B.Sc. Information Technology

Course Structure and Syllabus

(For the candidates admitted from the academic year 2025-2026 onwards)

Choice Based Credit System (CBCS)

&

Learning Outcomes-Based Curriculum Framework (LOCF)

THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)
(Approved by NAAC, Affiliated to Bharathidasan University)
ELAMBALUR, PERAMBALUR – 621 220

VISION:

- To be a Centre of excellence in education and research in the frontier areas of Computer Science.

MISSION:

- To facilitate quality transformative education in Computer Science
- To promote quality research and innovation in technology for meeting global challenges
- To transform students into competent professionals to cater to the needs of society.

Programme Outcomes (POs):

Upon completion of the programme, the undergraduate will be able to

PO1: Computational Foundations: Apply the basic knowledge of computers, math, and algorithms to solve real-world problems.

PO2: Problem Solving and Programming: Understand problems and solve them by writing code using different programming styles and tools.

PO3: Software Design and Development: Plan and build software systems using good methods and practices.

PO4: Teamwork: Work well in a team or lead a group to complete software projects successfully.

PO5: Creating and exploring new ideas: Try out new ideas, learn new technologies, and do small experiments to improve solutions.

PO6: Security and Ethics: Write code and build safe systems, protect user data, and follow ethical rules.

PO7: Using Modern Tools: Use the latest computer tools and technologies to write, test, and manage software.

PO8: Lifelong Learning: Keep learning new things to stay up to date with changes in computer science and technology.

Program Specific Outcomes (PSOs)

PSO1: Think in a critical and logical manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics, and real-time application-related sciences.

PSO3: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer Science and Industrial statistics.

PSO4: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PSO5: Develop a range of generic skills helpful in employment, internships& societal activities.

B.Sc. Information Technology

Choice-Based Credit System – Learning Outcome-Based Curriculum Framework

(For the candidate admitted from the academic year 2025 -2026)

Semester	Part	Course Code	Title of the Course	Int. Hrs / Week	Credits	End Sem. Exam Hrs	Max. Marks		
							CIA	ESE	Total
I	I	25UT1/H1	Tamil	6	3	3	25	75	100
	II	25UE1	English	6	3	3	25	75	100
	III	25UIT1CC1	Programming with C	6	5	3	25	75	100
		25UIT1CP1	Programming C Lab	5	4	3	40	60	100
		25UMA1AC1	Mathematical Computing	5	4	3	25	75	100
	IV	25UVE	Value Education	2	2	3	25	75	100
		25UITVA1	Value Added Course*	--	2*	3	50	50	100*
			Total	**30**	**21**	**-**	**-**	**-**	**600**
II	I	25UT2/H2	Tamil	6	3	3	25	75	100
	II	25UE2	English	6	3	3	25	75	100
	III	25UIT2CC2	Programming in Java	5	5	3	25	75	100
		25UIT2CP2	Programming in Java Lab	3	3	3	40	60	100
		25UMA2AC2	Statistical Computing	4	3	3	25	75	100
		25UMA2AP1	Statistical Computing Lab	2	2	3	40	60	100
	IV	25UIT2NME1	Basics of Internet	2	2	3	25	75	100
		25UES	Environmental Studies	2	2	3	25	75	100
		25UITVA2	Value Added Course*	--	2*	3	50	50	100*
			Total	**30**	**23**	**-**	**-**	**-**	**800**
III	I	25UT3/H3	Tamil	6	3	3	25	75	100
	II	25UE3	English	6	3	3	25	75	100
	III	25UIT3CC3	Programming in Python	6	5	3	25	75	100
		25UIT3CP3	Programming in Python Lab	3	3	3	40	60	100
		25UMS3AC5	Enterprise Resource Planning	5	4	3	25	75	100
	IV	25UIT3NME2	Print Media Design Software	2	2	3	25	75	100
		25UIT3SE1	Graphic Design Software	2	2	3	25	75	100
		25UITVA3	Value Added Course*	--	2*	3	50	50	100*
			Total	**30**	**22**	**-**	**-**	**-**	**700**

Semester	Part	Course Code	Title of the Course	Int. Hrs / Week	Credits	End Sem. Exam Hrs	Max. Marks		
							CIA	ESE	Total
IV	I	25UT4/H4	Tamil	6	3	3	25	75	100
	II	25UE4	English	6	3	3	25	75	100
	III	25UIT4CC4	Database Management Systems	5	4	3	25	75	100
		25UIT4CP4	Database Management Systems Lab	3	3	3	40	60	100
		25UMS4AC8	Management Information System	4	3	3	25	75	100
		25UMS4AP1	MIS Tools Lab	3	2	3	40	60	100
	IV	25UIT4SE2P	Angular Programming and Lab	2	2	3	40	60	100
		25UHW	Health and Wellness	1	1	--	--	--	100
		25UITVA4	Value Added Course*	--	2*	3	50	50	100*
			Total	30	21	-	-	-	800
V	III	25UIT5CC5	Data Structures and Algorithms	5	4	3	25	75	100
		25UIT5CC6	Operating Systems	5	4	3	25	75	100
		25UIT5CC7	Cloud Technologies	6	5	3	25	75	100
		25UIT5CP5	Cloud Technologies Lab	4	4	3	40	60	100
		25UIT5DE11 25UIT5DE12	Data Privacy Artificial Intelligence and Machine Learning	4	4	3	25	75	100
		25UIT5DE21 25UIT5DE22	Information Security Data Mining	4	4	3	25	75	100
	IV	25USS	Soft Skills	2	2	3	25	75	100
		25UIT5SI	Summer Internship	--	2*	--	--	--	
		25UITVA5	Value Added Course*	--	2*	3	50	50	100*
			Total	30	27	-	-	-	700
VI	III	25UIT6CC8	Computer Network	5	5	3	25	75	100
		25UIT6CC9	Web Development Applications	5	5	3	25	75	100
		25UIT6CC10	Mobile Application Development	5	5	3	25	75	100
		25UIT6DE31 25UIT6DE32	Internet of Things Web Security	5	3	3	25	75	100
		25UIT6DE41 25UIT6DE42	Deep Learning Network Security	5	3	3	25	75	100
		25UIT6PW	Project Work	4	3	3	20	80	100
	V	25UGS	Gender Studies	1	1	3	25	75	100
			Extension Activity	--	1	--	--	--	--
		25UITVA6	Value Added Course*	--	2*	3	50	50	100*
			Total	30	26	-	-	-	700
			Total	180	140				4300

Prepared by HoD CoE

Extra Credit Course which will not be included in the total CGPA

** Summer Internship after 4th semester during summer vacation -30 Hours and 2 credits will be included in the 5th semester.

