

ST. XAVIER'S COLLEGE (AUTONOMOUS)
PALAYAMKOTTAI - 627 002

(Recognized as "College with Potential for Excellence" by UGC)
(Accredited by NAAC at "A++" Grade with a CGPA of 3.66 in IV Cycle)
(Star College Programme by DBT, Govt. of India.)
Affiliated to Manonmaniam Sundaranar University
Tirunelveli

SYLLABUS



Preserve this copy of the syllabus until you complete the course, as it is an important document of your present course of study.

Name _____

BACHELOR OF COMPUTER APPLICATIONS

Choice Based Credit System (CBCS)
(w.e.f. June 2021)

PROGRAMME NAME : BCA

PROGRAMME CODE : UCA

PROGRAMME SPECIFIC OUTCOMES

On successful completion of BCA programme, the students will be able to

1. Apply the basic principles and practices of Computing grounded in Mathematics to solve complex problems.
2. Communicate effectively in both verbal and written form.
3. Explore their expertise in Programming Languages such as Visual Basic and Java in developing local-based stand-alone real-time projects.
4. Understand, analyze and develop computer programs in the areas related to Algorithms, Web designing and Mobile based systems of varying complexity.
5. Apply Standard Software Engineering Practices and Software Testing Strategies to deliver a quality product for the organization success.
6. Apply technical, professional and managerial skills to excel as Entrepreneurs.
7. Analyze and apply latest technologies to solve problems in the areas of Data Mining, Internet of Things and Social Networks.
8. Analyze strong Human Values and Professional Ethics with social responsibilities to function effectively in multi-disciplinary teams.

COMPUTER APPLICATIONS (BCA) – Programme Structure

Sem	Part	Status	Course Code	Title of the Paper	Hrs.	Cdts.
I	I	Lang	21UGT11	General Tamil – I	6	3
	I	Lang	21UGH11	Hindi - I		
	I	Lang	21UGF11	French - I		
	II	Lang	21UGE11	General English - I	6	3
	III	Core-T1	21UCA11	Programming in C	4	4
	III	Core-P1	21UCA12	Practical: Programming in C	4	2
	III	Allied-T1	21UCAA11	Discrete Mathematics	4	4
	IV	NME1	21UNM11	MS-Word and PowerPoint	2	2
	IV	SBE1	21USB11	Integrated Personality Development	2	2
IV	VE	21UVE11	Religion / Ethics	2	2	
					30	22
II	I	Lang	21UGT21	General Tamil – II	6	3
	I	Lang	21UGH21	Hindi - II		
	I	Lang	21UGF21	French - II		
	II	Lang	21UGE21	General English - II	6	3
	III	Core-T2	21UCA21	Object Oriented Programming with C++	4	4
	III	Core-P2	21UCA22	Practical: Programming with C++	4	2
	III	Allied-T2	21UCAA21	Computer Organization and Architecture	4	4
	IV	NME2	21UNM21	MS-Excel and Access	2	2
	IV	SBE2	21USB21	Life Issues And Coping Skill Development	2	2
IV	SBE3	21USB22	Professional English for Computer Applications	2	2	
					30	22
III	III	Core-T3	21UCA31	Programming in Java	4	3
	III	Core-T4	21UCA32	Visual Basic	4	3
	III	Core-P3	21UCA33	Practical: Programming in Java	4	2
	III	Core-P4	21UCA34	Practical: Visual Basic	4	2
	III	Allied-T3	21UCAA31	Numerical and Statistical Methods	4	4
	III	Allied-P1	21UCAA32	Practical: Numerical and Statistical Methods	4	2
	IV	SBE4	21USB31	Human Rights and Social Analysis	2	2
	IV	SBE5	21USB32	Macromedia Flash	2	2
	IV	EVS	21UES31	Environmental Studies	2	2
					30	22
IV	III	Core-T5	21UCA41	Relational Database Concepts	4	3
	III	Core-T6	21UCA42	Data Structures and Algorithms	4	3
	III	Core-T7	21UCA43	Software Engineering	4	3
	III	Core-P5	21UCA44	Practical: Oracle	4	2
	III	Core-P6	21UCA45	Practical: Data Structures using C++	2	1
	III	Elective-1	21UCAE41	Essentials of Financial Accounting / Management Information System / E-Commerce	4	3
	III	Allied-T4	21UCAA41	Operations Research	4	4
	III	Allied-P2	21UCAA42	Practical: Operations Research	2	1
	IV	SBE6	21USB41	Web Designing Languages	2	2

					30	22
V	III	Core-T8	21UCA51	.Net Programming using C#	4	4
	III	Core-T9	21UCA52	Operating Systems and UNIX	4	4
	III	Core-T10	21UCA53	J2EE	4	4
	III	Core-T11	21UCA54	Python Programming	4	4
	III	Core-P7	21UCA55	Practical: .Net Programming using C#	4	2
	III	Core-P8	21UCA56	Practical: UNIX	2	1
	III	Core-P9	21UCA57	Practical: J2EE	2	1
	III	Core-P10	21UCA58	Practical: Python Programming	2	1
	III	Elective-2	21UCAE51	Data Mining / Software Testing /Artificial Intelligence and Machine Learning	4	4
					30	25
VI	III	Core-T12	21UCA61	Android Programming	5	5
	III	Core-T13	21UCA62	PHP Programming	5	5
	III	Core-T14	21UCA63	Computer Networks	5	5
	III	Core-P11	21UCA64	Practical: Android Programming	4	2
	III	Core-P12	21UCA65	Practical: PHP Programming	4	2
	III	Project	21UCAR61	Project Work & Viva Voce	7	7
					30	26
				STAND		1
				TOTAL	180	141

