
2. <https://www.udemy.com/course/operating-systems-concepts-1/>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Know the fundamentals of Operating Systems and understand the concepts such as process and interrupts
2. Identify and design concurrent programming.
3. Recover problems in deadlocks and understand various processor scheduling techniques
4. Extend knowledge on Virtual Storage management
5. Structure different file systems and describe the architecture and features of Linux Operating System and distinguish it from other Operating System.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	H	-	L	H	-	L	-	-	H	-	-	L	L
CO 2	H	-	L	H	-	M	-	-	H	-	-	L	L
CO 3	H	-	L	H	-	-	-	-	H	-	-	L	L
CO 4	M	-	L	H	-	-	-	-	M	-	-	L	L
CO 5	M	-	L	H	-	-	-	-	H	-	-	L	M

Operating Systems – Practical V

Semester III
23BITC06P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To provide the knowledge about Linux utilities and commands
2. To introduce Linux shell commands for creating own programs
3. To train students for doing programs using various operators, loops and functions
4. To provide hands-on scripting knowledge for process management and deadlock management.
5. To give in-depth knowledge in creating shell scripts for working with File System

List of Exercises:

1. Write a shell script to stimulate the file commands: cat, pwd, cal, echo, who, man, info, ls, mv, wc, mail rm, cp, cmp, wc, split, diff
2. Write a shell script to stimulate the file commands: sort, cmp, chod, logout, grep, pr, more, clear, tail, expr
3. Write a shell script to show various system configuration
4. Write a Shell Script to implement the following: pipes, Redirection and tee commands.
5. Write a shell script for displaying current date, user name, file listing and directories by getting user choice.
6. Write a shell script to implement the filter commands.
7. A simple script to show usage of logical operators
8. Shell script for using different types of if statements
9. Shell script for using loops
10. Shell script to show the use of case statement
11. Shell script to show the usage of function
12. A script to demonstrate different types of array access
13. Write a shell script to remove the files which has file size as zero bytes.
14. Shell script for manipulating strings
15. Shell program using semaphores
16. Shell program for process management
17. Shell program to display file permission
18. Shell program to display file type
19. Shell program for process creation
20. Shell program for directory manipulation

Total Hours:60

Web References:

1. <https://www.sourcecodesolutions.in/2010/09/cs1254-operating-system-lab.html>
2. <https://www.w3resource.com/linux-system-administration/linux-commands-introduction.php>
3. <https://www.freecodecamp.org/news/bash-scripting-tutorial-linux-shell-script-and-command-line-for-beginners/>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Execute appropriate Linux commands for completing various tasks
2. Develop Linux utilities to perform all process based operations
3. Understand and develop shell scripts using pipes, redirection and filters
4. Develop Linux utilities to perform File processing and Directory handling
5. Develop Linux scripts to build real time applications

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	H	-	M	L	M	M	-	L	M	-	M	M	L
CO 2	H	-	M	L	M	M	-	L	M	-	M	H	L
CO 3	H	-	H	M	H	M	-	L	M	-	M	H	L
CO 4	M	-	H	M	H	M	-	M	M	-	M	H	M
CO 5	M	-	H	H	H	H	-	M	H	H	H	H	H

Software Engineering & Testing

Semester IV
23BITC07

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. To provide knowledge on generic software development process model
2. To analyze the basic software requirement specification and Scenario based modeling
3. To understand basic Software Design & Architecture
4. To learn fundamentals on testing, and types of testing
5. To understand about system testing, performance testing, acceptance testing and regression testing.

Unit I Introduction to Software Engineering

Software Engineering – The Software process – The essence of practice – Process Model : A generic process model – Waterfall model – incremental process model-RAD model - Evolutionary process model— spiral model – concurrent process model-Project management concept : Management spectrum : people-product-process, Product Life Cycle Model, Agile: Agility-Agile process –other Agile process model.

12

Unit II Requirements Analysis

Software requirement Specification –Developing use cases-Building Requirements Model-Requirements Modeling : Requirements Analysis – Scenario Based Modeling – UML Model-Data Modeling concepts-class based modeling –flow orients Modeling – creating behavioral model- Patters for requirements modeling – requirements modeling for webapps.