* Value Added Course (Outside Instruction Hours: 30 Hours)

1. Part-wise Credits

Part	Course details	No. of Courses	Total Credits
I	Tamil	04	12
II	English	04	12
III	Core Course Theory	10	47
	Core Practical	05	17
	Project with Viva-Voce	01	03
	Allied Course Theory	04	14
	Allied Practical	02	04
	Discipline-Specific Electives	04	14
IV	Skill Enhancement Courses	03	06
	Non-Major Elective	02	04
	Value Education	01	02
	Environmental Studies	01	02
	Summer Internship	01	02*
V	Gender Studies	01	01
	Health and Wealth	01	01
	Extension Activity		01
		Total	**140**

2. List of Value-Added Courses

Course Code	Course Title
25UITVA1	Internet of Things Fundamentals
25UITVA2	Cloud Computing Essentials
25UITVA3	Cyber Security and Ethical Hacking Basics
25UITVA4	Full Stack Web Development
25UITVA5	Data Analytics Using Python
25UITVA6	IT for Business and E-Commerce

3. Attendance

75% of attendance in each semester shall appear for the examination.

Attendance between 65% and 74% shall apply for **condonation** in the prescribed form with the prescribed fee.

Attendance between 50% and 64% shall apply for **condonation** in prescribed form **with** the prescribed fee along with the **Medical Certificate**.

Attendance below 50% is **not eligible to appear for the examination**. They shall re-do the semester(s) after completion of the Programme.

4. Question Paper Pattern of CIA I and CIA II Examinations

UG Programme		
Maximum Marks : 50		**Duration: 1 ½ Hours**
Section - A	**i) a-** (3 Questions for Multiple Choice) One question from each unit	3 x 1 = 03 Marks
	b- (5 Questions for Fill in the Blanks) One question from each unit	3 x 1 = 03 Marks
	ii) (5 short answer questions) One question from each unit	2 x 2 = 04 Marks
Section - B	**4 Questions** One set of questions from each unit	4 x 5 = 20 Marks
Section - C	**3 Questions** One question from each unit	2 x10 = 20 Marks

Question Paper Pattern of Pre-Semester and End Semester Examinations

UG Programme		
Maximum Marks : 75		**Duration: 3 Hours**
Section - A	**i) a-** (5 Questions for Multiple Choice) One question from each unit	5 x 1 = 05 Marks
	b- (5 Questions for Fill in the Blanks) One question from each unit	5 x 1 = 05 Marks
	ii) (5 short answer questions) One question from each unit	5 x 2 = 10 Marks
Section - B	**5 Questions** (Internal Choice: Either or) One set of questions from each unit	5 x 5 = 25 Marks
Section - C	**3 Questions** (Answer any 3 out of 5 Questions) One question from each unit	3 x10 = 30 Marks

5. The ratio of marks allotted to the continuous internal assessment and to the end semester examination

	Internal Marks	External Marks
Theory	25 Marks	75 Marks
Practical	40 Marks	60 Marks
Project	20 Marks	80 Marks

6. The Internal components of Theory course

	Maximum Marks
Maximum mark of CIA I & CIA II	Converted to 30 Marks
5 Assignments (5x5)	25 Marks
Seminar	10 Marks
Pre-Semester	Converted to 25 Marks
Library Assignment & Attendance	10 Marks
Total	100 Marks

100 marks converted to 25 marks.

7. The Internal components of Practical course

	Maximum Marks
Two Model Practical Exams	60 Marks
Record	10 Marks
Viva-Voce	10 Marks
Attendance	10 Marks
Overall Performance	10 Marks
Total	100 Marks

100 marks converted to 40 marks.

8. Passing Minimum for Theory

	Continuous Internal Assessment (CIA)	End Semester Examination (ESE)	CIA + ESE
Theory	40% out of 25 Marks [i.e. 10 Marks]	40% out of 75 Marks [i.e.30 Marks]	40 Marks
Practical	40% out of 40 Marks [i.e. 16 Marks]	40% out of 60 Marks [i.e.24 Marks]	40 Marks
Project	Viva-Voce 20 Marks 40% out of 20 Marks [i.e. 8 Marks]	Project Report 80 Marks 40% out of 80 marks [i.e. 32 marks]	40 Marks

9. UG Project Evaluation

Project Title Registration

Students must fill out the Final Year Project Title Registration Form. The Project Proposal Form should be submitted by the student to his/her supervisor before the commencement of the project. The form must include three project titles, the abstracts of the projects, objectives /aim (or goal), scope of the project, and proposed methodology. The first proposal **(Review 1)** is presented (seminar) before the project review committee for panel assessment.

Students should record project-related activity in a log. The log is a weekly record of the student's progress in meeting their objectives. Students should also record the meeting details with their supervisor in the log. Students should meet with their supervisor regularly, taking their log along to review progress. The complete log should be submitted as an appendix in the final report.

Review 1 – Project Proposal (20 Marks)

Present the abstracts of the projects, objectives /aim (or goal), scope of the project, and proposed methodology to the project review committee members.

The project review committee will assign the students a project, and the head of the department will assign them a supervisor.

a. Abstract of the proposed work.
b. Study of the Existing Systems. & drawbacks in the existing systems.
c. Objectives and scope of the proposed work.
d. Relation with current issues.
e. Methodology.
f. Presentation of proposed work.

Review 2 – Midterm Presentation (20 Marks)

a. Implemented modifications suggested in Review 1.
b. Timeframe work being followed.
c. Defined Objectives are achieved.
d. Individual or Team Contribution.
e. 75% of the Project Work is completed.

Review 3 - Final Presentation (30 Marks)

At the end of the final year project, students will be required to make a brief presentation on their project (UG: 6 minutes for each student). The presentation should cover the following:

a. Overview of the project (project objectives and scopes).
b. Methodology.
c. Result and discussion.
d. Conclusion and recommendation.
e. References.
f. Project demonstration (Optional) .

