GOVERNMENT ARTS COLLEGE (AUTONOMOUS)

COIMBATORE-641 018

Learning outcomes-based Curriculum Framework (LOCF) for

B.Sc. INFORMATION TECHNOLOGY

(Effective from Academic year 2023-2024)

POSTGRADUATE AND RESEARCH
DEPARTMENT OF INFORMATION TECHNOLOGY
2023 – 2024 Onwards

Preamble

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. Such changes have gained momentum with the introduction of Choice Based Credit System (CBCS) which further expects learning outcome-based curriculum in order to maximize the benefits of the newly designed curriculum. The learning outcome-based curriculum will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

Tamil Nadu State Council for Higher Education (TANSCHE) has formed the State Integrated Boards of Studies, which, with great diligence and expertise has devised the mandatory areas that have to be covered for three-year under graduation and two-year post graduation courses to realize the facilitation of the mobility of faculty and students from one university to another and to easily solve the problem of equivalence among courses. Great care has been taken so that these areas would take 75% of the course content and the remaining 25% can be decided by the individual institutions. The areas that must be covered by the student that are mandatory for earning the degree to have due value has been worked out so that the student will gain enough depth of knowledge in the subject concerned. 25% percent of the syllabus should be designed by the institutions, and the areas covered under this also must have a weightage of 25%. This gives the autonomous institution seamless liberty on every Board of Studies (BOS) to innovate and experiment, and more importantly, it is here that the institution devises appropriate strategies by which (i) to make creative and critical applications of what has been learnt in the mandatory components, and (ii) to meaningfully connect the learners to the career demands and expectations. It is essential that the theoretical subject knowledge of the students must be translated into practical hands-on experience.

One of the significant reforms in the undergraduate education is to introduce the Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the country which will help the students to ensure similar quality of education irrespective of the institute and location. With initiatives of University Grants Commission (UGC) for nation-wide adoption and implementation of the LOCF for bachelor's programmes in colleges, universities and HEIs in general. A Core Expert Committee (CEC) was constituted to formulate the modalities for developing the LOCF in various subjects being taught in the undergraduate courses in sciences, humanities, commerce and professional courses. The CEC also constituted the Subject Expert Committees (SEC) in various subjects to prepare detailed guidelines for the LOCF in subjects concerned.

The key components of the planning and development of LOCF are given in terms of clear and unambiguous description of the Graduate Attributes (GA), Qualification Descriptors (QD), Program Learning Outcomes (PLO) and Course Learning Outcomes (CLO) to be achieved at the end of the successful completion of each undergraduate program to be offered by HEIs. In undergraduate education in Information Technology, the programme of study leading to the degree of B.Sc. in Information Technology is discussed herewith.

The Qualification Descriptors (QD), Program Learning Outcomes (PLO) and the Course Learning Outcomes (CLO) were also finalized keeping the broad requirement of the programme in view. The LOCF also gives general guidelines for the Teaching Learning Process (TLP) corresponding to each component of theory, experiment, tutorials, projects and industrial / field visits to be followed in order to achieve the stated outcomes for each component. Finally, some suggestions for using various methods in the assessment and evaluation of learning levels of students are also made. It is a student centric framework where they are expected to learn fundamentals of Information Technology along with the latest trends and techniques like Artificial Intelligence, Internet of Things, Machine Intelligence along with advanced skill sets that include Mobile Application Development, Object Oriented Programming among many other courses.

1. Introduction

Information Technology (IT) has been evolving as an important branch of science and engineering throughout the world in the last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Information Technology isa discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Information Technology can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain.

Information Technology has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Information Technology is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

Universities and other HEIs introduced programmes of studies in Information Technology as this discipline evolved itself to a multidisciplinary discipline. Information Technology is growing rapidly. Increasing applications of computers in almost all areas of human endeavor has led to vibrant industries with concurrent rapid change in technology. Unlike other basic disciplines, developing core competency in this discipline that can be reasonably stable becomes a challenge. In India, it was initially introduced at the Master (postgraduate) level as MCA and M.Tech. Later on, engineering programmes such as B.Tech and B.E in Computer Science & Engineering and in Information Technology were introduced in various engineering College/Institutions to cater to the growing demand for trained engineering manpower in IT industries. Simultaneously, BSc and MSc programmes with specialization in Information Technology were introduced to train manpower in this highly demanding area. B.Sc in Information Technology are being planned and introduced in

different colleges and institutions.

Information Technology education at undergraduate level will result in earning a Bachelor of Science (BS) degree in Information Technology. The coursework required to earn a BSc is equally weighted in mathematics and science. B.Sc in Information Technology are aimed at undergraduate level training facilitating multiple career paths. Students so graduated, can take up postgraduate programmes in Information Technology leading to research , can be employable at IT industries, or can pursue a teachers' training programme such as B.Ed. ,in Computer Education, or can adopt a business management career. BSc in Information Technology aims at laying a strong foundation of Information Technology at an early stage of the career along with two other subjects such as Maths and Statistics. There are several employment opportunities and after successful completion of an undergraduate programme in Information Technology, graduating students can fetch employment directly in companies as Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel.

The Learning Outcome-based Curriculum Framework in Information Technologies aimed at allowing flexibility and innovation in design and development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in Information Technology courses, in outcome-based curriculum framework, helps students to learn in solving problems, accomplishing IT tasks, and expressing creativity, both individually and collaboratively. The proposed framework will help students learn programming techniques and the syntax of one or more programming languages.

Many of the learning outcomes of Information Technology can be achieved only by programming a computer for several different meaningful purposes. All students must, therefore, have access to a computer with a modern programming language installed. The computer science framework does not prescribe a specific language. The teacher and students will decide which modern programming languages students will learn. More importantly, students will learn to adapt to changes in programming languages and learn new languages as they are developed.

The present Learning Outcome-based Curriculum Framework for bachelor's degrees in Information Technology is intended to facilitate the students to achieve the following.

- To develop an understanding and knowledge of the basic theory of Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.

- To develop the ability to use this knowledge to analyse new situations

- To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.

- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems

- To learn skills and tools like mathematics and statistics to find the solution, interpret the results and make predictions for the future developments.

1.1 **Course Structure – Types of Courses.**

The following types of courses are offered under CBCS-LOCF:

1. **Core Courses (CC).** A core course is a compulsory course. A student of Information Technology has to take 14 such Information Technology courses over six semesters.

2. **Elective Courses (EC).** An elective course is a course that is to be chosen from a specified set of courses. These courses are of two types.

Discipline Specific Electives (DSE). These are elective courses that provide advanced undergraduate training in specialised areas of Information Technology A set of **4**, semester-specific, courses of this kind are offered in the fifth and sixth semesters of the Undergraduate programme.

Generic Electives (GE). These courses, in disciplines other than Information Technology, are intended to broaden the training of a student in the Information Technology Undergraduate programme. A student of Information Technology will take one such course, offered by another department, in each of Semester V to VI.

3. **Ability Enhancement Compulsory Course (AECC).** Two such courses are to be taken, one in Semester I (Environmental Studies) and one in Semester II (Value Education– Gandhian Thoughts).

4. **Skill Enhancement Course (SEC).** A student is to take one such course each in Semester III through Semester VI. Besides, an individual/group project in Semester VI.

2. Learning Outcomes-basedApproach To Curriculum Planning and Development (LOACPD)

2.1 Nature and Extent of the B.Sc Information Technology

The undergraduate programs in Information Technology builds on science-based education at +2 level. The +2 secondary school education aims and achieves a sound grounding in understanding the basic scientific temper with introduction to process of computation by introducing some programming languages. This prepares a young mind to launch a rigorous investigation of exciting world of Information Technology.

Framing and implementation of curricula and syllabi is envisaged to provide an understanding of the basic connection between theory and experiment and its importance in understanding the foundation of computing. This is very critical in developing a scientific temperament and to venture a career with a wide spectrum of applications as well as theoretical investigations. The undergraduate curriculum provides students with theoretical foundations and practical experience in both hardware and software aspects of computers. The curriculum in Information Technology is integrated with courses in the sciences and the humanities to offer an education that is broad, yet of enough depth and relevance to enhance student employment opportunities upon graduation. As a Bachelor's degree program, the curriculum is based on the criterion that graduates are expected to function successfully in a professional employment environment immediately upon graduation.

The undergraduate program in Information Technology is presently being offered though the courses designed for granting the Information Technology degree by various colleges and universities in India. Information Technology course are of 3-year duration spread over six semesters.

2.2 Aims of Bachelor of Science Programme in Information Technology

The Bachelor of Science degree in Information Technology emphasizes problem solving in the context of algorithm development and software implementation and prepares students for effectively using modern computer systems in various applications. The curriculum provides required Information Technology courses such as programming languages, data structures, computer architecture and organization, algorithms, database systems, operating systems, and software

engineering as well as elective courses in artificial intelligence, computer-based communication networks, graphics, multimedia, web technology, and other current topics in Information Technology. The main aim of this Bachelor's degree is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. The purpose of the Information Technology programs are twofold: (1) to prepare the student for a position involving the design, development and implementation of computer software/hardware, and (2) to prepare the student for entry into a program of postgraduate study in Information Technology/engineering and related fields.

3. Graduate Attributes

Graduate Attributes (GA) are the qualities, skills and understandings that students should develop during their time with the HEI. These are qualities that also prepare graduates as agents of social good in future. Graduate Attributes can be viewed as qualities in following subcategories.

- Knowledge of the discipline
- Creativity
- Intellectual Rigour
- Problem Solving and Design
- Ethical Practices
- Lifelong Learning
- Communication and Social Skills

Afore-mentioned GAs can be summarized in the following manner.

GA 1. A commitment to excellence in all scholarly and intellectual activities, including critical judgment

GA 2. Ability to think carefully, deeply and with rigour when faced with new knowledge and arguments.

GA 3. Ability to engage constructively and methodically when exploring ideas and theories.

GA 4. Ability to consider others points of view and make a thoughtful argument

GA 5. Ability to develop creative and effective responses to intellectual, professional and social challenges

GA 6. Ability to apply imaginative and reflective thinking to their studies

GA 7. Commitment to sustainability and high ethical standards in social and professional practices.

GA 8. Ability to be responsive to change, to be inquiring and reflective in practice, through information literacy and autonomous self-managed learning.

GA 9. Ability to communicate and collaborate with individuals and within teams, in professional and community settings

GA 10. Ability to demonstrate competence in the practical art of computing by showing in design an understanding of the practical methods, and using modern design tools competently for complex real-life IT problems

GA 11. Ability to use a range of programming languages and tools to develop computer programs and systems that are effective solutions to problems.

GA 12. Ability to understand, design, and analyse precise specifications of algorithms, procedures, and interaction behaviour.

GA 13. Ability to apply mathematics, logic, and statistics to the design, development, and analysis of software systems

GA 14. Ability to be equipped with a range of fundamental principles of Information Technology that will provide the basis for future learning and enable them to adapt to the constant rapid development of the field.

GA 15. Ability of working in teams to build software systems.

GA 16. Ability to identify and to apply relevant problem-solving methodologies

GA 17. Ability to design components, systems and/or processes to meet required specifications

GA18. Ability to apply decision making methodologies to evaluate solutions for efficiency, effectiveness and sustainability

GA 19. A capacity for self-reflection and a willingness to engage in self-appraisal

4. Qualification Descriptors

Qualification descriptors are generic statements of the outcomes of study. Qualification descriptors are in two parts. The first part is a statement of outcomes, achievement of which a student should be able to demonstrate for the award of the qualification. This part will be of interest to those designing, approving and reviewing academic programmes. They will need to be satisfied that, for any programme, the curriculum and assessments provide all students with the opportunity to achieve, and to demonstrate achievement of the outcomes. The second part is a

statement of the wider abilities that the typical student could be expected to have developed. It will be of assistance to employers and others with an interest in the general capabilities of holders of the qualification. The framework has the flexibility to accommodate diversity and innovation, and to accommodate new qualifications as the need for them arises.

Qualification Descriptor for B.Sc. in IT

On completion of B.Sc. in Information Technology, the expected learning outcomes that a student should be able to demonstrate are the following.

QD-1. Fundamental understanding of the principles of Information Technology and its connections with other disciplines.

QD-2. Procedural knowledge that creates different types of professionals related to Information Technology, including research and development, teaching and industry, government and public service;

QD-3. Skills and tools in areas related to Information Technology and current developments in the academic field of study.

QD-4. Use knowledge, understanding and skills required for identifying problems and issues, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources, and their application, analysis and evaluation using methodologies as appropriate to Information Technology for formulating solutions

QD-5. Communicate the results of studies undertaken in Information Technology accurately in a range of different contexts using the main concepts, constructs and techniques

QD-6. Meet one's own learning needs, drawing on a range of current research and development work and professional materials

QD-7. Apply Information Technology knowledge and transferable skills to new/unfamiliar contexts,

QD-8. Demonstrate subject-related and transferable skills that are relevant to industry and employment opportunities.