12

Unit III Software Design and Software Architecture

Design process- Design principles - Design concepts-Design models- Software architecture – Architectural Design- Component level design : Designing class based components – conducting component – Designing Traditional components

12

Unit IV Principles of Software Testing and Types of testing

Software Testing Fundamentals: Illustrated Principles, Types of testing: White Box Testing, Static Testing, Structural Testing, Unit testing, Black Box Testing, Integration Testing as Type of Testing, Integration Testing as a Phase of Testing.

12

Unit V System Testing and Acceptance Testing

System Testing Overview, Functional versus Non-functional Testing, Functional testing, Non-functional Testing, Acceptance Testing, Performance Testing: Factors governing Performance Testing, Regression Testing: Types of Regression Testing.

12

Text Book:

Total Hours:60

1. *Roger S. Pressman(2010), "Software Engineering – A Practitioner"s Approach", Seventh Edition, Mc Graw-Hill International Edition.*
2. *Srinivasan Desikan & Gopalswamy Ramesh (2006), "Software Testing Principles and Practices", Second Edition, Pearson Education.*

Reference Book:

1. *Richard Farley(2004). Software Engineering Concepts. TMH.1/e.*
2. *Jeff Tian(2006). Software Quality Engineering. Student Edition. Wiley India.*

Web References :

1. <http://www.engppt.com/2011/12/software-engineering-pressman-ppt.html>
2. http://www.nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Soft%20Engg/New_index1.html

Course Outcomes:

On successful completion of this course, the student will be able to

1. Get insight of software development process model
2. Gain knowledge on software requirement specification and Scenario based modeling
3. Design the software and gain different architecture
4. Understand the basic concepts of testing and its types.
5. Analyze about the system testing and other testing types.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	-	M	L	-	L	-	-	-	M	-	M	M	-
CO 2	M	H	M	M	L	-	-	-	H	-	M	M	-
CO 3	-	M	H	L	L	-	-	-	H	-	H	M	-
CO 4	M	-	-	-	-	-	-	-	M	-	H	M	-
CO 5	L	-	L	M	L	-	-	-	M	-	H	M	-

Software Testing - Practical VI

Semester IV
23BITC07P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To understand the basic concepts of Web driver
2. To understand the selenium methods and linking concepts
3. To locate a frame using Name
4. To synchronize the test using implicit and explicit wait
5. To work with Web driver using parameters, pop up windows and forms

List of exercises:

1. Using Selenium IDE, Write a test suite containing minimum 4 test cases.
2. Test the plan for login using Selenium tool.
3. Testing to maximize the window and to navigate the page using Selenium tool.
4. Develop a test case to open GOOGLE.
5. Test the case to print a message to display that a website is opened successfully.
6. Test the case by identifying and handling a pop-up window by its name.
7. Test the plan by choosing drop down list in any portal using Selenium tool.
8. Test the cases by applying keys using Selenium tool.
9. Develop a test to Synchronize with an implicit wait.
10. Develop a test to Synchronize with an explicit wait.
11. Write a simple test script to validate each field of the registration page. (Eg: Facebook Registration Page)
12. Develop the test by sending keys and applying link text.
13. Test with partial link text.
14. Develop a test plan to use locators with parameters to search for keyword
15. Develop a test to locate a frame using Tag Name

Web References :

Total Hours:60

1. For software installation <https://www.seleniumhq.org/download/>
2. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
3. <https://www.udemy.com/course/manual-software-testing-h/>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Conduct a software test process for a software testing project
2. Identify the needs of software test automation, and define and develop a test tool to support test automation.
3. Execute program and test evaluations
4. Execute specific software tests with well-defined objectives and targets
5. Implement various testing techniques, including domain, code, fault, usage and model-based.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	-	-	L	-	-	M	-	-	-	-	M	L	-
CO 2	M	-	L	M	L	L	-	-	-	-	M	L	-
CO 3	-	-	-	L	M	L	-	-	M	-	M	M	-
CO 4	M	-	-	L	-	L	-	-	L	-	H	M	-
CO 5	L	-	-	M	L	-	-	-	L	-	H	L	-

Python Programming

Semester IV
23BITC08

Hours of Instruction/week: 5+1
No of credits: 6

Course Objectives:

1. To describe the basic concepts of python.
2. To construct python programs with conditionals, loops and functions.
3. To examine python data structures.
4. To illustrate the concept of files and exception handling.
5. To demonstrate data visualization concepts of python

Unit-I Introduction to Python

Introduction-features-Python Installation-Comments-Operators-Variables – Datatypes: 18
Numbers: - Integer; Floating Point; Complex numbers; Random numbers; Type conversion –
Python Strings-Slicing; Modifying; concatenating; formatting; Escape characters; Built-in- string
Methods-Python Booleans - Operators.