Project Report Evaluation (10 Marks)

a. The project report is in the specified format.
b. Results are presented in a very appropriate manner.
c. Project work is well summarized and concluded.
d. Future extensions in the project are well specified.
e. References and citations are appropriate and well-mentioned.

10. End Semester Exam Project Work Evaluation

S.No.	Register No	Name of the student	Title of the Project	PPT presentation / Demonstration (2)	Usage of the latest tools and/or methodology (3)	Result and Discussion (2)	Individual contribution (3)	Viva-Voce (10)	Total (20)

11. Guidelines for the Preparation of a Project Report

Arrangements of Contents:

The Project Report has to be organised in the following order**.**

1. Cover Page (Refer to Appendix 1)
2. Inside Title Page (Refer to Appendix 1)
3. Declaration Certificate (Refer to Appendix 2)
4. Bonafide Certificate (Refer to Appendix 3)
5. Acknowledgements
6. Abstract
7. Table of Contents
8. List of Figures
9. List of Tables
10. Abbreviations/ Notations/ Nomenclature (if any)
11. Report text content (Minimum 5 Chapters – Minimum 80 Pages)

Chapter 1

Chapter 2

…....

Chapter 5

12. References
13. Appendices (if any)

APPENDIX 1

A typical Specimen of the Cover Page and Title Page
<Font Style Times Roman>

TITLE <Font Size 18>

A Project Report submitted <Font Size 14> <Italic>

in partial fulfillment for the award of the degree <Font Size 14> <Italic>

NAME OF THE DEGREE <Font Size 16>

Submitted By <Font Size 14> <Italic>

	Name	Register Number
1.		
2.		
3.		
4.		
5.		

under the guidance of <Font Size 14> <Italic>

NAME OF THE GUIDE<Font Size 16>

NAME OF THE DEPARTMENT <Font Size 16>

THANTHAI HANS ROEVER COLLEGE (Autonomous) <Font Size 16>

Elambalur, Perambalur – 621 220 <Font Size 14>

APRIL – 2026 <Font Size 16>

APPENDIX 2

Thanthai Hans Roever College (Autonomous)
(Accredited with 'A' Grade by NAAC (3rd cycle) with GPA 3.23 out of 4)
(Affiliated to Bharathidasan University, Tiruchirapalli)
Elambalur, Perambalur – 621 220

CERTIFICATE <Font size – 16>

<Below paragraph Font size – 14>

This is to certify that this Project entitled "**Title of the project**" is a bonafide record work done by the following members

<Following lines Font size – 12>

Name	**Register Number**
6.	
7.	
8.	
9.	
10.	

<Below paragraph Font size – 14>

in partial fulfillment of the requirement for the award of degree of Bachelor of Science in Computer Science during the year 2024-2025

Guide <Font size – 12> **Head of the Department**

Date of Viva –Voce: <Font size – 12>

Examiner <Font size – 12>

1.

2.

Thanthai Hans Roever College (Autonomous)
(Accredited with 'A' Grade by NAAC (3rd cycle) with GPA 3.23 out of 4)
(Affiliated to Bharathidasan University, Tiruchirapalli)
Elambalur, Perambalur – 621 220

BONAFIDE CERTIFICATE <Font size – 16>

<Below paragraph Font size – 14>

This is to certify that the project entitled "…….**TITLE OF THE PROJECT**……..." is the bonafide work carried out by the following students under my supervision does not form part of any other project or report based on which a degree or award was conferred on an earlier occasion on his or any other candidate.

Name	**Register Number**
1.	
2.	
3.	
4.	
5.	

Guide <<Signature of Guide >>

<<Signature of guide>> <<Font size – 16>>

<<Academic Designation>>

<<Department>>

Report Size
The report may contain a minimum of about **80 pages**, excluding references and appendices.

Paper Size
A4-size paper.

Paper Quality
White bond paper weighing 80 g/m2 or more should be used. The same quality of paper should be used throughout. Photographs or images with dense colors may be printed on a single side on glossy paper.

Margins
A margin of 2.54 cm is to be provided on the left and right sides, whereas the top and bottom margins should be 3 cm. No printed matter should appear in the margin except the page numbers. All page numbers should be centered inside the bottom margin, 2 cm from the bottom edge of the paper.

Font
Times New Roman **(TNR)** 12-point font has to be used throughout the running text. The captions for tables and figures should have a font size of 11, and footnotes should be set at font size 10. **Line**

Spacing
The line spacing in the main text should be 1.5. Single line spacing should be given for quotations, abstracts, figure captions, table captions, figure legends, footnotes, and references. The equations, tables, figures, and quotations should be set off from the main text both before and after with a spacing of 1.5. Two consecutive paragraphs should be separated by triple line spacing

Headings
The following format has to be followed in the headings of chapters and sections.

CHAPTER 3

TITLE PAGE-CENTERED TNR 17-POINT BOLD ALL CAPS

3.1. Section Heading

Left aligned with number, TNR 16 points, bold and leading caps

3.1.1. Second level section heading

The left is aligned with the number, TNR 14 points, and bold, sentence case.

3.1.1.1. Third level section heading

The left is aligned with the number, TNR 12 points, and bold, sentence case.

Fourth-level section heading. Numbered subsections beyond the third level are not recommended. However, fourth-level subsection headings may be included without numbering. TNR 12-point font, left aligned, and italicized.

Running text should be set in 12-point TNR and fully justified. The first line of the paragraph should have an indentation of 1.5 Cm.

Page Numbering

All page numbers (**Roman or Arabic**) should be typed without punctuation at the central bottom of each page. The preliminary pages of the reports (such as Title page, Acknowledgement, Table of Contents, etc.) should be numbered in lower-case Roman numerals. The title page will be numbered as (i), but this should not be typed. The page immediately following the title page shall be numbered as (ii). Pages of the main text, starting with Chapter 1, should be consecutively numbered using Arabic numerals.

Table / Figure/equation Format

Tables, figures, and equations shall be numbered chapter-wise. For example, the second figure in Chapter 3 will be numbered Figure 3.2. The figure can be cited in the text as Fig. 3.2. The figure caption shall be located below the figure.

Tables shall be numbered similarly (Table 2 in Chapter 3 will be numbered Table 3.2) and shall be cited in the text as Table 3.2. The table number and caption shall be located above the table.

Equations aligned to the page's center with equation numbers in the text have to be given at the end of the line within brackets.