5. Programme Learning Outcomes

These outcomes describe what students are expected to know and be able to do by the time of graduation. They relate to the skills, knowledge, and behaviours that students acquire in their graduation through the program

Programme Learning Outcomes for B.Sc Information Technology

The Bachelor of Science with Information Technology (BSc with IT) program enables

students to attain, by the time of graduation

- will be able to demonstrate:

(i) Fundamental/systematic or coherent knowledge and understanding of Information Technology and its applications.

(ii) procedural knowledge that creates different types of professionals related to the disciplinary/subject area of study, including research and development, teaching and government and public service.

(iii) Skills in the area of Software, Hardware and current developments.

- Skills in are as related to one's specialization and current developments in the academic field of study.

- Use knowledge, understanding and skills required for identifying problems and issues, collection of relevant data based on a wide range of sources and their application, analysis and evaluation using methodologies for generating solutions. Undertake hands on lab work and activities that develop practical knowledge and skills in the field of information Technology.

- Communicate the results of studies undertaken in an academic field accurately in a range of different contexts using the main concepts, constructs and techniques of the various subjects in Information Technology.

- Meet one's own learning needs, drawing on a range of current research and development work and professional materials.

- Ability to acquire knowledge and skills, including 'learning how to learn', that are necessary for participating in learning activities throughout life.

- Ability to embrace moral/ethical values in conducting one's life, and use/ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, void unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights and adopting objective, unbiased and truthful actions in all aspects of work.

- Ability to work effectively and respectfully with diverse teams, facilitate cooperative, coordinated effort on the part of a group and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

- Ability to work independently, identify appropriate resources required for a project and manage a project and complete the work.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), COIMBATORE - 18
PG & RESEARCH DEPARTMENT OF INFORMATION TECHNOLOGY
B.Sc Information Technology

B. Sc., Information Technology Syllabi and Scheme of Examinations for the Students Admitted from 2023-2024 Academic year onwards

Part	Sub Code	Title of the Paper	Hours (week)	Internal (CIA) Marks	External Marks	Total Marks	Ext – Min.	Total Pass Marks	Credits
Semester – I									
I	23TAM11L	**Part – I:** Language: Tamil I	4	25	75	100	30	40	3
II	23ENG12L	**Part –II:** English I	4	25	75	100	30	40	3
III	23BIT13C	**Core :** Computer Fundamentals and C Programming	7	25	75	100	30	40	4
III	23BIT14A	**Allied:1- Mathematics:1** Mathematical Foundations for Information Technology	6	25	75	100	30	40	4
III	23BIT15P	**Practical 1:** C Programming Lab	7	40	60	100	24	40	2
IV	23ENV1GE	**Environmental Studies**	2	25	75	100	30	40	2
Semester – II									
I	23TAM21L	**Part – I:** Language: Tamil II	4	25	75	100	30	40	3
II	23ENG22L	**Part –II:** English II	4	25	75	100	30	40	3
III	23BIT23C	**Core:** Object Oriented Programming with C++	4	25	75	100	30	40	4
III	23BIT24C	**Core:** Digital Computer Fundamentals	4	25	75	100	30	40	4
III	23BIT25A	**Allied:2- Mathematics:2** Computer Oriented Numerical and Statistical Methods	6	25	75	100	30	40	4
III	23BIT26P	**Practical 2:** C++ Programming Lab	4	40	60	100	24	40	2
IV	23NMN2AL	**Naan Mudalvan Scheme - Skill Course**: Language Skills for Employability	2	25	75	100	30	40	2
IV	23VAL2GE	**Value Education Gandhian Thoughts**	2	25	75	100	30	40	2

Semester – III

I	23TAM31L	**Part–I**:Language: Tamil III	4	25	75	100	30	40	3
II	23TAM32L	**Part –II:** English III	4	25	75	100	30	40	3
III	23BIT33C	**Core :** Operating Systems	4	25	75	100	30	40	4
III	23BIT34C	**Core :** Data Structures	4	25	75	100	30	40	4
III	23BIT35C	**Core :** Java Programming	4	25	75	100	30	40	4
III	23BIT36A	**Allied - 3:** Web Technology	4	25	75	100	30	40	4
III	23BIT37P	**Practical 3:** Java Programming and Web Technology Lab	4	40	60	100	24	40	2
IV	23NMN3CS	**Naan Mudalvan Scheme - Skill Course**: Fundamentals of Coding and Cloud	2	25	75	100	30	40	2

Semester – IV

I	23TAM41L	**Part–I**:Language: Tamil IV	4	25	75	100	30	40	3
II	23TAM42L	**Part –II:** English IV	4	25	75	100	30	40	3
III	23BIT43C	**Core :** Python Programming	4	25	75	100	30	40	4
III	23BIT44C	**Core :** Computer Networks	4	25	75	100	30	40	4
III	23BIT45C	**Core :** VB.NET Programming	4	25	75	100	30	40	4
III	23BIT46A	**Allied – 4:** Computer System Architecture	4	25	75	100	30	40	4
III	23BIT47P	**Practical 4:** VB.NET and Python Programming Lab	4	40	60	100	24	40	2
IV	23NMN4AL	**Naan Mudalvan Scheme - Skill Course**: Digitial Skills for Employability	2	25	75	100	30	40	2
V	23EXA44E	**@Extension Activities:** **NCC/NSS/SPORTS//YRC**	-	-	-	-	-	-	1

Semester – V									
III	23BIT51C	**Core :** Software Engineering	5	25	75	100	30	40	4
III	23BIT52C	**Core :** Relational Database Management System	5	25	75	100	30	40	4
III	23BIT53C	**Core :** Computer Graphics	5	25	75	100	30	40	4
III	23BIT54P	**Practical 5:** Relational Database Management System and R Programming Lab	5	40	60	100	24	40	2
IV	23BIT55S	**Skill Based Subject – I:** Data Mining and R Programming	5	25	75	100	30	40	3
IV	23BIT5EL	**Non-Major Elective Paper – I:** Information Technology - 1 (Basics of Computers and Office Automation)	3	25	75	100	30	40	2
IV	23NMN5CS	**Naan Mudalvan Scheme - Skill Course** Foundations of Coding and Cloud	2	25	75	100	30	40	2
Semester – VI									
III	23BIT61C	**Core :** Programming in PHP	5	25	75	100	30	40	4
III	23BIT62C	**Core :** Mobile Computing	5	25	75	100	30	40	4
III	23BIT63P	**Practical 6:** PHP Programming Lab	5	40	60	100	24	40	2
III	23BIT64V	**Mini Project**	5	20	80	100	32	40	6
III	23BIT65S	**Skill Based Subject – II:** Artificial Intelligence and Expert Systems	5	25	75	100	30	40	4
IV	23NMN6CS	**Naan Mudalvan Scheme - Skill Course:** Emerging Technology for the Workplace	2	25	75	100	30	40	2
IV	23BIT6EL	**Non-Major Elective Paper – II:** Information Technology - 2 (Hyper Text Markup Language)	3	25	75	100	30	40	2
		Total / Credits	**180**			**4400**			**140**

@ No External Examinations. Only Continuous Internal Assessment (CIA).

DISTRIBUTION OF MARKS FOR CONTINUOUS INTERNAL ASSESSMENT(CIA) AND COMPREHENSIVE EXTERNAL EXAMINATIONS(CEE)- Theory, Practical and Project

	Maximum Marks	Marks for		Components for CIA
		CIA	CEE	Test
Theory(Core/Elective)	100	25	75	25

Paper	Maximum Marks	Marks for		Components for CIA		
		CIA	CEE	Tests	Observation Note	Record Note
Practical(Core/Elective)	100	40	60	30	05	05

Paper	Maximum Marks	Marks for		
		CIA	CEE	
			Evaluation	Viva-voce
Project	100	20	60	20

INTERNAL MARKS DISTRIBUTION

INTERNAL EXAMINATIONS TOTAL MARKS : 50

OUT OF TWO TESTS BEST ONE WILL BE TAKEN FOR 25 MARKS

1	INTERNAL TEST	25 MARKS

SEMESTER EXAMINATION QUESTION PAPER FORMAT FOR UG

Max.Marks:75

PART-A (10*1=10 Marks)

Answer all Questions

I Choose the Best Answer (5*1=5)

With 4 distractors – Avoid using none of the above , all of the above

Question 1 from Unit – I
Question 2 from Unit – II
Question 3 from Unit – III
Question 4 from Unit – IV
Question 5 from Unit – V

II Answer in one or two words (5*1=5)

Question 6 from Unit – I
Question 7 from Unit – II
Question 8 from Unit – III
Question 9 from Unit – IV
Question 10 from Unit – V

PART-B (5*5=25 Marks)

Answer all Questions

Question 11. a) or b) From Unit - I
Question 12. a) or b) From Unit - II
Question 13. a) or b) From Unit - III
Question 14. a) or b) From Unit - IV
Question 15. a) or b) From Unit – V

PART-C (4*10=40 Marks)

Answer any FOUR questions

Question 16. From Unit - I

Question 17. From Unit - II

Question 18. From Unit - III

Question 19. From Unit - IV

Question 20. From Unit – V

INTERNAL EXAMINATION QUESTION PAPER FORMAT FOR UG

Max. Marks: 50

PART-A (5*1=5 Marks)

Answer all Questions

Choose the Best Answers

With 4 distractions – Avoid using none of the above , all of the above

5 Questions of 1 mark each , NO choice

PART-B (5*5=25 Marks)

Answer all Questions

5 Questions EITHER – OR type of 5 Marks each.

PART-C (2*10=20 Marks)

Answers any TWO questions out of 3 questions 10 Marks each

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Core: COMPUTER FUNDAMENTALS AND C PROGRAMMING**	I	23BIT13C

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Infer fundamentals of computers, OS, flowchart and algorithm

CLO2   Discuss the program structure of C

CLO3   Analyse the concept of decision making and branching and decision making and looping

CLO4   Compute about the arrays and strings

CLO5   Classify different category of functions

CLO6   Differentiate Structure from Union

CLO7   Explain about pointers and files in C

CLO8   Develop C programs to solve simple problems using arrays , functions, structures

UNIT I: Fundamentals of Computers: Introduction –Generations of Computers - Classification of Computers-Basic Anatomy of a Computer System-Input Devices Processor-Output Devices-Memory Management – Types of Software- Overview of Operating System- Programming Languages-Translator Programs-Problem Solving Techniques.

UNIT II: Overview of C: Introduction – Importance of C- Character set - C tokens - keyword & Identifiers -Constants - Variables - Data types - Declaration of variables - Assigning values to variables -Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Increment and Decrement operators, Conditional, Bitwise, Special Operators - Arithmetic Expressions - Evaluation of expressions -precedence of arithmetic operators - Type conversion in expressions – operator precedence & associativity - Mathematical functions- Reading & Writing a character - Formatted input and output.

UNIT III: Decision Making and Branching: Introduction – If, If….Else, nesting of If …Else statements- Else If ladder – The Switch statement, The ?: Operator – The Go to Statement. Decision Making and Looping: Introduction- the While statement- the do statement – the for statement-jumps in loops. Arrays - Character Arrays and Strings.

UNIT IV: User-Defined Functions: Introduction – Need and Elements of User-Defined Functions-Definition of functions- Return Values and their types - Function Calls – Function Declaration–

Category of Functions- Nesting of Functions - Recursion – Passing Arrays and Strings to Functions - Structures and Unions.

UNIT V: Pointers: Understanding pointers - Accessing the address of a variable - Declaring and initializing pointer variables - Accessing a variable through its pointer - Pointer expressions – pointer increments and scale factor - Pointers and arrays-Pointers and character strings – Array of pointers.
File Management in C: Introduction- Defining and opening a file -Closing a file – Input /Output operations on files - Error handling during I/O operations -Random access to files - Command line arguments.

TEXT BOOK

1. E Balagurusamy," Computing Fundamentals & C Programming" - TataMcGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.

REFERENCES

1. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.
2. Henry Mullish&HuubertL.Cooper: The Spirit of C, Jaico Pub. House, 1996.

FURTHER READING
https://www.tutorialspoint.com/cprogramming/c_quick_guide.htm

Mapping								
ProgrammeLeveloutcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge			✓	✓	✓			
Communication Skills	✓	✓			✓			✓
Critical Thinking			✓	✓		✓	✓	
Problem Solving			✓	✓	✓	✓	✓	
Analytical Reasoning					✓	✓	✓	✓
Research Related Skills			✓			✓		
Scientific Reasoning		✓		✓		✓	✓	✓
Life-Long Learning	✓			✓	✓	✓		

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Practical 1: C PROGRAMMING LAB**	I	23BIT15P

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Compute the program structure of C

CLO2   Explain about operators and evaluate expressions in C.