Unit-II Control Flow, Functions

Python Conditions and If statements: Indentation; if; if-else; elif; nested if -, for, break, 18
continue, pass; **Functions**,: creating Functions, Calling Functions ; Arguments: Required
arguments; Keyword arguments; Default arguments; Variable-length arguments- Anonymous
Functions – Return Statements- Recursion- Scope of the variables

Unit-III Data structures

List-creating; Accessing list values; updating and deleting list elements; list operators- Indexing, 18
Slicing, and Matrixes - Built-in-Functions and Methods **Tuple**: creating; Accessing tuple values
; updating and deleting tuple elements; tuple operators; Indexing, Slicing, and Matrixes in tuples
Built-in-tuple Functions **Dictionaries**- creating; Accessing dictionary values ; Properties of
Dictionary; updating and deleting dictionary elements; Built-in- dictionary Functions and
methods **Set**: Creating and Accessing Sets; -Built-in Set Function.

Unit-IV Object-oriented Programming, Files and Exception

Object-oriented Programming: Python classes and objects; Inheritance. **File**: file handling; 18
reading and writing files; renaming and deleting files; Command line Arguments- **Exceptions**:
Exception handling; try-except; try-except-finally; try- except- else; Assertions

Unit-V Data visualization with Python

Introduction to Matplotlib: Installing matplotlib - pyplot; plotting; markers – matplotlib lines, 18
labels, grids, subplot – Matplotlib bars, histograms, pie charts

Text Book:

Total Hours:90

1. *Ashok Namdev kamthane and Amit Ashok Kamthane (2016), "Programming and Problem solving with PYTHON", 1st Edition, McGraw Hill Education,*

Reference Books:

1. Allen B. Downey (2016), "Think Python: How to Think Like a Computer Scientist", 2nd edition, O.,Reilly Publishers.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero (2016), "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd.
3. Timothy A. Budd (2015). "Exploring Python", Mc-Graw Hill Education (India) Private Ltd

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_cs20/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs15/preview
3. https://onlinecourses.swayam2.ac.in/cec23_cs06/preview

Course Outcomes:

On successful completion of this course, the student will be able to

1. Demonstrate the working environment of python.
2. Develop programs using conditional statements, looping constructs and functions.
3. Devise lists, tuples, dictionaries, and files in Python.
4. Implement files and classes and handle exceptions in programs.
5. Visualize data with different types of graphs

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	H	H	M	M	M	M	M	M	M	M	M	M	M
CO 2	M	M	M	M	M	M	M	M	M	M	M	M	M
CO 3	M	M	M	M	M	M	M	M	M	M	M	M	M
CO 4	H	H	M	M	M	H	H	M	M	M	M	H	H
CO 5	H	H	M	M	M	H	H	M	M	M	H	H	H

Introduction to Augmented Reality and Virtual Reality

Semester V
23BITC09

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. Describe how AR systems work and list the applications of AR.
2. Understand and analyse the hardware requirement of AR.
3. Use computer vision concepts for AR and describe AR techniques.
4. Describe how VR systems work and list the applications of VR.
5. Explain the concepts of motion and tracking in VR systems.

Unit I Introduction to Augmented Reality [AR]

12

Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality, Difference between Augmented Reality and Virtual Reality.

Augmented Reality Concepts- How Does Augmented Reality Work, Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

Unit II Augmented Reality Hardware

12

Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception, Requirements and Characteristics, Spatial Display Model. **Processors** – Role of Processors, Processor System Architecture, Processor Specifications.

Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion.

Unit III Computer Vision for Augmented Reality & A.R. Software

12

Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking.

Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

Unit IV Introduction to Virtual Reality[VR] & Representing the Virtual World

12

Introduction to Virtual Reality - Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

Representing the Virtual World: Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR

Unit V Visual Perception, Rendering & Motion, Tracking

12

Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates.

Motion & Tracking :Motion in Real and Virtual Worlds- Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection Tracking- Tracking 2D & 3D Orientation, Tracking Position and Orientation, Tracking Attached Bodies.