Listing of the References

References are to be listed after the last chapter. They are to be listed in alphabetical order and numbered. Within a reference, the line spacing should be single. Each reference should be separated by one blank line. The reference number should be left-aligned. The text of the reference should have an indentation of 10 mm. The reference format to be followed for journal articles, textbooks, conference proceedings, etc., is given below

References

Journals

1. Deodhar. S.V. and Patel. A .N. (1996) “Behavior of brick masonry in compression” Journal of Structural Engineering 22, 221-227.

2. Liu. H., Williams Burkett. and Kirk Haynes.(2005) “Improving freezing and thawing properties of fly ash bricks”, World of coal ash conference 11-15.

3. Prakas, K. (2011). Feedback and optimal sensitivity: Model reference transformations, multiplicative seminorms, and approximate inverses. IEEE Transactions on Automatic Control, 26(2): 301–320.

4. Ram, R., Krishna, S. and Peter, K. (2005a). Risk sensitive estimation and a differential game. IEEE Transactions on Automatic Control, 39(9): 1914– 1918.

5. Sarangapani. G., Venkatarama Reddy. B. V. and Jagadish. K. S. (2009) “Structural characteristics of bricks, mortars and masonry” Journal of Structural Engineering 29(2), 101-110.

Conference proceedings

1. Payne, D.B. and Gunhold, H.G. (1986). Digital sundials and broadband technology, In Proc. IOOC-ECOC, 1986, pp. 557-998.

2. Singh, K. and Robin, R. (2008). A linear-quadratic game approach to estimation and smoothing. In the American Control Conference, New York. June 20 – 25, 2008, pp. 2818–2822.

Online journals with a DOI (Digital Object Identifier)

1. Amra Bratovcic, (2025). Exploring Food Waste Potential for Bioethanol Production in Sustainable Energy and Emission Reduction, Journal of Sustainable Bioenergy Systems 15(2): 272- 275. doi: 10.4236/jsbs.2025.152004

2. Krebs, D.L. and Denton, K. (2006). Explanatory limitations of cognitive developmental approaches to morality. Psychological Review, 113(3): 672- 675. doi: 10.1037/0033-295X.113.3.672

Online journals without a DOI

1. Vicki, G.T., Thomas, M., Cullen, A. and Fernandez, H. (2007). Modeling the hydrological impact on Tropical Forests. Forest Ecology, 13(10): 122-132. http://www.uiowa.edu/~grpproc/crisp/crisp.html

Online abstracts

1. Perilloux, C. and Buss, D.M. (2008). Human relationships: Costs experienced and coping strategies deployed. Evolutionary Psychology, 6(1): 164-181. Abstract retrieved from http://www.epjournal.net

Online books

1. Perfect, T.J. and Schwartz, B. L. (Eds.) (2002). Applied metacognition. Retrieved from http://www.questia.com/read/107598848 (--If DOI is available, use the DOI instead of a URL)

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
I	25UIT1CC1	5	Programming with C	CC	5	1	-	3 Hrs.	25	75	100
Pre-Requisite:											

Course Objectives: The purpose of learning this course is:

1. Understand the origin and significance of the C programming language in software development
2. Apply decision-making and loop control structures effectively.
3. Use functions, pointers, and arrays for modular programming.
4. Demonstrate file handling, string manipulation, and structure usage.
5. Implement pre-processor directives for efficient code compilation and management.

Course Outcomes:

CO1: Use C language as the base for a higher-level course in programming
CO2: Acquire the basic constructs of C programming.
CO3: Apply a structured approach in program design
CO4: Apply suitable logic in solving problems
CO5: Develop applications to solve real-world problems

Unit-I Basics of C and Decision Control 13 Hrs.

Basic of C: History of C and its importance – Structure of a C program – Data Types – Constants and Variables – Operators and Expressions – Order of Precedence, Evaluating of Arithmetic Expressions – Type Conversion- Decision Statements: if, if-else, and nested if statements

Unit-II Loop and Case Control 12Hrs.

Loop Control Instruction – Loops – The while Loop – More Complex Repetition – The for Loop – The break Statement – The continue Statement – The do-while Loop – Case Control Instruction – Decisions with switch – The goto keyword.

Unit-III Functions, Pointers and Pre-processor 18Hrs.

Functions – Passing Values between Functions – Scope Rule of Functions – #Using Library Functions#. Pointers – Call by Value and Call by Reference – An Introduction to Pointers – Pointer Notation –The C Pre-processor – Features of C Pre-processor – Macro Expansion – File Inclusion – Conditional Compilation – if and elif Directives – Miscellaneous Directives – The Build Process.

Unit-IV Arrays and Strings 16 Hrs.

Arrays – More on Arrays – Pointers and Arrays – Multidimensional Arrays – Two-Dimensional Arrays - Arrays of Pointers –Three-Dimensional Array– Strings –Pointers and Strings – Standard Library String Functions –

Unit-V Structures, I/O, and File Handling 16 Hrs.

Structures – Console Input / Output – Types of I/O – Console I/O Functions – File Input / Output – Data Organization – File Operations – Counting Characters, Tabs, Spaces – A File-Copy Program – File Opening Modes – String (Line) I/O in Files - Record I/O in Files.

Text Book(s):

1. Dr.S.Sivakumar "Programming in C " Sk Research Group 1st edition 2022 978-93-91077-99-0
2. Jens Gustedt "Modern C**"** Manning Publications 2nd edition and 3rd edition 2023-2024
3. YashavantKanetkar, "Let Us C", BPB Publications, New Delhi, 15th Edition, 2019.