CLO3   Apply the concept of decision making and branching and decision making and looping.

CLO4   Write C programs using arrays and string handling functions.

CLO5   Analyse various types of functions

CLO6   Distinguish Structure from Union

CLO7   Develop C programs using pointers.

CLO8   Create file programs in C using command line arguments.

List of Programs

1. Write a C program to find the largest of 3 numbers using nested if ...else statements.

2. Write a C program to print multiplication table using do … while.

3. Write a C program to print n^{th} Fibonacci number using for loop.

4. Write a C program to print all prime numbers between 1 and n using function.

5. Write a C program to illustrate the use of BREAK and CONTINUE statement.

6. Write a C program to find the transpose of a matrix.

7. Write a C program to sort the given set of numbers in ascending order.

8. Write a C program to count the number of Vowels and consonants in a text string.

9. Write a C program to check whether the given string is a palindrome or not.

10. Write a C program to print the students Mark sheet assuming roll no, name, and marks in 5 subjects in a structure. Create an array of structures and print the mark sheet in the university pattern.

11. Write a C program which receives two filenames as arguments and check whether the file contents are same or not. If same delete the second file.

12. Write a program which takes a file as command line argument and copy it to another file. At the end of the second file write the total i)number of chars ii) number of words and iii) number of lines.

FURTHER READING:

https://www.tutorialspoint.com/cprogramming/index.htm

Mapping								
ProgrammeLevelou tcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Displinary Knowledge	✓		✓					
Communication Skills								
Critical Thinking	✓	✓	✓	✓	✓	✓	✓	✓
Problem Solving	✓	✓	✓	✓	✓	✓	✓	✓
Analytical Reasoning	✓	✓	✓	✓	✓	✓	✓	✓
Research Related Skills						✓	✓	✓
Scientific Reasoning	✓	✓	✓	✓				
Life-Long Learning							✓	

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**ENVIRONMENTAL STUDIES** (For all UG courses)	I	**23ENV1GE**

COURSE LEARNING OUTCOMES:

On the successful completion of the course, students will be able to:
1. Recognize the role of the environment and the need to conserve it for sustaining life.
2. Enumerate the natural resources
3. Explores the adverse effects of deforestation and over exploitation of natural resources
4. Associate the components of the ecosystem and need for biodiversity conservation.
5. Evaluate the environmental pollution hazards and their effects on the living system.
6. Interpret the different disaster management procedures.
7. Analyse the climatic change and global effects
8. Infer the need for environmental laws in the constitution of India.
9. Relate the growth of the human population and its impact on the environment.

UNIT I:

Environment – Introduction – Nature - Scope – Content – Need for study. Natural resources- Forest and energy resources- Use and overexploitation - deforestation. Energy resources- renewable and non-renewable energy resources.

UNIT II:

Ecosystem – concept – types- Forest, Grassland, Desert and Aquatic (Pond)- Structure and function of an ecosystem – Producers- consumers and decomposers – Food chain – food web- ecological pyramids- energy flow. Biodiversity and its conservation- *in situ* and *ex situ* conservation- Mega biodiversity centres and hotspots.

UNIT III:

Environmental pollution- definition- causes-effects and control measures of air, water, soil, thermal and nuclear pollution. Waste management- Industrial and solid waste. Disaster management – earthquake, cyclone, flood and landslides.

UNIT IV:

Social Issues and the environment-Urbanization-Urban problems related to energy and watershed management. Environmental Ethics- Issues and possible solutions- Wasteland reclamation- Climate change - causes and effects. Global warming- Acid rain- Ozone layer depletion- Public awareness. Environmental laws- Environment Protection Act, Wildlife Protection Act, Forest Conservation Act.

UNIT V:

Human population and its impact on environment- Population growth- Resettlement and Rehabilitation of project affected persons- Case studies – Sardar Sarovar Project, Maharashtra and Bandipur National Park- Project Tiger, Karnataka, NTPC, India. Role of Indian and Global

religions and Cultures in environmental conservation- Case study: sacred groves in Western Ghats (kavu) & Chinese culture. Human and Wildlife Conflict.

PEDAGOGY STRATEGIES
- ⧫ Board and Chalk lectures
- ⧫ PowerPoint slide presentations
- ⧫ Assignments

Textbooks:
1. Sharma, P. D. 2000. Ecology & Environment. Rastogi Publications, Meerut,India.
2. Bharucha, E. 2003. Text book of Environmental Studies. UGC, New Delhi & Bharati Vidyapeeth Institute of Environmental Education and Research, Pune.
3. Arumugam, M. and Kumaresan, V. 2016. Environmental Studies (Tamil version). Saras Publications,Nagerkoil.

Online/E-Resources:

https://www.edx.org/course/subject/environmental-studieshttps://www.coursera.org/courses?_facet_changed_=true&domains=life-sciences%2Cphysical-science-and-engineering%2Csocial-sciences&query=environmental%20science%20and%20sustainability&userQuery=environmental%20science%20and%20sustainability
https://www.open.edu/openlearn/nature-environment/free-courses

COURSE LEVEL MAPPING OF PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	COURSE LEARNING OUTCOMES (CLO)								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Disciplinary Knowledge		√	√		√	√			
Communication Skills		√		√				√	√
Critical Thinking	√		√		√		√		
Research related skills	√		√			√		√	
Analytical reasoning	√			√		√		√	
Problem Solving		√	√			√			√
Team Work				√	√		√		√
Moral and ethical awareness		√		√		√		√	√

Year	Subject title	Sem	Sub Code
2023 -24 Onwards	**Core: Object Oriented Programming with C++**	**II**	**23BIT23C**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Able to differentiate the procedure oriented and object oriented concepts

CLO2   Generalize the basic concepts of C++ programming

CLO3   Design programs with classes and objects

CLO4   Apply the concepts of friend functions and overloading

CLO5   Analyze the concept reusability through inheritance

CLO6   Demonstrate the concept of object oriented programming through C++

CLO7   Explore the ease of C++ programming

CLO8   Develop programs using I/O streams

Unit I: Introduction to C++: Object oriented technology- Programming paradigms- Key concepts of OOP – Advantages – object oriented languages – Input and output in C++: Streams in C++ - Pre- Defined Streams – Unformatted console I/O operation – Formatted console I/O operations – C++Declarations – Control structures: Decision Making statements –If….Else – Jump – GOTO – Break – Continue – Switch case statements – Loops in C++ : For – While – Do… While Loops – Functions in C++ - In Line Functions – Function Overloading.

Unit II: Class and Object: Declaring objects – Defining Member Functions – Static Member Variables and Functions – Array of Objects – Friend Functions – Overloading Member Functions –Constructor and Destructors: Characteristics – Calling Constructor and Destructors – Constructors and Destructors with Static Member.

UNIT III: Operator Overloading: Overloading Unary – Binary Operators – Overloading Friend Functions – Type Conversion – Inheritance: Types of Inheritance – Single – Multilevel – Multiple – Hierarchical – Hybrid and Multi Path Inheritance – Virtual Base Classes – Abstract Classes.

UNIT IV: Pointers: Declaration – Pointer to Class – Object – THIS Pointer – Pointer to Derived Classes and Base Classes – Arrays: Characteristics – Arrays of Classes – Memory Models – New and Delete Operators–Virtual Functions –Pure virtual functions. Working with Strings: Declaring and initializing string objects-String Attributes- Accessing elements of strings- comparing and exchanging.

UNIT V: Files: File Stream Classes – File Modes – Sequential Read/ Write Operations – Binary and ASCII Files – Random Access Operation – Command Line Arguments - Exception Handling: Principles of Exception Handling – The Keywords try, Throw and Catch – Exception Handling Mechanism – Multiple Catch Statements – Catching Multiple Exceptions – Re-throwing Exception.

TEXT BOOK

1. Ashok N Kamthane (2011).Object Oriented Programming with ANSI and Turbo C++. Pearson Education Publications.

REFERENCES

1. E. Balagurusamy, (2012), Object-Oriented Programming with C++, Tata McGraw Hill Education Private Ltd., New Delhi, Sixth edition.
2. Bjarne Strouststroup(2014). Programming – Principles and Practice using C++, Second Edition. Addison Wesley publications.
3. K.R.Venugopal, (2013), Mastering C++, McGraw Hill Education India Pvt. Ltd, Second edition.

FURTHER READING

www.nptel.ac.in
www.cplusplus.com

<table>
<tr><td colspan="9" align="center">Mapping</td></tr>
<tr><td rowspan="2">ProgrammeLevelou tcomes</td><td colspan="8" align="center">COURSE LEARNING OUTCOMES(CLOs)</td></tr>
<tr><td>CLO1</td><td>CLO2</td><td>CLO3</td><td>CLO4</td><td>CLO5</td><td>CLO6</td><td>CLO7</td><td>CLO8</td></tr>
<tr><td>Disciplinary Knowledge</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Communication Skills</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Critical Thinking</td><td>✓</td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Problem Solving</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Analytical Reasoning</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Research Related Skills</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Scientific Reasoning</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Life-Long Learning</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Core: Digital Computer Fundamentals**	**II**	**23BIT24C**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Associatebasic concepts of number system and its conversion

CLO2   Summarize the various types of codes

CLO3   Outline the boolean laws and Evaluate the expressions

CLO4   Simplify SOP and POS using K - Map

CLO5   Design logic circuits

CLO6   Discuss TTL and CMOS circuits

CLO7   Construct counters using flip flops

CLO8   Compare A/D, D/A Conversion

UNIT I: Number Systems: Decimal, Binary, Octal, Hexadecimal – conversion from one to another – Binary Addition, Subtraction, Multiplication and Division – Codes – BCD – Weighted – Excess-3 – Gray – Error Detection Codes.

UNIT II: Basic Logic Gates – Boolean Laws And Theorems – Sum Of Products Method– Truth Table To Karnaugh Map – Pairs, Quads And Octets – Karnaugh Simplifications –Don't Care Conditions - Product Of Sums Method - Product Of Sum Simplification.

UNIT III: Data Processing Circuits: Multiplexers – Demultiplexers – 1-OF-16 Decoder – Encoders - Arithmetic building blocks: Half Adder, Full Adder – The Adder - Subtractor. TTL Circuits: Digital IC – Positive and negative logic – CMOS circuits: CMOS Characteristics.

UNIT IV: Flip Flops: RS Flip Flop, Clocked RS Flip Flop, D Flip Flop, - Edge triggered D Flip Flop, JK Flip Flop, JK Master/Slave Flip Flop- Shift Register: Serial In Serial Out - Counters – Asynchronous Counters – Synchronous Counters, MOD-3 Counter - MOD-5 Counter, Shift Counters.

UNIT V: D/A and A/D Conversion: Variable – Resistor Network - Binary Ladder – D/A Converter – A/D Converter: Simultaneous Conversion - Counter Method – A/D Techniques.

TEXT BOOK

1. "Digital Principles and Applications" – Albert Paul Malvino, Donald, P. Leach, McGraw Hill,2002.

REFERENCES

1. Digital Computer Fundamentals – Bartee, Tata McGraw Hill, 1996.
2. Digital Logic & Computer Design, Morris Mano, PHI, 2001.

FURTHER READING:

https://www.tutorialspoint.com/computer_fundamentals/index.htm

Mapping								
ProgrammeLevelou tcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge		✓		✓		✓	✓	
Communication Skills	✓							✓
Critical Thinking	✓		✓	✓	✓		✓	✓
Problem Solving	✓	✓	✓	✓	✓	✓	✓	✓
Analytical Reasoning	✓	✓	✓		✓		✓	
Research Related Skills			✓	✓		✓		✓
Scientific Reasoning	✓	✓		✓	✓	✓	✓	
Life-Long Learning	✓		✓		✓		✓	

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	Practical 2: C++ PROGRAMMING LAB	II	23BIT26P

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Infer the basic concepts of C++ programming

CLO2   Design programs with classes and objects

CLO3   Distinguish the concepts of constructors and destructors

CLO4   Apply the concepts of friend functions and overloading

CLO5   Analyze the concept reusability through inheritance

CLO6   Demonstrate the concept of pointers

CLO7   Explore the ease of C++ programming

CLO8   Develop programs using I/O streams

List of Programs:

1. Program using looping and branching statements.
2. Program based on Classes and objects.
3. Program based on Class and Array of objects.
4. Program based on Objects as function arguments and function that return objects.
5. Programs based on inline functions.
6. Program based on friend function.
7. Program on based on function overloading.
8. Program based on constructors and destructors.
9. Program using binary operator overloading.
10. Program based on inheritance
11. Program using pointers.
12. Program using the concept of Files.