Total Hours:60

Text Books:

1. Schmalstieg , Hollerer, “*Augmented Reality: Principles & Practice*” Pearson Education India; First edition , 12 October 2016,
2. Steven M. LaValle, “*Virtual Reality*”, Cambridge University Press, 2016
3. Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, “*Developing Virtual Reality Applications: Foundations of Effective Design*”, Morgan Kaufmann Publishers 2009.

Reference Books:

1. Sanni Siltanen, (2012), “*Theory and Applications of Marker-Based Augmented Reality*”, Julkaisija – Utgivare Publisher. ISBN 978-951-38-7449-0
2. Gerard Jounghyun Kim,(2005), “*Designing Virtual Systems: The Structured Approach*”, Springer
3. Burdea, Grigore C and Philippe Coiffet, (2003), “*Virtual Reality Technology*”, Wiley Interscience, India.

Web References:

1. <https://www.coursera.org/learn/ar>
2. <https://www.coursera.org/learn/introduction-virtual-reality>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Describe how AR systems work and list the applications of AR.
2. Understand and analyse the hardware requirement of AR.
3. Use computer vision concepts for AR and describe AR techniques.
4. Understand the design and implementation of the hardware that enables VR systems to build.
5. Describe the importance of interaction and audio in VR systems.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	L	M	M	H	H	M	M	L	M	M	L	L	H
CO 2	M	-	M	M	L	L	M	L	M	M	L	M	M
CO 3	-	L	H	M	L	-	M	L	L	L	M	L	L
CO 4	-	L	M	M	M	H	M	L	M	L	M	M	M
CO 5	-	H	H	M	-	L	L	M	M	M	H	M	M

Multimedia - Practical VII

Semester V
23BITC09P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To explore fundamental techniques in Graphics and Multimedia.
2. To discover the possibilities of tools and develop an understanding of layering techniques.
3. To design brochures, posters, invitations, and banners based on industrial needs.
4. To interpret own ideas for creating animations.
5. To incorporate button for sound effects and adding colors to frames.

List of Exercises (Using Online/Open source Multimedia Tools)

1. Create a threefold or four fold Broacher.
2. Restore a picture.
3. Create a poster for the department symposium using at least 4 text effects
4. Design a birthday card using bending modes and filters.
5. With the given picture use color balancing, brightness and contrast.
6. Transform the given picture and implement cropping also.
7. Create a watermarking image.
8. Convert a photo into line art drawing.
9. Design a smiley.
10. Bring out a small animation.
11. Develop an Animated banner.
12. Create an animated wallpaper for your PC.
13. Create buttons with text and sound effects.
14. Design an e-card of any occasion
15. Implement frames in a picture and also add colors to it.
16. Design an advertisement for a product using effects like rotating skewing and scaling.
17. Design a animated banner add advertisement.
18. Implement shape and motion tweens in the given picture.
19. Create a movie with a concept and add sounds to it.
20. Create a movie and add it to a webpage.
21. Create a stickman Animation.
22. Create an animated cartoon movie with background voice.
23. Create a car game with sounds using action script.
24. Create a photo gallery slideshow.

Total Hours: 60

Web References:

1. <https://helpx.adobe.com/photoshop/tutorials.html>
2. <https://www.photoshopesentials.com/basics/upscale-images-photoshop-cc-2018/>
3. <http://www.teacherclick.com/flash8/index.htm>
4. <https://msu.edu/course/cas/892/hypermedia/web101PDF/fl/Flash%20Lesson%201.pdf>
5. <http://www.refreshi.com/blog/create-animated-gif-imageready7>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Design Web pages, Animated banner, Brochure for Conferences, Cards for any events.
2. Gains knowledge of filtering techniques using transformations.
3. Design wallpaper using color balancing, watermarking and blending modes.
4. Able to create cartoon movies with voice buttons.
5. Create Stickman and photo gallery slideshow

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	L	H	M	L	L	M	M	-	H	H	M	H	M
CO 2	L	M	M	L	L	L	M	-	M	M	L	M	M
CO 3	L	L	M	L	L	L	M	-	M	M	L	M	M
CO 4	M	M	M	L	L	L	M	-	M	M	M	M	M
CO 5	-	L	-	-	-	L	L	-		M	-	L	M

Data Science

Semester V
23BITC10

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. To provide a strong foundation for data science and its application area.
2. To understand the underlying core concepts and emerging technologies in data science.
3. To develop applied experience with data science software, programming, applications and processes.
4. To develop practical skills needed in modern analytics.
5. To gain useful conclusions from large and diverse data sets through exploration, prediction, and inference.