Reference Book(s):

1. Yashavant Kanetkar, Let Us C, BPB Publications, New Delhi, Thirteenth Edition, 2013.

2. Kernighan, B. W., & Ritchie, D. M. *The C Programming Language.* Third Edition 2024.

Web Resources:

1. https://www.programiz.com/c-programming
2. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
3. https://archive.nptel.ac.in/courses/106/105/106105151
4. https://nptel.ac.in/courses/106105151

Course Outcomes (COs)	Program Outcomes (**POs**)								Programme Specific Outcomes (**PSOs**)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	2	1	1	1	2	3	2	2	2	3	2
CO2	3	2	2	2	1	1	2	2	2	2	2	2	2
CO3	2	2	3	1	1	2	2	2	3	2	2	2	2
CO4	2	3	2	2	2	2	2	2	3	2	3	2	2
CO5	2	3	3	3	3	3	3	2	3	3	3	2	3
Average	2.4	2.6	2.4	1.8	1.6	1.8	2.2	2.2	13	11	12	11	11
	Overall CO – PO Mapping index = 2.12								**Overall CO – PSO Mapping index = 2.32**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
I	25UIT1CP1	4	Programming **C** Lab	CP	--	--	5	**3 Hrs.**	**40**	**60**	**100**
Pre-Requisite:											

Course Objectives: The purpose of learning this course is:

1. To introduce the basic concepts and syntax of C programming.
2. To understand and apply decision-making and looping structures.
3. To explore the use of arrays, strings, functions, and pointers.
4. To apply modular and structured programming principles.
5. To work with user-defined data types and pre-processor directives.

Course Outcomes:

CO1: Write and execute C programs using basic syntax and logic structures.
CO2: Apply conditional and loop control instructions for problem-solving.
CO3: Develop modular programs using functions and pointer concepts.
CO4: Perform operations on arrays and strings effectively.
CO5: Demonstrate understanding of structures and pre-processor usage in practical scenarios.

Develop a program in C

1. Using assignment statements.
2. Using different forms of if statement.
3. To demonstrate Logical operators
4. Using While, Do-While & For Loop
5. Using Switch
6. To illustrate the use of Functions & Pointers
7. Using Macro definitions to test whether a character is uppercase or lowercase
8. To make use of arrays.
9. To manipulate Strings.
10. To demonstrate structure.

. Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
I	25UMA1AC1	4	Mathematical Computing	AC	4	1	--	3 Hrs.	25	75	100

Pre-Requisite:

Course Objectives: The purpose of learning this course is:

1. Introduce the fundamental concepts of set theory, relations, and functions, and their applications in mathematics and computer science.
2. Develop logical reasoning skills through the study of propositional logic**,** logical equivalence**,** and mathematical induction**.**
3. Familiarize students with the basic concepts and operations of matrices, solutions of linear systems
4. Introduce graph theory, covering various types of graphs, trees, and applications such as spanning trees and shortest paths.
5. Teach the fundamental principles of finite probability, including conditional probability, independence, Bayes' theorem, and expected value

Course Outcomes:

CO1: Demonstrate understanding of set theory, relations, and functions, and apply them to solve related mathematical problems.

CO2: Apply principles of logic, truth tables, and mathematical induction to construct valid arguments and proofs.

CO3: Perform matrix operations, compute determinants and inverses.

CO4: Understand and apply key concepts in graph theory including Euler and Hamiltonian graphs, spanning trees, and graph traversal algorithms.

CO5: Apply probability rules and techniques to evaluate probabilities, use Bayes' theorem, and compute expected values in finite sample spaces.

Unit - I	Mathematical Logic	12 Hrs.

Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

Unit - II	Set theory	12 Hrs.

Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties.

Unit - III	**Matrices**	12 Hrs.

Singular matrices – Inverse of a non-singular matrix using adjoint method - Rank of a Matrix – Characteristic equation – Cayley Hamilton's Theorem (proof not needed)– Simple applications only

Unit - IV	**Solutions of Simultaneous Linear Algebraic Equations**	12 Hrs.

Gauss Elimination Method– Gauss Jordan Method - Gauss Jacobi - Gauss Seidel Method.

Unit - V	**Graph Theory**	12 Hrs.

Introduction - Representing Graphs - Operations on graphs, Directed Graphs - Graph Isomorphism, Paths – Cycles - Euler Graph - Hamilton Graph - Planar Graphs.

Trees (Basic Concepts Only): Introduction, Applications of Trees, Spanning Trees, Minimum Spanning Trees

Text Books:

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.
3. T.K. Manickavasagam Pillai & Others, Algebra, Vol II, S.V Publications, Pvt.Ltd 2011
4. S.S.Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Pvt.Ltd, New Delhi 2010.
5. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science".

Reference Books:

1. J.P. Tremblay and R. Manohar Discrete Mathematical Structures with Applications to Computer Science", Mc Graw Hill Education,2015
2. C. L L IU, "Elements of Discrete Mathematics"
3. Discrete Mathematics- a) Semyour Lipschutz, Marc Lipson b) Vinay Kumar.
4. R.S.N. Pillai and Bagavathi, Practical statistics, 2nd Edition, 2013

Web Resources:

1. https://vemu.org/uploads/lecture_notes/17_02_2023_252595088.pdf
2. https://users.encs.concordia.ca/~doedel/courses/comp-232/slides.pdf
3. https://mis.alagappauniversity.ac.in/siteAdmin/dde-admin/uploads/5/__UG_B.Sc._Information%20Technology_129%2051%20Discrete%20Mathematics_BSc-IT_Sem%20V_8236.pdf
4. https://www2.cs.uh.edu/~arjun/courses/ds/DiscMaths4CompSc.pdf

Course Outcomes (COs)	Program Outcomes (**POs**)								Programme Specific Outcomes (**PSOs**)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	2	2	1	2	2	2	3	3	2	2	3
CO2	3	3	1	1	2	2	2	1	3	3	1	1	3
CO3	3	3	3	2	1	1	2	2	3	3	2	1	3
CO4	3	3	3	2	3	1	3	2	3	3	2	2	3
CO5	3	3	3	1	2	3	3	1	3	3	1	2	3
Average	3.0	3.0	2.4	1.6	1.8	1.8	2.4	1.6	3.0	3.0	1.6	1.6	3
	Overall CO – PO Mapping index = 2.20								**Overall CO – PSO Mapping index = 2.44**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
II	25UIT2CC2	5	Programming in Java	CC	4	1	--	3 Hrs.	25	75	100
Pre-Requisite:											

Course Objectives: The purpose of learning this course is:

1. To Introduce the fundamental concepts of Java programming
2. To Understand and apply object-oriented programming
3. To Object-oriented programming concepts in Java
4. To Java applications that perform file handling using I/O streams
5. To Java applications using networking concepts and implement

Course Outcomes:

CO1: Remember the features and basic building blocks of Java Programming
CO2: Differentiate the concepts of method overloading and method overriding
CO3: Apply the user interfacing controls and exception handling technique
CO4: Apply Java I/O streams and serialization for file handling
CO5: Develop network-based Java applications using networking classes

Unit-I Fundamentals of Object-Oriented Programming in C++ 11 Hrs.