FURTHER READING

www.researchgate.com

www.tutorialspoint.com

www.programiz.com

Mapping								
ProgrammeLevelou tcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓	✓	✓
Communication Skills								
Critical Thinking	✓	✓	✓	✓	✓	✓	✓	✓
Problem Solving	✓	✓	✓	✓	✓	✓	✓	✓
Analytical Reasoning	✓	✓	✓	✓	✓	✓	✓	✓
Research Related Skills	✓	✓	✓	✓	✓	✓	✓	✓
Scientific Reasoning	✓	✓	✓	✓	✓	✓	✓	✓
Life-Long Learning	✓	✓	✓	✓	✓	✓	✓	✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Core: OPERATING SYSTEMS**	**III**	**23BIT33C**

COURSE LEARNING OUTCOMES
On Successful Completion of the Course, the students will be able to :

CLO1   Summarize the basic knowledge about the functionalities of operating system

CLO2   Paraphrase the concepts of process

CLO3   Discuss the concepts of deadlock

CLO4   Summarize about storage management, auxiliary storage management

CLO5   Impart the knowledge of disk performance optimization techniques

CLO6   Analyze the need for scheduling algorithms

CLO7   Discussthe concept of distributed Computing

CLO8   Associate the concepts of Scheduling

Unit I: INTRODUCTION AND PROCESS CONCEPTS: what is an Operating System? Definition of process – process states – process state transition – interrupt processing – mutual exclusion – semaphores – deadlock and indefinite postponement.

Unit II: STORAGE MANAGEMENT: REAL STORAGE – storage organization, management and hierarchy - storage management strategies – contiguous Vs non-contiguous storage allocation – single user contiguous storage allocation – fixed partition multiprogramming – variable partition multiprogramming – multiprogramming with storages wrapping.

Unit III: VIRTUAL STORAGE MANAGEMENT: Introduction - Virtual storage management strategies – page replacement strategies –working sets – demand paging – page size. PROCESSOR MANAGEMENT: JOB AND PROCESSOR SCHEDULING: Scheduling Objectives-Preemptive vs non-preemptive scheduling – priorities – deadline scheduling – FIFO – RR – SJF – SRT – HRN.

Unit IV: DISTRIBUTED COMPUTING: Classification of sequential and parallel processing - pipelining –vector processing - array processors – dataflow computers – multiprocessors – fault tolerance. AUXILIARY STORAGE MANAGEMENT: DISK PERFORMANCE OPTIMIZATION: Operation of moving head disk storage – need for disk scheduling – seek optimization – FCFS – SSTF – SCAN – RAM disks – optical disks.

Unit V: FILE AND DATABASE SYSTEMS: File system – functions – organization – allocating and freeing space – file descriptor – access control matrix – backup and recovery – file servers – distributed file system.

TEXT BOOK

1. H.M Deitel., "Operating Systems", 2nd Edition, Pearson Education Publ., 2004.

REFERENCES

1.Achyut S Godbole, "Operating Systems", TMH Publ., 2002.

2.Andrew S. Tanenbaum, (2014), Modern Operating Systems, Pearson Prentice Hall of India, Fourth Edition.

3.Abraham Silberschatz, Peter B. Galvin and Greg Gagne, (2012), Operating System Concepts, John Wiley and Sons Inc., Ninth Edition.

FURTHER READING

www.udacity.com

www.sites.google.com

Mapping								
ProgrammeLeveloutcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓	✓	✓
Communication Skills	✓	✓	✓	✓	✓	✓	✓	✓
Critical Thinking		✓	✓	✓	✓	✓	✓	✓
Problem Solving			✓	✓	✓	✓	✓	✓
Analytical Reasoning	✓	✓	✓	✓	✓	✓	✓	✓
Research Related Skills			✓	✓	✓	✓	✓	✓
Scientific Reasoning		✓	✓	✓	✓	✓	✓	✓
Life-Long Learning	✓	✓	✓	✓	✓	✓	✓	✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	Core: DATA STRUCTURES	III	23BIT34C

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Write and analyze efficient algorithm for a problem

CLO2   Apply the suitable data structure to a given problem

CLO3   Utilize data structure sorting and searching techniques in problem solving

CLO4   Gain knowledge on memory management, trees and its implementation

CLO5   Distinguish the concepts of linear and non-linear data structures and its application

CLO6   Able to use the algorithms in real time applications

CLO7   Analyze the efficiency of different algorithms

CLO8   Explain the technologies to be used in programming languages

UNIT I: Introduction and overview: Preliminaries: Mathematical Notations and Functions- Algorithmic Notations- Complexity of Algorithms- Other Asymptotic Notations for complexity of algorithms. Arrays, Records and pointers: Introduction- Linear arrays- Arrays as ADT- representation of Linear arrays in memory- Traversing Linear arrays- Inserting and deleting- Multidimensional arrays- Representation of Polynomials using arrays- pointers- dynamic memory management- records- representation of records- matrices- sparse matrices.

UNIT II: Stacks, queues, Recursion: Introduction- stacks- array representation of stacks- linked representation of stacks- application of stacks- recursion- towers of Hanoi- queues- linked representation of queues- circular queues- deques - application of queues.

UNIT III: Searching and Sorting: Linear Search- Binary Search-Bubble sort-Insertion sort- Selection sort- merge sort- shell sort- radix sort- heap sort. Searching and data modification - hashing.

UNIT IV: Linked List: Representation of linked list in memory- traversing a linked list- searching a linked list- insertion into a linked list- deletion from a linked list- circular linked list- doubly linked list.

UNIT V: Trees: Introduction- binary trees- representing binary trees in memory- traversing a binary tree- binary search trees. Graphs: introduction- graph theory terminology- Linked representation of a graph - traversing a graph.

TEXT BOOK

1. "Data structures with C", Seymour Lipschutz – Schaum's outlines 2012.

REFERENCES

1. Ellis Horowitz &SartajSahani "Fundamentals of data Structure", Galgotia Books source,1999.
2. Ashok N Kamthane, "Programming and Data Structures", Pearson Education, 2004.
3. Algorithms + Data Structures= Programs by Niklaus Wirth, Prentice Hall of India Pvt Ltd**.**

FURTHER READING

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

Mapping								
ProgrammeLevelou tcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓		✓	✓			✓
Communication Skills		✓					✓	
Critical Thinking		✓			✓			✓
Problem Solving	✓		✓		✓	✓	✓	
Analytical Reasoning	✓		✓					
Research Related Skills			✓	✓	✓	✓		
Scientific Reasoning		✓		✓	✓	✓		
Life-Long Learning		✓				✓		✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Core: JAVA PROGRAMMING**	**III**	**23BIT35C**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Explain basic concepts of object Oriented program design

CLO2   Discuss the program structure in Java

CLO3   Apply the various building blocks of a Java program

CLO4   Differentiate between interfaces and multiple inheritance

CLO5   Identify the characteristics and uses of packages

CLO6   Describe the advantages of using Java for Applets and Graphics programming

CLO7   Explain the usage of I/O streams and file handling in Java.

CLO8   Develop Java programs to solve simple problems

UNIT I: JAVA Evolution History – Features – How Java Differs from C and C++ – Java and Internet – Java and WWW – Web Browsers. Overview of Java Language: Introduction –Simple Java Program – Structure – Java Tokens – Statements – Java Virtual Machine.

UNIT II: Constants – variables – Data types – Type Casting - Operators and Expressions. Decision Making and Branching: If, If...else, else...If Ladder, switch, ? : operator - Decision making and looping: while, do, for – jumps in loops – labelled loops. Classes, Objects and Methods

UNIT III: Arrays, Strings and Vectors – Interfaces: Multiple Inheritance – Defining, Extending and Implementing Interfaces - Packages: Putting classes together – Multi Threaded Programming.

UNIT IV: Managing Errors and Exceptions: Types of errors and exceptions - Syntax of exception handling code - Multiple catch statements - Using finally statement - Throwing our own exceptions – Applet Programming: Applets and Applications - Applet code - Applet life cycle - Applet Tag - Adding applet to HTML file - Passing parameters to applets - Event Handling - Graphics programming: The Graphics class - Lines, rectangles, circles, ellipses, arcs, polygons - Line graphs, Bar charts - Introduction to AWT package and Swings.

UNIT V: Files: Introduction – Concepts of Streams – Stream classes – Using Streams – I/O classes – File class – I/O Exceptions – creation of files – Reading / Writing characters / Bytes –Handling primitive data types – Random access Files.

TEXT BOOK

1. E. Balagurusamy "Programming with Java - A Primer", TMH Publ., 4th Edition, 2010.

REFERENCES

1. Patric Naughton*,* and Herbert Scheldt "The Complete Reference Java 2" Tata McGraw Hill

Publishers, 2000.

2. C. Xavier "Programming with Java 2", SciTech Publ., 2000.

FURTHER READING

1.   https://www.edx.org>course>java

Mapping								
ProgrammeLevelou tcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓	✓	✓
Communication Skills	✓			✓				✓
Critical Thinking			✓		✓		✓	
Problem Solving				✓	✓	✓	✓	✓
Analytical Reasoning	✓		✓		✓		✓	✓
Research Related Skills						✓	✓	✓
Scientific Reasoning	✓	✓					✓	
Life-Long Learning	✓			✓		✓		

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Allied 3 : WEB TECHNOLOGY**	**III**	**23BIT36A**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Restate and apply to create web application

CLO2   Solve real time problems using HTML,XML and CSS

CLO3   Apply controls and menus

CLO4   Examine the complexity of problems, analyze and design style sheets

CLO5   Explain basic concepts of VBscript and java script

CLO6   Discuss the concepts of objects

CLO7   Analyze java script programs

CLO8   Create HTML forms and simple web application projects

UNIT I: HTML- Outline of an HTML document- Head Section- Body Section- Headers- Paragraphs-Text formatting- Linking-Internal linking- Embedding images- Lists- Tables- Frames- Other Special tags and characters- HTML Forms - Examples.

UNIT II: Cascading Style Sheet- Coding CSS- Properties of tags- properties of values- other style properties- In-line style sheet- embedded style sheets- External Style sheets- Grouping- positioning-background- element dimensions.

UNIT III: XML- Introduction- HTML Vs XML- Syntax- XML attributes- XML validation- XML DTD-Building blocks of XML- DTD element- DTD Attributes- DTD entities- DTD Validation.

UNIT IV: Javascript- Introduction- Language elements- identifiers- expressions- keywords- operators-statements- Functions- Object of Javascript- Window object- Document object- forms object- Text boxes, Text areas- Buttons, Radio buttons and Checkboxes- Select Object-Date Object- Math Object- String Object- Arrays.

UNIT V: VB Script- Introduction- Embedding VB Script code in an HTML document- Comments-Variables- Operators- Procedures- Conditional Statements- Looping Constructs.

TEXT BOOK:

1. N.P. Gopalan, J.Akilandeswari, "Web Technology, A developers Perspective"- Prentice

   Hall of India PVT Limited, New Delhi.