Unit I Introduction to Data Science

Definition – Basic Terminology- Data science Venn diagram- Types of Data- Structured versus Unstructured data- Quantitative versus Qualitative data- The Four Levels of Data- Five steps of Data Science- Data Science Process Overview –Data science classification-Data Science Algorithms- Business Intelligence and Data Science- Components of Data Science.

12

Unit II Mathematics using R

Introduction to R Language - Basic Data Types - Math, Variables, and Strings - R Environment - Conditions and Loops – Data Frames - Functions in R.

R for Basic Statistics- Descriptive Statistics: Arithmetic Mean, Median, Measure of Dispersion - Minimum and Maximum Values, Quantiles, Percentiles, Interquartile Range (IQR), Standard Deviation, Variance. Linear regression – using linear and logistic regression and making predictions. Characterizing prediction quality. Using correlation to find relations between variables –Pearson, Kendall and Spearman tests.

12

Unit III Data Pre-processing and Analysis

Data Pre-processing: Data cleaning – data integration – Data Reduction - Data Transformation and Data Discretization. Evaluation of classification methods – Confusion matrix, Students T-tests and ROC curves.

Exploratory Data Analysis (EDA): Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA – The Data Science Process.

12

Unit IV Data Modelling and Analytics

Data Science Methodology: Analytics for Data Science- Data Analytics Examples- Data Analytics Life Cycle- Data Discovery- Data preparation- Model Planning- Model Building - Operationalization.

Data Visualization: Basic principles, ideas and tools for data visualization - Types of Data Visualization.

12

Unit V Machine Learning Fundamentals

Basic Machine Learning Algorithms – Supervised and Unsupervised Learning Algorithms – Model training and evaluation. Feature Generation and Feature Selection: Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests.

12

Total Hours:60

Text Book:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, (2016), "Introducing Data Science", Manning Publications.
2. Vijay Kotu, Bala Deshpande, (2019), "Data Science: Concepts and Practices", Morgan Kaufmann Publishers, Second edition.

Reference Books:

1. Hadley Wickham and Garrett Golemund, (2017), "R for Data Science", O'Reilly.
2. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, (2022), "Fundamentals of Data Science", CRC Press.
3. Chirag Shah, (2020), "A Hands-On Introduction to Data Science", Cambridge University Press.
4. Vineet Raina, Srinath Krishnamurthy, (2021), "Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice", Apress.

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs60/preview
2. <https://www.classcentral.com/course/swayam-python-for-data-science-142663>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Understand the fundamental concepts of data science
2. Apply data pre-processing and analysis techniques for handling large data
3. Visualize and present the inference using various tools
4. Understand various machine learning algorithms used in data science process
Comprehend various Data Science Tools with real-world applications.

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M	-	L	M	L	M	-	-	L	-	H	H	M
CO 2	-	-	L	M	-	H	-	-	M	-	M	H	-
CO 3	-	-	L	M	L	H	-	-	L	-	M	M	-
CO 4	-	-	L	H	L	H	-	L	L	-	H	H	-
CO 5	-	L	M	H	-	H	-	-	H	L	M	M	-

Data Science - Practical VIII

Semester V
23BITC10P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To develop data analytic code in R Programming
2. To be able to use necessary libraries for handling data
3. To develop analytical applications using R
4. To perform data visualization using plots
5. To develop practical skills in applying data science techniques and tools

List of Exercises

1. Downloading, installing and setting path for R.
2. Validating the input from the user.
3. R as a calculator: Perform arithmetic operations in R.
4. Program using logical operators
5. R script to demonstrate loops
6. R script to demonstrate conditional statements.
7. R script to create a list and data frame to store data and perform functions on it.
8. Creating user defined function in R.
9. R script using arrays.
10. R Script for aggregate functions in R: count, min, max.
11. Program for searching within a list.
12. R script to merge two given lists into one list.
13. Program using Strings.
14. Program to get the unique elements of a given string and unique numbers of vector.
15. Program to find the sum, mean value and product of given numbers
16. Program to create a simple bar plot of five different values.
17. Program using vector operations and perform sorting of vectors.
18. Program using matrices.
19. Program to create an ordered factor
20. Perform Logistic Regression analysis on given data and plot the results.