Basic concepts of OOP – Structure of C++ Program – Operators and Data Types in C++ – Manipulators – Inline Functions – Default Arguments – Recursion– Function Overloading – Classes and Objects – Arrays of Objects – Objects as Function Arguments – Friendly Functions – Returning Objects.

Unit-II Basics of Java Programming 11 Hrs.

Introduction to Java Programming: Introduction-Features of Java-Applications and Applets Java Development Kit - The Building Blocks of Java - Data Types - Variable Declarations: Declaring, Initializing and Variables - Variable Types in Java -Wrapper Classes - Operators- Control Structures-Arrays-Strings

Unit-III Object-Oriented Programming in Java 12 Hrs.

Java as an OOP Language: Defining Classes - Defining Methods - Knowing this - Passing Arguments to Methods - Overloading Methods - Constructor Methods - Inheritance- Overriding Methods - Finalizing Classes, Methods and Variables - Abstract Classes and Methods - Packages - Interfaces

Unit-IV Exception Handling and Multithreading in Java 13 Hrs.

Exception Handling: Basics of Exception Handling in Java - Exception Hierarchy - Throwable Class - Handling Exceptions in Java - Throwing User Defined Exceptions. Multithreading - Overview of Threads - Creating Threads - Thread Life - cycle - Thread Priorities and Thread Scheduling

Unit-V Java I/O and GUI Programming 13 Hrs.

Files and I/O Streams: Java I/O - File Streams – File Input Stream and File Output Stream - Serialization. Basic classes in AWT - Event Handling - AWT Components - Layout Managers - The Swing package

Text Book(s):

1. E. Balagurusamy "Object Oriented Programming with C++", McGraw Hill Education 6th Edition or Latest
2. Sachin Malhotra "Programming in Java", Oxford University 2nd Edition 2020 10:0-19948414-7
3. E.Balagurusamy "Programming with Java", 4th Edition McGraw_hill 978-9353162344
4. Surbhi kakar "JavaProgramming", dreamtech Press 2019 9789389520910

Reference Book(s):

1. Dr. Muneer Ahmad Dar "java Programming simplified", March 2020 9789389845143
2. Harish G. Narula, Khushboo Shah "Java Programming", 1st Edition 2023 978-93-5563-909-7

Web Resources:

1. https://docs.oracle.com/javase/tutorial/
2. https://www.slideshare.net/slideshow/java-notespdf-259708081/259708081
3. https://www.tutorialspoint.com/java/java_tutorial.pdf

Course Outcomes (COs)	Program Outcomes (POs)								Programme Specific Outcomes (PSOs)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	1	1	1	1	2	2	2	2	2	3	1
CO2	2	3	2	2	2	1	2	2	3	2	2	2	1
CO3	1	3	3	1	3	3	3	2	2	3	3	2	2
CO4	2	2	2	2	1	2	3	2	2	3	2	2	2
CO5	2	3	3	3	3	3	3	3	3	2	2	2	3
	10	13	11	9	10	10	13	11	12	12	11	11	9
	Overall CO – PO Mapping index = 2.17								**Overall CO – PSO Mapping index = 2.2**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
II	25UIT2CP2	3	Programming in Java Lab	CP	--	--	3	3 Hrs.	40	60	100
Pre-Requisite:											

Develop a Java Program

1. a) Finding biggest among three numbers (if statements)

   b) Displaying sum of the individual digits of a given number (while/do. while loop)

   c) Finding factorial of a given number (for loop)

   d) Displaying the day of a week (switch statement)

2. a) Sorting a set of given numbers (arrays)

   b) Arranging the given names in alphabetical order (String)

3. a) Area of a circle (class and objects)

   b) Students Mark Sheet (Single inheritance)

4. a) Area of the shapes (interface)

   b) EB-Bill preparation (package)|

5. a) Handling multiple exceptions

   b) Creating threads using Runnable interface

6. a) Copying the contents of one file in to another file

   b) Object Serialization

7. a) Displaying geometrical shapes on a Frame window

   b) Displaying the zonal areas names using Border Layout

8. Simple user interface using AWT components

Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
II	25UMA2AC2	3	Statistical Computing	AC	4	--	--	3 Hrs.	25	75	100
Pre-Requisite:											

Course Objectives: The purpose of learning this course is:

1. Enable students to classify, tabulate, and represent data using diagrams and graphs.
2. Familiarize students with measures of central tendency and their applications.
3. Introduce measures of dispersion and their role in data analysis.
4. Explain the concepts of correlation and regression with real-life applications.
5. Develop analytical and interpretative skills to understand and apply statistical tools.

Course Outcomes:

CO1: Understand the basic concepts of statistics, types of variables, and sources of data and present data effectively through classification, tabulation, and graphical tools.

CO2: Calculate and interpret various measures of central tendency.

CO3:Compute and compare different measures of dispersion such as range, standard deviation, etc.

CO4: Analyze the relationship between two variables using correlation techniques.

CO5: Apply regression methods to predict values and understand the trend in data.

Unit - I Descriptive Statistics 8 Hrs.

Definition of Statistics - Importance and Scope of Statistics - Limitations of Statistics - Frequency Distribution - Continuous Frequency Distribution - Graphic Representation of a Frequency Distribution – Histogram - Frequency Polygon.

Unit - II Measures of central tendency 10 Hrs.

Arithmetic Mean - Properties of Arithmetic Mean - Merits and Demerits of Arithmetic Mean - Geometric Mean - Merits and Demerits of Geometric Mean - Harmonic Mean - Merits and Demerits of Harmonic Mean - Median - Merits and Demerits of Median - Mode – Merits and Demerits of Mode

Unit - III Measures of dispersion 10 Hrs.

Range - Quartile Deviation - Mean Deviation - Standard Deviation - Coefficient of Variation - Merits and Demerits

Unit - IV Correlation 10 Hrs.

Introduction – Meaning – Scatter Diagram – Karl Pearson's coefficient of correlation – Correlation coefficient for a Bivariate frequency distribution – Probable error of correlation coefficient - Rank correlation.

Unit - V Regression 7 Hrs.

Introduction – Linear regression – Curvilinear regression – Regression curves.