REFERENCES

1. Tomas A.Powell, "The complete Reference Web design", Tata McGraw Hill Pub.

2. C.Xavieer, "World Wide Web Design with HTML", TML Publications, 2001.

3. Joel Sklar, "Principles of Web Design", Vikas Pub, 2001.

ProgrammeLevelou tcomes	Mapping COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Displinary Knowledge	✓	✓	✓	✓	✓	✓	✓	✓
Communication Skills	✓	✓	✓	✓	✓	✓	✓	✓
Critical Thinking		✓	✓	✓	✓	✓	✓	✓
Problem Solving			✓	✓	✓	✓		✓
Analytical Reasoning	✓	✓	✓	✓	✓	✓	✓	✓
Research Related Skills			✓	✓	✓	✓	✓	✓
Self-directed Learning		✓	✓	✓	✓	✓	✓	✓
Life-Long Learning	✓	✓	✓	✓	✓	✓	✓	✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	Practical 3: JAVA Programming and Web Technology LAB	III	23BIT37P

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Apply the various building blocks of a Java program

CLO2   Differentiate between interfaces and multiple inheritance

CLO3   Identify the characteristics and uses of packages

CLO4   Describe the advantages of using Java for Applets and Graphics programming

CLO5   Develop Java programs to solve simple problems

CLO6   Solve real time problems using HTML,XML and CSS

CLO7   Explain basic concepts of VB script and Java script

CLO8   Create HTML forms and simple web application projects

LIST OF PROGRAMS

JAVA Programs

1. Write a Java program to define a class, describe its constructors and instantiate its object.

2. Write a Java program to implement Inheritance and demonstrate method overriding.

3. Write a Java program to demonstrate use of implementing interfaces.

4. Write a Java program to implement the concept of importing classes from user defined package and creating packages.

5. Write a Java program to implement the concept of multithreading by extending thread class.

6. Write a Java program to implement the concept of Exception Handling by creating user defined exceptions.

7. Write a Java Applet program to display basic shapes and fill them.

Web Technology

1. Create your class time table in a web page.

2. Create a HTML page, which has properly aligned paragraphs with image along with it.

3. Demonstrate the usage of internal and external style sheet using CSS.

4. Write a JavaScript program to input your name and age using form and know whether he/she is eligible to vote or not.

5. Write a VBScript to add two integers.

FURTHER READING

1. https://www.edx.org>course>java
2. https://www.geeksforgeeks.org/web-technology/

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disiplinary Knowledge	✓	✓	✓	✓	✓	✓	✓	
Communication Skills								
Critical Thinking	✓				✓			
Problem Solving	✓	✓	✓	✓	✓	✓	✓	✓
Analytical Reasoning	✓	✓	✓	✓	✓			
Research Related Skills	✓				✓		✓	
Scientific Reasoning		✓		✓		✓		
Life-Long Learning	✓		✓			✓		✓

Year	Subject Title	Sem	Sub Code
2023 - 24 Onwards	**Core: PYTHON PROGRAMMING**	**IV**	**23BIT43C**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Demonstrate the working environment of python

CLO2   Develop programs using conditional statements, looping constructs and functions

CLO3   Devise lists, tuples and dictionaries

CLO4   Identify and debug errors in the program

CLO5   Discuss the basic concepts of python

CLO6   Illustrate the concepts of files

CLO7   Build efficient programs using python

CLO8   Explain the concepts of directories

UNIT-I: Introduction to Python: Python Overview-Getting Started with Python-Python Identifiers-Reserved Keywords-Variables-Standard Data Types-Operators- Statement and Expression-String Operations-Boolean Expressions-Control Statements-Iteration-while Statement-Input.

UNIT-II: Functions: Introduction-Built-in Functions-Composition of Functions-User Defined Functions-Parameters and Arguments-Function Calls- The Return Statement-Python Recursive Function-The Anonymous Functions-Writing Python Scripts.

UNIT-III:Strings: Strings-Compound data types- len function- String Slices-Strings are Immutable- String Traversal-Escape Characters-String formatting operators and functions. Lists: Values and accessing elements-lists are mutable-Traversing and deleting elements – Built-in operators and methods.

UNIT-IV: Tuples: Creating tuples-accessing values-tuple assignment-tuples as return values-variable length argument tuples-basic tuple operations-built-in tuple functions. Dictionaries: Creating and accessing values in a dictionary - updating and deleting elements -operations and built-in dictionary methods.

UNIT-V: Files: Text files-Opening and Closing a file-Reading and Writing from a file-File object attributes-Renaming the file-Deleting a file- Files related methods- Directories.

TEXT BOOK

1. E.Balagurusamy, "Introduction to Computing and Problem Solving Using Python", McGraw Hill Education Private Limited, 1st Edition, New Delhi.

REFERENCES

1. Martin C. Brown, "PYTHON: The Complete Reference", McGraw-Hill, 2001.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/).
3. Mark Summerfield. "Programming in Python 3: A Complete introduction to the Python Language", Addison-Wesley Professional, 2009.

FURTHER READING

https://www.w3schools.com/python/

https://www.tutorialspoint.com/python/index.htm

https://www.programiz.com/python-programming

Mapping								
Programme Level outcomes	COURSE LEVEL OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓	✓	✓			✓
Communication Skills			✓		✓		✓	
Critical Thinking		✓		✓		✓	✓	
Problem Solving	✓	✓	✓			✓	✓	
Analytical Reasoning		✓	✓	✓		✓	✓	
Research Related Skills				✓				✓
Scientific Reasoning								
Life-Long Learning	✓			✓	✓		✓	✓

Year	Subject Title	Sem	Sub Code
2023 - 2024 Onwards	**Core: COMPUTER NETWORKS**	**IV**	**23BIT44C**

COURSE LEARNING OUTCOMES
On Successful Completion of the Course, the students will be able to :

CLO1   Know the basics of computer networks and network reference models

CLO2   Discuss transmission spectrum and transmission of data

CLO3   Discuss how data can be transmitted without errors

CLO4   Have an insight into the technologies like bluetooth

CLO5   Outline how data can be routed from source to destination

CLO6   Know about the different internet protocols

CLO7   Discuss about domain name system

CLO8   Know about Electronic Mail

UNIT I: Introduction- The Uses of Computer Networks – Types of Computer Networks – Network Technology, from Local to Global - Examples of Networks : The Internet - Reference models: The OSI Reference Model – The TCP/IP Reference Model .

UNIT II: The Physical Layer - Guided Transmission Media – Wireless transmission –Using the Spectrum for Transmission – Cellular Networks - Communication satellites.

UNIT III: The Data Link layer - Data link layer Design Issues – Error Detection and Correction-Medium Access Control Sub Layer : The channel allocation problem – Multiple access protocols : Aloha - Carrier sense multiple access protocols, Collision-free Protocols. Bluetooth : Bluetooth Architecture , bluetooth applications.

UNIT IV: The Network Layer – Network Layer Design Issues – Routing Algorithms –The Optimality Principle, shortest path routing, flooding, distance vector routing. The network layer in the internet : The IP Version 4 Protocol, IP Addresses, IP Version 6.

UNIT V: Application Layer – The Domain Name System, Electronic Mail, Streaming Audio and Video : Digital Audio – Digital Video. Case Study : Compare IPV4 and IPV6

TEXT BOOKS
1. Andrew S. Tanenbaum, NickFeamster, David J. Wetherall, "Computer Networks", 6th Edition, Pearson Education Publ..

REFERENCES

1. Miller, "Data and Network Communications", Vikas Publ., 2001.

2. William A Shay, "Understanding data communications and Networks", 2nd Edition, Vikas Publ., 2001.

FURTHER READING

1. **James F. Kurose, "Computer Networking", 8th Edition.**, University of Massachusetts, Amherst. Keith Ross., Pearson
2. https://www.cse.iitk.ac.in/users/dheeraj/cs425/
3. https://w3.cs.jmu.edu/bernstdh/web/common/help/topics_computer-networks.php

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓	✓	✓			✓
Communication Skills	✓	✓	✓	✓	✓			✓
Critical Thinking			✓	✓				✓
Problem Solving			✓	✓	✓			✓
Analytical Reasoning			✓	✓	✓			
Research Related Skills		✓	✓	✓	✓	✓	✓	✓
Scientific Reasoning		✓	✓					✓
Life-Long Learning		✓	✓	✓	✓	✓		✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Core: VB.NET PROGRAMMING**	**IV**	**23BIT45C**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Acquire knowledge in branching and looping in VB.NET

CLO2   Solve real world problems

CLO3   Apply controls and menus

CLO4   Examine the complexity of problems, modularize the problems into small modules

CLO5   Generalize the working nature of files

CLO6   Compare the concepts of front end and back end

CLO7   Evaluate menus and dialog boxes in VB.NET

UNIT I: Understanding Visual Basic .NET: What Is .NET? - .NET Framework - Common Language Runtime (CLR) - Programming in the .NET Framework - .NET Languages - Create and execute VB .NET Programs - Visual Studio .NET Requirements .

UNIT II: Variables, Constants and Operators-controlling program flows- MsgBox()- InputBox()-Projects, Forms, and Buttons: Types of Projects - Configuring Your Project and Environment- Adding a Windows Form - Adding Controls - Event Handlers

UNIT III: Working with Windows Forms and Controls: TextBox – Richtextbox - Label-Button-CheckBox - RadioButton- ComboBoxes- ListBoxes - CheckedListBox – PictureBox- StatusBars-ToolBars –ToolTips- Dialogue boxes- Common Dialog Controls.

UNIT IV: Timer Component- Testing and Debugging: Stepping through a Program- Setting Breakpoints- Viewing Variables in the Watch Window- Executing Statements Using the Command Window- Using Other Debugging Tools-working with files

UNIT V: Working with Data and ADO.NET: Database Basics - Data Components - Working with Managed Providers - Displaying Data with a DataReader - Adding Data Components - Creating a Dataset with Data Components: Adding a DataAdapter Component - Creating a New Data Connection- Building a Query- Working with the Data Adapter- Previewing the Dataset- Generating the Dataset.

Binding Controls to Data: Creating a Dataset in Code- Binding to a DataGrid and Updating a Database-Using the Data Form Wizard.

TEXT BOOK

   1. Visual Basic .NET Programming -Harold Davis, BPB Publication, 2006 Edition-Ebook

   2.ASP.NET and VB.NET Web Programming – Matt J.Crouch(UNIT II- Variables, Constants and Operators, Controlling Programming Flow)

REFERENCES

   1.Dave Grundgeiger,"Programming Visual Basic .NET ",First Edition January 2002,O'Reilly Publications.

   2.The Complete Reference Visual Basic .Net- Jeffery R. Shapiro- Ebook

Mapping								
Programme Level outcomes	Course Level Outcomes(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓		✓	✓	✓		✓	✓
Communication Skills	✓	✓		✓	✓			
Critical Thinking						✓	✓	
Problem Solving	✓	✓	✓	✓	✓	✓	✓	✓
Analytical Reasoning			✓	✓	✓			✓
Research Related Skills		✓				✓		
Scientific Reasoning		✓					✓	
Life-Long Learning		✓		✓		✓		

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Allied – 4: COMPUTER SYSTEM ARCHITECTURE**	**IV**	**23BIT46A**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Summarize arithmetic, logic and shift micro operations and draw the circuit diagram of ALS unit

CLO2   Discuss about various instruction codes and registers

CLO3   Implement Stack operations (push and pop)

CLO4   Analyse RTL using various instruction formats

CLO5   Explain about different addressing modes

CLO6   Differentiate RISC from CISC

CLO7   Apply addition, subtraction, multiplication and division algorithm

CLO8   Impart knowledge of various memories

UNIT I: Data Representation: Fixed point representation – Floating point representation – Alphanumeric code - Register Transfer and Micro operation: Register Transfer Language – Register Transfer – Arithmetic Micro operation – Logic Micro operation – Shift Micro operation – Arithmetic Logic Shift Unit.

UNIT II: Basic Computer Organization and Design: Instruction Codes – Computer Registers – Computer Instructions - Instruction Cycle – Input-Output and Interrupt - Micro-Programmed Control: Control Memory – Address Sequencing – Design of Control Unit.

UNIT III: Central Processing Unit: General Register Organization – Stack Organization – Instruction Formats – Addressing Modes – Data Transfer and Manipulation – Program Control – Reduced Instruction Set Computer – CISC.

UNIT IV: Computer Arithmetic: Addition and Subtraction – Multiplication Algorithm – Division Algorithm - Input Output Organization: Peripheral Devices – Input Output Interface – Asynchronous Data Transfer – Modes of Transfer – Direct Memory Access – Input Output Processor (IOP).

UNIT V: Memory Organization: Memory Hierarchy – Main memory – Auxiliary memory – Associative memory – Cache memory – Virtual memory.

TEXT BOOKS

1. M. Morris Mano, "Computer System Architecture", Third Edition, PHI, 2001.

REFERENCES

1. Hayes. J. P, "Computer Architecture and Organization", McGraw Hill, 1998.

Further Reading:

https://www.tutorialspoint.com/Computer-System-Architecture

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓		✓		✓		
Communication Skills			✓		✓			
Critical Thinking		✓	✓		✓		✓	✓
Problem Solving		✓		✓				✓
Analytical Reasoning	✓		✓		✓	✓	✓	
Research Related Skills	✓	✓		✓			✓	✓
Scientific Reasoning	✓		✓	✓	✓		✓	
Life-Long Learning		✓		✓				✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	Practical 4: VB.NET AND PYTHON PROGRAMMING LAB	IV	23BIT47P

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Identify the basic programming knowledge

CLO2   working decision structures, loops and functions

CLO3   Illustrate programs with MDI forms

CLO4   Apply, compile and debug programs

CLO5   Analyze and solve simple VB projects

CLO6   Familiarize with connecting front end and back end

CLO7   Working and applying advanced controls

CLO8   Summarize to program with mathematical concepts

LIST OF PROGRAMS

VB.NET PROGRAMMING

1. Write a VB.NET program to find out area and circumference of a rectangle and circle.
2. Write a VB.NET program to add the items to list box with user input and move the selected Item to combo box one by one.
3. Write a VB.NET program to develop a calculator with basic operation.
4. Write a VB.NET program to prepare a Questionnaire.
5. Write a VB.NET application for Student Mark List Processing System.
6. Write a VB.NET application for UG admission.