Web References:

Total Hours: 60

1. Andrew Oleksy, (2018), "*Data Science with R: A Step By Step Guide with Visual Illustrations & Examples*", Independently Published.
2. Nina Zumel and John Mount,(2014), "*Practical Data Science with R*", Dreamtech / Manning.

Course Outcomes:

On successful completion of this course, the student will be able to

1. Create and understand R programs
2. Perform descriptive analytics using R
3. Perform data exploration using R
4. Perform inferential data analytics
5. Ability to analyze the degree of certainty of predictions using statistical test and models

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	L	L	L	L	-	L	-	L	M	-	M	H	L
CO 2	-	-	L	M	-	H	-	-	L	-	M	H	-
CO 3	-	-	L	M	-	H	-	-	L	-	M	H	-
CO 4	-	L	L	L	-	M	-	L	L	L	H	H	-
CO 5	-	-	-	M	-	M	-	-	L	-	H	H	-

Mobile Communications

Semester VI
23BITC11

Hours of Instruction/week: 4
No of credits: 4

Course Objectives:

1. To introduce the basic concepts and principles in mobile communication.
2. To familiarize with various protocols involved in mobile communication systems
3. To study the functionalities of Telecommunication Systems
4. To gain knowledge on satellite and broadcast systems
5. To introduce the student to the major concepts involved in Wireless LANs

Unit I Introduction to Mobile Communication 12

Applications, simplified reference model. Wireless Transmission: Frequencies of transmission, Signal propagation, multiplexing, Modulation.

Unit II Medium Access Control (MAC) 12

Specialized MAC - Hidden and exposed terminals, Near and far terminals: SDMA, FDMA, TDMA - Fixed TDM, Classical Aloha, Slotted Aloha, CDMA, Comparison of S/F/T/CDMA.

Unit III Telecommunication system 12

GSM (Global system for Mobile Communication) mobile services, GSM system architecture, Radio interface, Hand over, Security, New data services. - HSCSD, GPRS. DECT - System Architecture, Protocol Architecture.

Unit IV Satellite Systems and Broadcast Systems 12

Application, Basics - GEO, LEO, MEO, routing, localization, Hand over. Broadcast system - cyclical Repetition of data, digital audio broadcasting, Multimedia object transfer protocol, digital video broadcasting.

Unit V Wireless LAN 12

Infrared Vs Radio transmission, Infrastructure and adhoc networks, wireless ATM.

Total Hours:60

Text Book:

1. **Jochen Schiller (2009). *Mobile Communications*. Second Edition. Addison - Wesley Publications, Pearson Education Limited.**

Reference Book:

1. **Asoke K Talukder, Roopa R Yavagal (2008). *Mobile Computing*. TMH.**
2. **KurnkumGarg (2010), *Mobile Computing*, Pearson Education Limited.**

Web References:

1. https://www.tutorialspoint.com/wireless_communication/index.htm
2. http://www.radio-electronics.com/info/cellulartelecomms/gsm_technical/gsm_introduction.php

Course Outcomes:

On successful completion of this course, the student will be able to

1. Understand the basic concepts and list the applications of mobile communications
2. Describe the features and functions of multiplexing and modulation
3. Compare different Multiple Access Techniques
4. List the applications of satellite systems and describe the routing techniques of satellite transmission.
5. Differentiate various wireless LAN Technologies

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	-	-	H	M	-	M	-	L	-	-	-	M	-
CO 2	-	L	H	M	L	-	M	M	L	M	M	L	L
CO 3	L	-	H	M	-	-	-	M	L	-	-	L	-
CO 4	-	L	H	M	M	L	-	M	-	M	L	-	-
CO 5	-	L	H	M	M	L	-	L	-	M	-	-	L

Mobile Application Development - Practical IX

Semester VI
23BITC11P

Hours of Instruction/week: 4
No of credits: 2

Course Objectives:

1. To understand Android application development environment and how Android applications works
2. To learn how to design and implement application interfaces using GUI components
3. To understand the fundamentals of user interaction and navigation within Android applications
4. To integrate various device features and services in an application
5. To manage data storage and retrieval in Android applications