Text Books:

1. S. C. Gupta, V. K. Kapoor, Fundamentals of Mathematical Statistics, Edition:2002, Sultan Chand & Sons publications, New Delhi. ISBN: 81-7014-791-3

Reference Books:

1. S.P. Gupta, Statistical Methods, Revised Edition 2001.
2. R.S.N. Pillai and Bagavathi, Practical statistics, 2nd Edition, 2013.
3. T. Veerarajan, Probability, Statistics and Random processes, 3rd Edition: 2012, TataMcGraw Hill Education Private Limited, New Delhi.
4. S.S.Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Pvt.Ltd, New Delhi 2010

Web Resources:

1. https://byjus.com/maths/statistics/
2. https://www.msuniv.ac.in/images/distance%20education/learning%20materials/ug%20pg/ug//bsc_statistics/I%20Year%20-%20DJS1B%20-%20Descriptive%20Statistics.pdf
3. https://www.youtube.com/watch?v=nmIwSQJmX2M
4. https://www.teachmint.com/tfile/studymaterial/class-2nd/statisticalmethods/stat-231-full-printed-notespdf/137a97d0-48c1-4613-b674-d785e52a6e95
5. https://mu.ac.in/wp-content/uploads/2021/06/USIT204-Numerical-and-Statistical-methods.pdf

Course Outcomes (COs)	Program Outcomes (**POs**)								Programme Specific Outcomes (**PSOs**)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	3	1	2	3	2	1	3	3	2	3	1
CO2	3	3	3	1	2	1	2	1	3	3	1	1	1
CO3	3	3	3	1	2	1	2	1	3	3	2	1	1
CO4	3	3	3	1	2	1	2	2	3	3	3	3	1
CO5	3	3	3	1	2	3	3	3	3	3	3	3	1
Average	3.0	3.0	3.0	1.0	2.0	1.8	2.2	1.6	3.0	3.0	2.2	2.2	1.0
	Overall CO – PO Mapping index =2.2								**Overall CO – PSO Mapping index =2.28**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HoD

Sem.	Course code	Credits	Title of the Course	CC / AC/ DE / SE / GS / EVS/ VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
II	25UMA2AP1	2	Statistical Computing Lab	AC			2	3 Hrs.	40	60	100
Pre-Requisite:											

Course Objectives: The purpose of learning this course is:

1. Understand the fundamentals of statistical concepts such as central tendency, dispersion, correlation, and data visualization
2. Develop proficiency in R programming for data analysis tasks
3. Apply graphical and numerical techniques to summarize, analyze, and interpret data.
4. Evaluate the relationship between data sets using statistical tools
5. Enhance problem-solving skills through hands-on scripting and plotting exercises

Course Outcomes:

CO1: Apply R functions to compute mean, median, mode, range, and standard deviation.
CO2: Generate bar charts, pie charts, and histograms to visualize datasets
CO3: Analyze relationships between variables using covariance and correlation
CO4: Interpret the distribution and variability of data using visual and numeric methods
CO5: Develop and test R scripts independently for solving statistical problems

Develop a program using the R Program

1. Write an R program to display the marks of 5 subjects using bar horizontal bar chart.
2. Given a set of marks in 4 subjects, write an R script to represent them as a pie chart and add appropriate Labels and a title.
3. Create an R script to draw a histogram with labelled axes, custom breaks, and coloured bars for test scores
4. Write an R program to calculate the mean of the following marks: 45, 56, 78, 88, and 92
5. Write an R program to find the median of the dataset: 56, 68, 72, 74, and 80.
6. Write an R program to find the mode of the values: 2, 4, 4, 6, 7, 4, and 8.
7. Write an R program to find the range of 45, 55, 60, 75, and 90.
8. Write an R program to compute the standard deviation of 10, 15, 20, 25, and 30.
9. Write an R program to calculate the covariance between X = c(1, 2, 3, 4, 5) and Y = c(2, 4, 6, 8, 10).
10. Write an R program to calculate the correlation coefficient between x = c(1,2,3,4,5) and y = c(5,4,3,2,1).

Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE / VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
II	25UIT2NME1	2	Basics of Internet	NME	2	--	--	3 Hrs.	25	75	100
Pre-Requisite:											

Course Objectives: The purpose of learning this course is:

1 .To introduce the concept and evolution of the Internet
2. To familiarize students with the basics of Internet technologies
3. To develop basic web design skills using HTML
4. To enable students to create structured web pages
5. To teach the use of advanced HTML features

Course Outcomes:

CO1: Understand the basic concepts of the Internet, its services, and their applications in business and communication..
CO2: Explain various Internet technologies such as modems, connections, IP addressing, and web browsers..
CO3: Create and structure web pages using HTML tags, including text formatting, lists, images, and links..
CO4: Design and format HTML tables effectively with elements like captions, alignments, row span, cols pan, and cell spacing/padding.
CO5: Build interactive web pages using frames and HTML forms with different input controls.

Unit-I Introduction to the Internet and Its Applications 6 Hrs.

Introduction To The Internet: Computer in Business – Networking – Internet -E-mail – Resource Sharing – Gopher – World Wide Web – Telnet – Bulletin Board Service – Wide Area Information Service.

Unit-II Internet Technologies and Connectivity Tools 6 Hrs.

Internet Technologies: Modem - Internet addressing – Physical -Connections – Telephone Lines – Internet browsers – Internet Explorer – Netscape Navigator.

Unit-III Introduction to HTML and Web Page Design 6 Hrs.

Introduction to HTML: Designing a home page – HTML documents – Anchor tag – Hyper Links. Traditional text and formatting

Unit-IV HTML Lists, Multimedia Tags, and Tables 6 Hrs.

Types of lists: Ordered, Unordered – Nesting Lists – Other tags: Marquee, HR, BR- Using Images – Creating Hyperlinks ,Tables: Creating basic Table, Table elements, Caption – Table and cell alignment – Rowspan, Colspan – Cell padding

Unit-V HTML Frames and Forms 6 Hrs.

Frames: Frameset – Targeted Links – No frame – Forms: Input, Text area, Select, Option.

Text Book(s):

1.“Mastering HTML5 and CSS3 Made Easy”, TeachUComp Inc., 2014.