PYTHON PROGRAMMING

1. Write a Python Program using Operators and Expressions.

2. Write a Python Program using conditional control structures and string functions.

3. Write a Python Program using Arrays.

4. Write a Python Program to demonstrate the use of lists and tuple.

5. Write a Python Program to implement a dictionary.

6. Write a Python Program to demonstrate a file.

FURTHER READING

https://www.computer-pdf.com/tutorials-visual-basic-6

https://ceng.eskisehir.edu.tr/emrekacmaz/bil158/VBTutorial.pdf

https://www.w3schools.com/python/

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓		
Communication Skills	✓	✓		✓		✓	✓	✓
Critical Thinking				✓		✓	✓	
Problem Solving	✓	✓	✓	✓	✓	✓	✓	✓
Analytical Reasoning		✓		✓		✓		
Research Related Skills			✓	✓				
Scientific Reasoning			✓		✓	✓	✓	
Life-Long Learning		✓		✓			✓	✓

Year	Subject Title	Sem	Sub Code
2023-24 Onwards	**CORE: SOFTWARE ENGINEERING**	V	23BIT51C

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Get insight of Software development model

CLO2   Gain knowledge on Software requirement specification and Scenario based modelling

CLO3   Testing conventional applications

CLO4   Understand and design the architecture for a software

CLO5   Improve knowledge on software quality metrics and testing strategies

CLO6   Acquire knowledge on software configuration management and software maintenance

CLO7   Design component level methodology

CLO8   Create different diagrams and models

UNIT I: Introduction to Software Engineering: Software Process- Software Engineering practice- Process Model: A generic model- Waterfall Model- Incremental Process model- RAD model- Evolutionary process model- Spiral Model- Concurrent process model.

UNIT II: Understanding requirements – Establishing the groundwork – Eliciting requirements – Developing use cases – Building requirements model- Negotiating requirements – Validating requirements – Requirements analysis.

UNIT III: Requirements Modeling – Scenario based Modeling – UML Models – Data Modeling Concepts – Class-based Modeling – Flow-Oriented Modeling – Creating a data flow Model – Control flow Model – Modeling for Web apps.

UNIT IV: Software Design: Design Concepts – Design Process – Design Model – Component level Design: What is a Component – Designing Class-based Components – Conducting component level design.

UNIT V: Testing conventional Applications: White box testing – Basis Path testing – Control Structure Testing – Black-box Testing. Maintenance and Reengineering: Software Maintenance – Software Reengineering – Reverse Engineering – Restructuring.

TEXT BOOK
1. "Software Engineering – A Practitioner's Approach" – Seventh Edition – Roger S. Pressman –McGraw - Hill Publishing Company Limited.

REFERENCES

1.Software Engineering – K. L. James, Prentice Hall of India Pvt.Ltd, New Delhi – 2009

2.Fundamentals of Software Engineering – Rajib Mall, Prentice Hall of India Pvt.Ltd., New Delhi – 2003.

FURTHER READING

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

3. Richard Farley(2004). Software Engineering Concepts. TMH.

4. Jeff Tian(2006). Software Quality Engineering. Student Edition. Wiley India.

Mapping								
Programme Level outcomes	**COURSE LEARNING OUTCOMES(CLOs)**							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓		✓
Communication Skills	✓	✓		✓		✓	✓	
Critical Thinking				✓	✓			✓
Problem Solving	✓		✓			✓	✓	✓
Analytical Reasoning				✓	✓			
Research Related Skills				✓		✓		✓
Scientific Reasoning	✓		✓				✓	✓
Life-Long Learning		✓		✓		✓		✓

Year	Subject Title	Sem	Sub Code
2023-24 Onwards	Core : Relational Database Management System	V	23BIT52C

COURSE LEARNING OUTCOMES
On Successful Completion of the Course, the students will be able to :

CLO1   Study the basic concepts of Relational Data Model, Entity- Relationship Model and process of Normalization

CLO2   Study the basic concepts of Relational Data Model, Entity- Relationship Model and process of Normalization

CLO3   Understand the database using Structured Query Language (SQL) in Oracle9i environment.

CLO4   Construct the database using Structured Query Language (SQL) in Oracle9i environment.

CLO5   Explain basics of PL/SQL. Understand and use built-in functions and enhance the knowledge of handling multiple tables

CLO6   Develop programs using Cursors, Exceptions, Procedures and Functions.

CLO7   Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)

UNIT I: Database Concepts: A Relational approach: Database–Relationships–DBMS–Relational Database Model–Integrity Rules–Theoretical Relational Languages. Database Design: Data Modeling and Normalization: Data Modeling–Dependency–Database Design – Normal Forms– Dependency Diagrams- Denormalization – Another Example of Normalization.

UNIT II: Oracle9i: Overview: Personal Databases–Client/ServerDatabases–Oracle 9i: An Introduction–SQL*Plus Environment–SQL–Logging into SQL*Plus–SQL*Plus Commands–Oracle Errors and Online Help–Alternate Text Editors-SQL*PlusWorksheet – iSQL*Plus .Oracle Tables: DDL: Naming Rules and Conventions– Data Types–Constraints–Creating an Oracle Table–Displaying Table Information–Altering an Existing Table–Dropping, Renaming, Truncating Tables –Oracle various Table Types–Spooling–Error codes.

UNIT III: Working With Tables: Data Management and Retrieval: DML – Adding a new Row/Record – Customized Prompts – Updating and Deleting Existing Rows/Records–Retrieving Data from A Table–Arithmetic Operations– Restricting Data with a WHERE Clause– Sorting– Revisiting Substitution Variables–DEFINE Command–CASE Structure. Functions and Grouping: Built-in Functions – Grouping Data .Multiple Tables: Joins and Set operations: Join–Set Operators.

UNIT IV: PL/SQL: A Programming Language: History–Fundamentals–Block Structure–Comments – Data Types–Other Data Types–Variable Declaration–Anchored Declaration-Assignment Operation – Bind Variables–Substitution Variables–Printing–Arithmetic Operators. Control Structures and Embedded SQL: Control Structures–Nested Blocks–SQL in PL/SQL–Data Manipulation in PL/SQL– Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit cursors – Explicit cursors – Implicit cursor attributes – Explicit cursor attributes–Cursor FOR loops–SELECT…FOR UPDATE – WHERE CURRENT OF clause– Cursor with Parameters– Cursor Variables– Exceptions– Types of Exceptions.

UNIT V: PL/SQL:PL/SQL Composite Data Types: Records–Tables– Varrays. PL/SQL Named Blocks: Procedures–Functions–Packages–Triggers – Data Dictionary Views. **Case Study: Banking System**

TEXT BOOK
1. "Database Systems Using Oracle"–NileshShah,2ndEdition, PHI.

REFERENCES
1."Database Management Systems" Arun Majumdar & Pritimoy Bhattacharya, 2007, TMH.
 2."Database Management Systems",GeraldV.Post,3rdedition,TMH.

FURTHER READING:
www.tutorial points.com
www.guru99.com

Mapping							
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)						
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓	✓
Communication Skills	✓	✓	✓				
Critical Thinking				✓	✓	✓	✓
Problem Solving					✓	✓	✓
Analytical Reasoning						✓	✓
Research Related Skills			✓	✓	✓	✓	✓
Scientific Reasoning						✓	✓
Life-Long Learning	✓	✓	✓	✓	✓	✓	✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Core: COMPUTER GRAPHICS**	V	23BIT53C

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Discuss input devices and input techniques available to work with graphics

CLO2   Demonstrate their ability to use computer graphics techniques

CLO3   Apply different algorithms to solve graphics problems

CLO4   Discuss the 2D and 3D Graphics and their transformations

CLO5   Apply clipping techniques to graphics

CLO6   Apply Display Techniques

CLO7   Explain Three-Dimensional viewing and Hidden-Surface and Hidden-Line removal

CLO8   Discusscolour models and colour applications

UNIT-I: Overview of Graphics System – Display Devices – CRT – Random Scan and Raster Scan Monitors – Techniques for Producing Colour Display – Beam – Penetration and Shadow – Mask Methods – DVST – Plasma – Panel Displays – Hardcopy Devices – Printers and Plotters – Display Processors – Output Primitives – DDA and Bresenham's line drawing algorithms – Bresenham's Circle Algorithm.

UNIT-II: Two-dimensional Transformations – Scaling, Translation and Rotation – Matrix Representations – Composite Transformations – Reflection – Shearing – Other Transformations. Windowing and Clipping – Concepts – Cohen and Sutherland Line Clipping Algorithm – Midpoint Subdivision.

UNIT III: Three dimensional Concept- Three-Dimensional object representations – polygon surfaces – polygon tables- plane equations - Three-Dimensional geometric transformations – translation – rotation – scaling – other transformations.

UNIT IV: Three-Dimensional viewing – viewing pipeline - Parallel Projection – Perspective Projection – Hidden-Surface and Hidden-Line removal – Back face removal – Depth Buffer Method – Scan Line Method – BSP Tree Methods – Depth-Sorting Method – Area-subdivision Method – Octree Methods.

UNIT V: Colour models and colour applications – properties of light – standard primaries and the chromaticity diagram – XYZ colour model – CIE chromaticity diagram – RGB colour model – YIQ, CMY, HSV colour models, conversion between HSV and RGB models, HLS colour model.

TEXT BOOK

1. Donald Hearn and Pauline Baker, "Computer Graphics", Second Edition, PHI.

REFERENCES

1. "Computer Graphics" – Schaums outline series, Second Edition.

2. William M. Newman and Robert F.Sproull, "Principles of Interactive Computer Graphics",   Mc GrawHill 1978.

FURTHER READING

1. https://onlinecourses.nptel.ac.in/noc20_cs90/preview

2. https://nptel.ac.in/courses/106/106/106106090/

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓		✓					
Communication Skills					✓		✓	
Critical Thinking	✓	✓		✓	✓	✓	✓	✓
Problem Solving	✓	✓	✓	✓	✓		✓	✓
Analytical Reasoning	✓	✓	✓	✓	✓	✓	✓	✓
Research Related Skills						✓	✓	
Scientific Reasoning	✓	✓	✓	✓	✓	✓		
Life-Long Learning	✓	✓	✓	✓	✓		✓	

Year	Subject Title	Sem	Sub Code
2023-24 Onwards	PRACTICAL 5: Relational Database Management System and R Programming LAB	V	23BIT54P

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Apply the concepts of Structured Query Language (SQL)

CLO2   Apply PL/SQL to develop programs using cursor, procedures and functions

CLO3   Analyzing data structure of SQL operators

CLO4   Build efficient programs

CLO5   Identify, debug and correct errors

CLO6   Understand the basics of R, data types and variables.

CLO7   Understand Import and Export of Data in R

RDBMS Programs

1. (Exercise on retrieving records from the table)

EMPLOYEES (Employee_Id, First_Name, Last_Name, Email, Phone_Number, Hire_Date, Job_Id, Salary, Commission_Pct, Manager_Id, Department_Id)
(a) Find out the employee id, names, salaries of all the employees
(b) List out the employees who works under manager 100
(c) Find the names of the employees who have a salary greater than or equal to 4800
(d) List out the employees whose last name is 'AUSTIN'
(e) Find the names of the employees who works in departments 60,70 and 80
(f) Display the unique Manager_Id.

2. (Exercise on modifying and deleting the table, updating and deleting records in the table)

Create Client_master with the following fields(ClientNo, Name, Address, City, State, Bal_due)
Alter the table by adding MobileNumber
(a) Insert five records
(b) Find the names of clients whose bal_due> 5000 .
(c) Change the bal_due of ClientNo " C123" to Rs. 5100
(d) Change the name of Client_master to Client12 .
(e) Display the bal_due heading as "BALANCE"
(f) Delete the rows if   BALANCE is less than Rs.5000
(g) Remove the column MobileNumber from Client_master
(h) Delete the Table Client_master.

3. (Exercise on order by and group by clauses)

Create Sales table with the following fields(Sales No, Salesname, Branch, Salesamount, DOB)
(a) Insert five records
(b) Calculate total salesamount in each branch
(c) Calculate average salesamount in each branch .
(d) Display all the salesmen, DOB who are born in the month of December as day in character format i.e. 21-Dec-09
(e) Display the name and DOB of salesman in alphabetical order of the month.

4. Create an Emp table with the following fields:

(EmpNo, EmpName, Job,Basic, DA, HRA,PF, GrossPay, NetPay)
(Calculate DA as 30% of Basic and HRA as 40% of Basic)
(a) Insert Five Records and calculate GrossPay and NetPay.
(b) Display the employees whose Basic is lowest in each department .
(c) If NetPay is less than <Rs. 10,000 add Rs. 1200 as special allowances .
(d) Display the employees whose GrossPay lies between 10,000 & 20,000
(e) Display all the employees who earn maximum salary .