List of Exercises

1. Develop an image gallery application
2. Develop an application that uses GUI components, Font and Colors
3. Create an application that generates a scrollable view
4. Build an application for generating and managing a To-do list
5. Develop an application with a menu
6. Create an application utilizing alert dialog box
7. Develop an application to use Date and Time Picker
8. Create an application to set countdown timer
9. Develop an application with Radio Group Button
10. Develop an application that makes use of Notification Manager
11. Develop an application that allows users to compose and send SMS and email messages using implicit intents
12. Create an Android Application for User Authentication
13. Implement an application that creates an alert upon receiving a message
14. Develop a native application that uses GPS location information
15. Develop an application with database connectivity

Total Hours: 60

Web References:

1. <https://developer.android.com/>
2. <https://docs.oracle.com/javase/6/docs/api/>
3. <https://www.codepath.org/>
4. <https://www.udacity.com/course/android-basics-user-interface--cd0342>
5. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-android-app-development/>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Design, develop, and troubleshoot Android applications effectively
2. Design and create user-friendly and responsive interfaces with incorporating GUI components
3. Implement interactive features within Android applications
4. Design applications with integrating device features and services
5. Develop mobile applications that make use of databases

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	M	-	H	M	H	-	H	-	H	H	M	H	H
CO 2	M	-	H	M	H	-	H	L	H	H	H	H	H
CO 3	M	-	H	M	H	-	H	-	H	H	M	H	H
CO 4	M	-	H	H	H	L	H	M	H	H	H	H	H
CO 5	M	-	M	M	M	-	H	L	H	H	M	H	H

Data Communications and Networks

Semester VI
23BITC12

Hours of Instruction/week:5+1
No of credits: 6

Course Objectives:

1. To understand the fundamental concepts of data communications.
2. To Familiarize the student with different transmission media and switching techniques
3. To Introduce different types of networks preparing the student for entry into advanced courses in computer networking
4. To gain expertise on various protocols involved in data communication
5. To inculcate the knowledge on OSI Layers and their functions

Unit I Fundamentals of Data Communications 18
Introduction to Data Communications and Networking. Transmission Methods - Modes of Data Transmission and Multiplexing. Transmission Errors- Detection and Correction

Unit II Transmission media, Switching techniques, Routing and OSI Model 18
Transmission Media - Guided Media, Unguided Media. Network Topologies- Mesh, Star, Tree, Ring, Bus, Hybrid. Switching - Circuit switching, Message switching, Packet switching. Routing - Routers and Routing, Factors affecting Routing Algorithms, Routing Algorithms, Approaches to Routing. Network Protocols and OSI Model – OSI Model, OSI layer functions.

Unit III Types of Networks 18
Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Integrated Services Digital Network (ISDN), Frame Relay.

Unit IV Internetworking and TCP/IP 18
Internetworking Concepts -Devices, Internet Basics, History and Architecture. TCP/IP - Introduction, IP Datagrams, Concept of IP Address, ARP, RARP, ICMP.

Unit V TCP, UDP and Application Layer Protocols 18
TCP -Features of TCP, Relationship between TCP and IP, Ports and Sockets, TCP connections, TCP Reliability, TCP Packet Format. User Datagram Protocol (UDP) - UDP Packet, Difference between UDP and TCP. Domain Name System (DNS), Electronic Mail (Email), File Transfer Protocol (FTP), TFTP.

Total Hours:90

Text Book:

1. Achyut S.Godbole(2010). *Data Communications and Networks*. Tata McGraw Hill Pub Company Ltd 10th Edition

Reference Book:

1. Behrouz A. Forouzan(2007). *Data Communications and Networking*. Tata McGraw Hill Pub Company Ltd 2nd Edition.
2. Andrew S. Tanenbaum(2000). *Computer Networks*. Prentice Hall of India. 3rd Edition

Web References:

1. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
2. <http://what-when-how.com/data-communications-and-networking/data-communications-networks/>

Course Outcomes:

On successful completion of this course, the student will be able to

1. Understand the basic concepts of data communications and Networking
2. Compare different switching techniques and Transmission media
3. Classify different types of networks and Recognize the different internetworking devices and their functions
4. Describe how TCP and UDP function and Explain the role of protocols in networking
5. List the functions performed by layers in the OSI model

CO-PO Mapping and Matrix

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	L	L	M	L	L	L	M	L	M	M	L	L	L
CO 2	L	L	L	L	L	L	L	L	M	M	L	L	M
CO 3	M	M	M	L	L	M	M	M	M	M	L	M	H
CO 4	H	H	M	L	L	H	H	M	M	M	L	H	H
CO 5	H	H	M	L	L	H	H	M	M	M	L	H	H