2.Thomas Michaud, “Foundations of Web Design: Introduction to HTML & CSS”

Reference Book(s):

1. Internet and Web Technologies" by Ramesh Bangia
2. Kogent Learning Solutions "HTML and Web Design Tips and Techniques'

Web Resources:

1. https://blogmedia.testbook.com/blog/wp-content/uploads/2022/04/informatics-practices-chapter-5-3659db64.pdf
2. https://funaab.edu.ng/funaab-ocw/attachments/473_CSC%20701-internet.pdf
3. https://www.geeksforgeeks.org/html/html-introduction/

Course Outcomes (COs)	Program Outcomes (POs)								Programme Specific Outcomes (PSOs)				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	2	1	1	1	2	1	2	2	2	2	2	2	2
CO2	2	2	2	1	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	3	2	2	2
CO4	2	2	2	2	2	2	2	3	1	2	2	2	2
CO5	2	3	3	3	3	3	3	3	3	3	3	3	3
	10	10	10	9	11	10	11	12	10	12	11	11	11
	Overall CO – PO Mapping index = 2.05								**Overall CO – PSO Mapping index = 2.2**				

1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE / VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
II	25UITVA1	2*	Internet of Things Fundamentals	VAC	2	--	--	3 Hrs.	50	50	100
Pre-Requisite:											

Course Objectives: The purpose of learning this course is:

1. To understand the basic concepts and applications of IoT.
2. To learn about IoT hardware like sensors, Arduino, and Raspberry Pi
3. To introduce basic programming for IoT devices
4. To explore how IoT devices communicate using different protocols
5. To learn how to send and view sensor data using cloud platforms

Course Outcomes:

CO1: Understand the basic concepts, architecture, and applications of IoT.
CO2: Identify and use basic IoT hardware like sensors, actuators, and microcontrollers.
CO3: Write simple programs to control IoT devices using Arduino or Raspberry Pi.
CO4: Connect IoT devices to the internet and send data to cloud platforms.
CO5: Apply basic security practices and develop simple IoT-based projects.

Unit-I Introduction to IoT Hrs.

What is IoT? - Applications of IoT (Smart Home, Smart City, etc.) - Basic IoT Architecture (Sensors - Devices - Cloud - Apps) - Benefits and challenges of IoT

Unit-II IoT Devices and Sensors Hrs.

Introduction to microcontrollers (Arduino, Raspberry Pi) - Basic sensors and actuators- Simple hardware setup Overview of Arduino IDE

Unit-III Communication in IoT Hrs.

How IoT devices talk: Wired vs Wireless - Basics of Wi-Fi, Bluetooth, Zigbee - What is MQTT and HTTP (Basic idea) - Connecting devices over the internet

Unit-IV IoT Programming and Cloud Hrs.

Basics of programming IoT devices (using Arduino/C or Python) - Sending sensor data to cloud platforms (Thingspeak, Blynk) - Visualizing data (basic dashboards) -Hands-on: LED control, temperature monitoring

Unit-V IoT Security and Career Scope Hrs.

. Simple security issues in IoT (privacy, hacking examples) - Tips for keeping devices safe -Future of IoT and latest trends -Job roles and career opportunities in IoT

Text Book(s):

1. Internet of Things – A Hands-On Approach by Arshdeep Bahga & Vijay Madisetti, Universities Press

2. Getting Started with Arduino – Massimo Banzi
3. Internet of Things Simplified – V. Sridhar (Free open source notes or eBooks)

Reference Book(s):

1. Adrian McEwen, Hakim" Designing the Internet of Things" Cassimally Wiley
2. V. Sridhar "Internet of Things Simplified" Notion Press

Web Resources:

1. https://www.arduino.cc
2. https://www.raspberrypi.org
3. https://appinventor.mit.edu

Prepared by Checked by HoD

Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS / GS / NME / SE / VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total
II	25UITVA2	2*	Cloud Computing Essentials	VAC	2	--	--	3 Hrs.	50	50	100
Pre-Requisite:											

Pre-Requisite:

Course Objectives: The purpose of learning this course is:

1. To introduce the fundamental concepts and architecture of cloud computing
2. To explain different cloud service models (IaaS, PaaS, SaaS) and deployment models
3. To familiarize students with major cloud platforms like AWS, Azure, and Google Cloud.
4. To explore cloud technologies including virtualization, storage, and cloud security
5. To examine real-world applications and emerging trends in cloud computing

Course Outcomes:

CO1: Explain the basic concepts, characteristics, and models of cloud computing.
CO2: Compare various cloud service models (IaaS, PaaS, SaaS) and deployment models
CO3: Use basic services provided by leading cloud providers such as AWS, Azure, and Google Cloud
CO4: Identify security challenges and apply best practices in cloud environments
CO5: Analyze the applications and future trends of cloud computing in different domains

Unit-I Introduction to Cloud Computing Hrs.

Definition of Cloud Computing -Characteristics and Benefits of Cloud-History and Evolution of Cloud-Types of Clouds: Public, Private, Hybrid, Community-Service Models: IaaS, PaaS, SaaS

Unit-II Cloud Architecture and Technologies Hrs.

Cloud Architecture Overview - Virtualization: Concepts and Types- Cloud Storage and Databases - Scalability and Elasticity- Key Enabling Technologies (Web Services, APIs, etc.)

Unit-III Cloud Service Providers Hrs.

Overview of Leading Providers: AWS, Microsoft Azure, Google Cloud- Basic Cloud Services (Compute, Storage, Network)- Cloud Deployment and Management Tools- Comparison of Providers

Unit-IV Cloud Security and Challenges Hrs.

Security Concerns in the Cloud- Data Privacy and Confidentiality- Authentication and Access Control- Risk Management and Legal Issues- Best Practices for Cloud Security

Unit-V Applications and Future of Cloud Computing Hrs.

Real-Time Applications: E-commerce, Education, Healthcare,- Cloud in IoT and Big Data- Mobile Cloud Computing- Green Cloud Computing- Emerging Trends: Serverless Computing, Edge Computing, AI in Cloud

Textbook(s):

1. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl et al.

Reference Book(s):

1.Rajkumar Buyya – *Cloud Computing: Principles and Paradigms*
2.Toby Velte – *Cloud Computing: A Practical Approach*
3.Arshdeep Bahga and Vijay Madisetti – *Cloud Computing: A Hands-On Approach*

Web Resources:

1. https://www.ibm.com/think/topics/cloud-computing
2. https://cloud.google.com/architecture/framework
3. https://docs.aws.amazon.com/wellarchitected/latest/security-pillar/welcome.html

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