5. Create the tables "DEPARTMENT" and "EMPLOYEE" and perform the following queries

Department (dept _no , dept_ name , dept_location);
Employee (emp_id , emp_name , emp_salary,dept_no);
a) Display the employee details, departments that the departments are same in both the emp
   and dept.
b) Display the employee name and Department name by implementing a left outer join.
c) Display the employee name and Department name by implementing a right outer join.
d) Display the details of those who draw the salary greater than the average salary.

6. Write a PL/SQL program to demonstrate Exceptions and Cursors

7. Write a PL/SQL program to demonstrate Functions and Procedures.

R Programs

1. Write a R program using Flow of Control .
2. Manipulate Data Frame using R.
3. Write a R program using Plots.
4. Write a R program for Outlier Detection.
5. Implement a Cluster using R.

FURTHER READING:
swayam.gov.in
https://www.w3schools.com/

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓	✓	✓
Communication Skills	✓			✓		✓	✓	✓
Critical Thinking	✓	✓		✓		✓	✓	✓
Problem Solving	✓	✓	✓	✓	✓	✓	✓	✓
Analytical Reasoning				✓	✓	✓	✓	✓
Scientific Reasoning				✓	✓	✓	✓	✓
Research Related Skills	✓	✓	✓	✓	✓	✓	✓	✓
Life-Long Learning	✓	✓	✓	✓	✓	✓	✓	✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Skill Based Subject I –** **DATA MINING AND R PROGRAMMING**	V	**23BIT55S**

COURSE LEARNING OUTCOMES
On Successful Completion of the Course, the students will be able to :

CLO1   Explain the basics of Data Mining and Data Warehousing

CLO2   Identify the appropriate data mining technique for problem solving

CLO3   Demonstrate various data mining techniques and data warehousing tool

CLO4   Implement the methods and techniques with an example dataset

CLO5   Know how to identify associations between given dataset

CLO6   Know how to group data based on classification and clustering methods

CLO7   Give an introduction to R programming.

CLO8   Know about data frames and operations on datasets.

UNIT I: Introduction: Data Mining Applications – Data Mining Techniques – The Future of Data Mining - Data Mining Software. Data understanding and data preparation: introduction - data collection and preprocessing - Outliers - Mining Outliers - Missing data - Types of Data - Computing Distance - Data summarising using basic statistical measurements - Displaying data graphically - Multi dimensional Data Visualisation.

UNIT II: Association Rule Mining: Introduction – Basics – The Task and a Naïve Algorithm – The Apriori Algorithm – Improving the Efficiency of the Apriori Algorithm – Mining Frequent patterns without Candidate Generation (FP-Growth) – Performance Evaluation of Algorithms.
Classification: Introduction – Decision Tree – Over fitting and Pruning – Decision Tree Rules - Naïve Bayes Method – Estimating Predictive Accuracy of Classification Methods – Improving Accuracy of Classification Methods – Other Evaluation Criteria for Classification Methods –
– Classification Software.

UNIT III: Cluster Analysis: Introduction – features – Types of Data – Computing Distance - Types of cluster Analysis Methods – Partitioned Methods – Hierarchical Methods – Density Based Methods – Quality and validity of Cluster Analysis Methods – Cluster Analysis Software.

UNIT IV: Introduction R – Installing R – Initiating R: help – Assigning Variables – Basic Mathematical Operations – Packages in R – Environments and functions – Flow Control – Loops – Data types in R – Vectors – Matrices and Arrays – Lists.

UNIT V: Data Frames – Factors – Strings – Date and Times – Data Preparation: Datasets –Importing and Exporting Files : Text and CSV- Unstructured Files –HTML Files- Excel Files – Accessing Databases – Data Cleaning and Transforming : Manipulating Strings – Manipulating Data Frames – Data Reshaping – Grouping Functions.

TEXT BOOK

1.G.K Gupta, "Introduction to Data Mining with Case Studies", Prentice Hall of India(Pvt) Ltd, India, 2008.

2.R Programming – An Approach to Data Analytics by Dr.G.sudhamathy and Dr.C.Jothi Venkateswaran. MJP Publishers, 2020.

REFERENCES

1. Jinweihan, MichelineKambler, "Data Mining: Concepts and Techniques", Morgan Kaufman Publishers, New Delhi.
2. Margaret.H.Dunham, "Data Mining Introductory and advanced topics" , Prentice Hall of India(Pvt) Ltd, India,

FURTHER READING

1.Paul C Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, David Corrigan, James Giles, "Harness the Power of Big Data", The McGraw-Hill Publications,2013,1st Edition.

2.Arun.K.Pujari, "Data Mining Techniques", Universities Press, 2008

3.https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/

4.https://www.researchgate.net/publication/228571634_Mining_Students_Data_to_Analyze_Learning_Behavior_A_Case_Study

5.https://www.ripublication.com/ijcir17/ijcirv13n8_08.pdf

6. https://www.tutorialspoint.com/r/index.htm

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓	✓	✓
Communication Skills	✓	✓	✓	✓	✓	✓	✓	✓
Critical Thinking		✓	✓	✓	✓	✓	✓	✓
Problem Solving		✓		✓	✓	✓	✓	
Analytical Reasoning		✓	✓	✓	✓	✓		
Research Related Skills		✓	✓		✓	✓	✓	
Self-directed Learning		✓			✓	✓		✓
Life-Long Learning		✓	✓	✓	✓	✓		

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Non-Major Elective Paper – I** **INFORMATION TECHNOLOGY - 1** **(Basics of Computers and Office Automation)**	V	**23BIT5EL**

COURSE LEARNING OUTCOMES
On Successful Completion of the Course, the students will be able to :

CLO1   Summarize the types, characteristics and generations of Computers

CLO2   Discuss the Functions and Components of Computer

CLO3   Realize the basic concept of Computer software and Programming Languages

CLO4   Distinguish between input and output device

CLO5   Explain Text Manipulations   and text formatting using MS-office

CLO6   Outline Editing, Usage of Formulae, File Manipulations and Creating Graphs using MS-Excel

CLO7   Preparing and Presenting slide show using MS-Powerpoint

CLO8   Creating application using MS Office packages

UNIT-I: Introduction to Computer: Introduction - Types of computers - Characteristics of Computers. Generations of Computers: First Generation - Second Generation - Third Generation - Fourth Generation - Fifth Generation. Classification of Digital Computers: Anatomy of Digital Computer : Functions and Components of Computer - Central Processing Unit - Control Unit - Arithmetic - Logic Unit - Memory - Registers - Addresses. Memory Units: RAM, ROM,

UNIT – II: Computer Software: Introduction - Operating System - Utilities - Compiler and Interpreters – Programming Languages: High level language - Types of High Level Language.
Input Devices: Output Devices:

UNIT – III: MS-Office: Text Manipulations - Usage of Numbering, Bullets, Footer and Headers - Usage of Spell check, Find & Replace - Text Formatting - Picture insertion and alignment - Creation of documents, using templates - Formatting a Table - Mail Merge Concepts

UNIT – IV : MS-EXCEL : Cell Editing -   Usage of Formulae and Built-in Functions - File Manipulations - Data Sorting (both number and alphabets) - Creating Graphs

UNIT – V: MS-POWER POINT : Inserting Clip arts and Pictures - Frame movements of Clip arts and Pictures - Insertion of new slides - Preparation of Organization Charts - Presentation using Wizards - Usage of design templates**. Case Studies:** Designing Advertisement and Document creation with special features like header, footer, tables, etc -PowerPoint presentation on various concepts

TEXT BOOK:

1. Alexis Leon and Mathews Leon, "Fundamentals of Computer Science and Communication Engineering", Leon Techworld, 1998.
2. Joyce Cox and Team, "Step by Step 2007 Microsoft Office System", PHI Learning Private limited, New Delhi, 2009.

REFERENCES

1. B Ram and Sanjay Kumar, "Computer Fundamentals", 5th Edition, New Age International Publishers, 2014.
2. Anita Goel, "Computer Fundamentals", 1st Edition, Pearson Education India, 2010.
3. Peter Weverka, "MS Office 2013 All-in-One for Dummies", 1st Edition, Wiley Publications, 2013.

FURTHER READING

1. https://www.msuniv.ac.in/images/econtent/6.Computer%20%20Fundamentals%20 and%20Office%20Automation.pdf
2. https://www.wileyindia.com/computer-basics-with-office-automation.html
3.https://support.microsoft.com/en-us/office/create-a-cross-reference-300b208c-e45a-487a-880b-a02767d9774b
4. https://www.informit.com/articles/article.aspx?p=170392

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge			✓	✓	✓			
Communication Skills	✓	✓			✓		✓	
Critical Thinking			✓	✓		✓	✓	
Problem Solving			✓	✓	✓	✓	✓	
Analytical Reasoning					✓	✓	✓	✓
Research Related Skills			✓		✓			
Co-operation/Team work		✓		✓		✓	✓	✓
Life-Long Learning	✓			✓	✓	✓		

Year	Subject Title	Sem	Sub C
2023 -24 Onwards	**Core: PROGRAMMING IN PHP**	**VI**	**23BIT**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Develop programs using conditional statements, looping constructs

CLO2   Analyze array concepts, Create functions

CLO3   Analyse the concept of forms, files and dictionaries

CLO4   Create cookies and session related programs

CLO5   Discuss the concepts of Mysql, create connectivity, develop programs

CLO6   Illustrate the concepts string, numeric, date and time function

CLO7   Build efficient programs using PHP, with HTML

CLO8   Discuss the concepts of OOPs and apply in PHP

UNIT I: PHP Introduction: History-unique features-basic development concepts. Using variables and operators: storing data in variables-understanding. PHP's data types - using constants. Controlling program flow: if, if-else, if-else if-else, switch case, while, do while, for loop, Interrupting and Skipping Loops.

UNIT II: Working with string and numeric functions: using string functions, using numeric functions. Working with arrays: Storing Data in Array - Processing Arrays with Loops and Integrators - Using array with forms - Working with array functions - Working with Dates and Times - Creating user defined functions.

UNIT III: Creating Classes: Introducing classes and objects-defining and using classes-Using advanced OOPs concepts - using constructors and destructors - extending classes -adjusting visibility settings - Working with files and directories: reading local file-remote file-specific segments of a file - Writing files - Processing directories - Performing other file and directory operations.

UNIT IV: Working with forms: creating a simple Input form –Accessing form- combining HTML and PHP code on single page –using hidden fields to save state –redirecting the user –working with file uploads. Working with Cookies, Sessions and Headers : Working with cookies – Working with sessions - Working with Headers. Handling errors: Handling script errors – Using exceptions.

UNIT V: Database & MySQL – Installing MySQL – Integrating PHP & MySQL – Connecting to MySQL – MySQL Queries – Dataset – Multiple Connection – Error Checking – Creating MySQL Database with PHP – MySQL Data types – MySQL Functions.

TEXT BOOKS

1. Vikram Vaswani, "PHP: A beginners guide", TMH Hill, 1st edition, 2010.
2. Steve Suehring, Tim Converse, Joyce Park , "PHP 6 and MySQL 6 Bible", Wiley India PVT. Ltd., Edition, 2009

REFERENCES

1. Matt Doyle, " Beginning PHP 5.3", Wiley India pvt. Ltd, First edition, 2010.

2. Luke welling and Laura Thomson, "PHP and MySQL Web Development", 5th Edition,

   2016.

3. Julie C. Meloni , "PHP, MYSQL and Apache", Dorling Kindersley(India) Pvt Ltd, 2005.

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓		✓		✓	✓	✓
Communication Skills			✓		✓		✓	✓
Critical Thinking	✓		✓	✓		✓	✓	✓
Problem Solving			✓		✓	✓		✓
Analytical Reasoning		✓		✓		✓	✓	
Research Related Skills	✓			✓	✓	✓	✓	✓
Scientific Reasoning	✓		✓		✓		✓	
Life-Long Learning	✓		✓	✓		✓	✓	✓

Year	Subject Title	Sem	Sub Code
2023-2024 Onwards	**Core: MOBILE COMPUTING**	**VI**	**23BIT62C**

COURSE LEARNING OUTCOMES

On Successful Completion of the Course, the students will be able to :

CLO1   Outline the fundamentals of Mobile Computing

CLO2   Differentiate Mobile networks from other types of networks

CLO3   Analyse the Mobile Computing Architecture

CLO4   Evaluate emerging technologies that use mobile computing

CLO5   Describe the GSM standard for mobile computing

CLO6   Distinguish between GSM and GPRS

CLO7   Compare mobile computing over SMS

CLO8   Design simple mobile computing applications

UNIT I: Introduction: Mobility of Bits and Bytes –Wireless: The Beginning –Mobile Computing – Dialogue Control – Networks – Middleware and Gateways – Applications and services Developing Mobile computer Applications – Security in mobile computing – Standards - Why is it necessary – Standard bodies.

UNIT II: Mobile Computing Architecture: History of computers and Internet – Architecture for mobile computing – Three-tier architecture – Design considerations for mobile computing - Mobile computing through Internet – Making existing applications mobile enabled.

UNIT III: Mobile Computing Through Telephony: Evolution of telephony – Multiple access procedures –Satellite Communication Systems-Mobile computing through telephone – Developing an IVR Application – Voice XML – Telephony application Programming Interface

UNIT IV: Emerging Technologies: Introduction - Bluetooth – Radio Frequency Identification– Wireless Broadband– Mobile IP – Internet Protocol Version 6 – Java Card. GSM: Global System for mobile communications – GSM Architecture – GSM Entities – Call routing in GSM – GSM Addresses and Identifiers – Mobility Management - Authentications and Security.

UNIT V: GPRS – GPRS and packet data network – GPRS network architecture – Application for GPRS - SMS: Mobile Computing Over SMS - Short Message Service-Value Added Services through SMS. **Case Study:** How to analyse and design a mobile application?

TEXT BOOK

1.”Mobile Computing - Technology, Applications and Service Creation”, Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, Second Edition, 2010.

REFERENCES

1. Raj Kamal, "Mobile Computing", Second Edition, Pearson Education, New Delhi, 2007.

2. Ikvinderpalsingh, "Mobile Computing", First Edition, Khanna book publications,2017.

FURTHER READING

1. http://www.gsmworld.com

2. http://www.etsi.org

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓		✓		✓	✓	✓
Communication Skills			✓		✓			✓
Critical Thinking	✓		✓	✓			✓	✓
Problem Solving			✓		✓	✓		✓
Analytical Reasoning		✓		✓		✓	✓	
Research Related Skills	✓		✓		✓	✓	✓	✓
Scientific Reasoning	✓		✓		✓		✓	
Life-Long Learning	✓			✓		✓		✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Practical: PHP PROGRAMMING LAB**	**VI**	**23BIT63P**

COURSE LEARNING OUTCOMES
On Successful Completion of the Course, the students will be able to :

CLO1   Evaluate electric bill using PHP

CLO2   Explain the looping concepts

CLO3   Program to create classes and objects

CLO4   Apply the concepts uploading files

CLO5   Analyze the concept of strings, date and time functions

CLO6   Demonstrate the HTML application

CLO7   Explore the concept of using images

CLO8   Develop programs using MySQL

List of Programs

1. Write a PHP program to calculate electricity bill using if-else conditions.
Conditions:
● For first 50 units – Rs. 3.50/unit
● For next 100 units – Rs. 4.00/unit
● For next 100 units – Rs. 5.20/unit
● For units above 250 – Rs. 6.50/unit

2. Write a PHP program using nested for loop that creates a chess board.
3. Write a PHP program to draw different shapes.
4. Write a PHP program to perform the string manipulation.
5. Write a PHP program to perform uploading files.
6. Write a PHP program to perform user registration form using HTML tags.
7. Write a PHP program to display current date and time with specific format.
8. Write a PHP program to find factorial of a given number using recursive function.
9. Write a PHP program to perform file manipulations.
10. Write a PHP program to handle cookies and sessions.
11. Write a PHP program to illustrate classes and objects.
12. Write a PHP program to access the database table using MySQL.

Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7	CLO8
Disciplinary Knowledge	✓	✓	✓	✓	✓	✓	✓	✓
Communication Skills								
Critical Thinking	✓	✓	✓	✓	✓	✓	✓	✓
Problem Solving	✓	✓	✓	✓	✓	✓	✓	✓
Analytical Reasoning	✓	✓	✓	✓	✓	✓	✓	✓
Research Related Skills								
Scientific Reasoning								
Life-Long Learning	✓	✓	✓	✓	✓	✓	✓	✓

Mapping

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Skill based subject II** **ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**	**VI**	**23BIT65S**

COURSE LEARNING OUTCOMES
On Successful Completion of the Course, the students will be able to :

CLO1	Discuss the nature of AI problems and task domains of AI.
CLO2	Apply the appropriate search procedures to solve the problems by using best algorithms
CLO3	Analyze and select the suitable knowledge representation method
CLO4	Manipulate the acquired knowledge and infer new knowledge
CLO5	Demonstrate the development of AI systems by encoding the knowledge

UNIT I: Introduction: AI Problems – AI techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search

UNIT II: Heuristic Search techniques: Generate and Test–Hill Climbing– Best-Fist, Problem Reduction, Constraint Satisfaction, Means-end analysis

UNIT III: Knowledge representation issues: Representations and mappings–Approaches to Knowledge representations –Issues in Knowledge representations– Frame Problem.

UNIT IV: Using Predicate Logic: Representing simple facts in logic-Representing Instance and Isa Relationships-Computable Functions and Predicates-Resolution-Natural Deduction–Procedural Vs Declarative Knowledge - Logic Programming.

UNIT V: Expert Systems - Representing and Using Domain Knowledge - Expert System Shells-Explanation - Knowledge Acquisition . Perception and Action - Real time Search - Perception - Action - Robot Architectures.

TEXT BOOK
1.Artificial Intelligence, Elaine Rich and Kelvin Knight, TMH, 2nd Edn,1991

REFERENCES
 1.Artificial Intelligence, George FLuger,4thEdition,Pearson,2002.
 2.Foundations of Artificial Intelligent and Expert Systems, VS Janaki Raman, K Sarukesi, P Gopala Krishnan, MacMillan India limited

FURTHER READING

www.tutorials.com/AI

Mapping					
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)				
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**
Disciplinary Knowledge	✓	✓	✓	✓	✓
Communication Skills	✓	✓	✓		
Critical Thinking				✓	✓
Problem Solving				✓	✓
Analytical Reasoning					✓
Research Related Skills	✓	✓	✓	✓	✓
Self-directed Learning	✓	✓	✓	✓	✓
Life-Long Learning	✓	✓	✓	✓	✓

Year	Subject Title	Sem	Sub Code
2023 -24 Onwards	**Non-Major Elective Paper – II: INFORMATION TECHNOLOGY - 2 (Hyper Text Mark up Language)**	VI	**23BIT6EL**

COURSE LEARNING OUTCOMES
On Successful Completion of the Course, the students will be able to :

CLO1   Learn the Concepts of Web Development.

CLO2   Know about Hyperlinks.

CLO3   Create a Simple Web Page

CLO4   To build Tables in Web Pages.

CLO5   To Design a Web page with Different Frames and Colours.

UNIT I: Web Development Overview: Need for careful Web Development – Approaching a website project – The site plan – Design phase Dissected – Beta site implementation – Testing.

UNIT II: Core Elements : Core HTML Attributes – Headings – Paragraphs and Breaks – Divisions and centering – Quotations – Preformatted Text – Lists – Horizontal Rules – Address – Text Level elements – Inserted and deleted Text – Comments.

UNIT III: Linking Basics – linking in HTML – Images: Image preliminaries- HTML Image Basics. HTML Approach to Visual Design: Basic text layout elements – Non breaking spaces - <center> tag – Alignment Attribute – word Hinting <nobr> and <wbr> - Text alignment with images – Extensions – Background Images – Controlling page Margins.

UNIT IV: Tables and Layout: Introduction to Tables – The rowspan and colspan attributes – Tables for layout: Cell padding and cell spacing – cell alignment – colored Tables and cells – Background Images in Tables – Centered layout – Top-left-bottom layout- Stretchable Table layouts.

UNIT V: Frames – Overview of Frames – Simple Frame Example – Frame Layouts.
Case Studies:
1. Create a HTML document to display the three lines about the internet. Give suitable heading, underline it and center it. Give proper alignments and change the size of the font to "7".

2. Create a HTML document that contains the RED color scrolling text "ALL THAT GLITTERS IS NOT GOLD" in "yellow" background.

3. Create a Ordered, Unordered and Definition list to display the names of your favorite web sites.

4. Create a table to Display the subject code and subject name of current semester.

5. Create a HTML document containing names of Five freedom fighters. If we click on the name, the page containing the life history of the corresponding freedom fighter should be displayed. Also provide option to return to the main from each page.

TEXTBOOK

1. The Complete Reference HTML and XHTML -4th Edition- Thomas A.Powell.

FURTHER READING

1. https://www.w3schools.com/html/
2. https://www.tutorialspoint.com/html/index.htm
3. https://html.com/

Mapping								
Programme Level outcomes	COURSE LEARNING OUTCOMES(CLOs)							
	CLO1	**CLO2**	**CLO3**	**CLO4**	**CLO5**	**CLO6**	**CLO7**	**CLO8**
Disciplinary Knowledge	✓	✓	✓					
Communication Skills	✓	✓			✓		✓	
Critical Thinking			✓	✓		✓	✓	
Problem Solving			✓	✓	✓	✓	✓	
Analytical Reasoning					✓	✓	✓	✓
Research Related Skills			✓		✓			
Co-operation/Team Work	✓			✓		✓		
Life-Long Learning	✓			✓	✓	✓		

7. Teaching-Learning Methodologies

The teaching-learning process should be in-line with the course objective and outcomes. Teaching has to ensure that the suggested outcomes are ensured for each course and overall programme. Teaching-aids should be used wherever required to facilitate proper and impactful learning. Blended learning is recommended with the use different platforms and classroom teaching.

To meet the set objectives of the course and enable students achieve the expected outcomes of the course the teaching-learning process should be appropriately chosen. Though the teachers are best positioned to create innovative models suitable for teaching the course, certain well accepted and widely tested processes are suggested to achieve the desired outcomes

CLASSROOM TEACHING - Regular classroom and face to face teaching and tutorials can be primarily used for imparting theoretical foundations of Information Technology. Applications of the same may be explained from time to time so that the student can appreciate the theory.

LABORATORY - Lab exercises in programming and usage of package / software tools should be made mandatory and integral part. Open source software/Packages should be preferred over proprietary tools wherever available.

SEMINARS - Guest lectures and seminars involving industry experts and eminent teachers should be arranged to help the students understand the practices in the industry and developments in the field.

PROJECT - Wherever possible the laboratory assignments can be designed in the form of a mini project. For example, the database course lab assignments can be designed to build a complete system for library management. Similarly, summer/ Semester breaks can be utilized for guiding students to develop live projects with industry orientation/ industry problem.

ASSIGNMENTS - Home assignments should be designed to make student collect information from various sources and solve unfamiliar problems and make comparisons of solutions.

8. Assessment and Outcome Measurement Methods

The committee recommends that assessment should be viewed not only merely as a testing by the institution to evaluate the students' progress, but also as a valuable tool for a student to learn what is expected of him/her, where their level of knowledge and skill is lacking, and perhaps most importantly, what he/she could do to improve these levels with the valuable inputs of the lecturers. Assessment methods are the strategies, techniques, tools and instruments for collecting information to determine the extent to which students demonstrate desired learning outcomes. In the Bachelor's programmes leading to degrees such as BSc with Information Technology, the assessment and evaluation methods focus on testing the conceptual understanding of the basic ideas of computer hardware and software, development of programming skills and experimental techniques, retention and ability to apply the knowledge acquired to real-life applications, and to solve new problems and communicate the results and findings effectively. Based on the Learning Objectives defined for each course as proposed in detail, assessment methods can be designed to monitor the progress in achieving the Learning Objectives during the course and test the level of achievement at the end of the course. Several methods can be used to assess student learning outcomes. Relying on only one method to provide information about the program will only reflect a part of students' achievement.

Continuous Assessment

The continuous assessment occurs on a regular and continuous basis, it is an ongoing formative and summative process, involves the monitoring of students, is integrated with teaching, involves a systematic collection of marks or grades into a final score, may be used to determine the students' final grades.

Direct methods of assessment ask students to demonstrate their learning while indirect methods ask students to reflect on their learning. Tests, essays, presentations, etc. are generally direct methods of assessment, and indirect methods include surveys and interviews. For each Learning Objective, a combination of direct and indirect assessment methods should be used.

As this is a technology oriented programme and new technologies are introduced quite often, care should be taken to familiarize the students with the recent advances through seminars or term papers and case studies. This should be given due weightage during continuous evaluation process. To achieve this objective, the following are suggested

(i)   The end examination papers should be covering all units of the syllabus. Questions should be balanced and evaluate the comprehension, analytical and problem -solving skills.

(ii)   The students should be evaluated on teamwork in addition to the technical skills through projects.

(iii)   Ability to self-learning and solving new problems should be assessed through assignments, Seminars and project work.

(iv)   It is recommended weightage be given for practical and laboratory work.

(v)   Peer evaluation component is recommended for project evaluation and seminar.

(vi)   Online course certification should be encouraged and equivalent grade for the same need to be worked to achieve the outcome off self-learning.