Extra Credit Courses

Sem.	Course Code	Title of the Course	Credits
I	21UEC11	Fundamentals of Computers	3
II	21UEC21	M-Commerce	3
III	21UEC31	Computer Graphics	3
IV	21UEC41	Wireless Technology	3
V	21UEC51	Internet of Things	3
VI	21UEC61	Social Networks	3

PROGRAMMING IN C
(Course Code: 21UCA11)

SEMESTER - I

CORE - T1

HOURS - 4

CREDITS - 4

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe types of operators and decision making statements. **(K1)**
2. Interpret looping statements, arrays and strings. **(K2)**
3. Examine the various categories of functions and recursion. **(K3)**
4. Analyze chain of pointers and array of pointers. **(K4)**
5. Evaluate structures and unions. **(K5)**
6. Design files using various input/output file operations. **(K6)**

UNIT I INTRODUCTION

History and Importance of C – Keywords and Identifiers – Constants – Variables – Data types – Types of Operators and Expressions – Managing Input and Output Operations. Decision Making and Branching – Types of if statements – switch statement and goto statement.

UNIT II ARRAYS

Loop Control Statements: while Loop – do..while Loop – for Loop – Jumps in Loops. Array: Declaration and Initialization of One Dimensional Arrays – Two Dimensional and Multidimensional Arrays – Reading and Writing Strings – String Handling Functions.

UNIT III FUNCTIONS

User-Defined Functions: Definition – Function Declaration – Category of Functions – Nesting of Functions – Recursion – Passing Arrays to Functions – Passing strings to Functions.

UNIT IV STRUCTURES, UNIONS AND FILES

Defining a Structure – Declaration – Initialization – Array of Structures – Structures within Structures – Unions – Files: Defining and Opening a file – Input/Output Operations on Files – Error Handling during I/O Operations – Random access to files.

UNIT V POINTERS

Pointers: Introduction – Declaring Pointer Variables – Initialization – Chain of Pointers – Pointer Expressions – Pointers and Arrays – Pointers and Character Strings – Array of Pointers – Pointers and Structures.

TEXT BOOK

E. Balagurusamy, “Programming in ANSI C”, Eighth Edition, McGrawHill Education (India) Private Limited, 2019.

REFERENCE BOOKS

1. Dr. Ashish Sasankar, Prof. Prachi A. Sasankar, “Programming in C - A Practical Approach”, First Edition, Global Education, 2020.
2. Byron S. Gottfried, “Programming with C - Schaum’s Outlines”, Fourth Edition, McGrawHill Education, 2018.
3. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGrawHill Education, 2017.

PRACTICAL: PROGRAMMING IN C
(Course Code: 21UCA12)

SEMESTER - I	CORE - P1	HOURS - 4	CREDITS - 2
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1. Write a program to find the largest number and smaller number by using if statement.
2. Write a program to convert the decimal to binary conversion by using while statement.
3. Write a program to count the number of positives, negatives & zeroes in an array.
4. Write a program to check whether a given number is prime or not.
5. Write a program to generate the Fibonacci Series.
6. Write a program to concatenate two strings without using String Library Function.
7. Write a program to count the number of Vowels, Consonants, and Digits in a Line of Text.
8. Write a program to reverse a String.
9. Write a program to design the Calculator Functions such as addition, subtraction and multiplication.
10. Write a program to find the Factorial of a number using Recursion.
11. Write a program to prepare Students Mark List using Array of Structures.
12. Write a program to separate odd and even numbers using Files.

DISCRETE MATHEMATICS
(Course Code: 21UCAA11)

SEMESTER - I

ALLIED - T1

HOURS - 4

CREDITS - 4

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the relations and functions and be able to determine their Properties. **(K1)**
2. Illustrate the basic principles of sets and operations in sets. **(K2)**
3. Solve basic set equalities. **(K3)**
4. Classify the counting principles to determine probabilities. **(K4)**
5. Determine if the argument is valid or not valid. **(K5)**
6. Formulate and solve real world problems using graphs and trees. **(K6)**

UNIT I SET THEORY AND RELATION

SET THEORY: Introduction – Sets and Elements – Universal Set and Empty Set – Subsets – Venn Diagrams – Set Operations – Algebra of Sets and Duality – Finite Sets, Counting Principle – Class of Sets, Power Sets and Partitions. **RELATIONS:** Introduction – Product Sets – Relations – Pictorial Representations Of Relations – Composition of Relations – Types of Relations – Closure Properties – Equivalence Relations – Partial Ordering Relations – n-ary Relations.

UNIT II FUNCTION

Introduction – Functions – One-to-One-Onto and Inevitable Functions – Mathematical Functions, Exponential and Logarithmic Functions – Sequences, Indexed Classes of sets – Recursively Defined Functions – Cardinality

UNIT III LOGIC AND PROPOSITIONAL CALCULUS

Introduction – Propositions and Compound Propositions – Basic Logical Operations – Propositions and Truth Tables – Tautologies and Contradictions – Logical Equivalences – Algebra of Propositions – Conditional and Biconditional Statements – Arguments – Logical Implication – Propositional Functions, Quantifiers – Negation.

UNIT IV COUNTING

Introduction, Basic Counting Principles – Factorial Notation – Binomial Coefficients – Permutations – Combinations – The Pigeonhole Principle – The Inclusion – Exclusion Principle

UNIT V GRAPH THEORY

Graphs – Complete, Regular and Bipartite Graphs – Labeled and Weighted Graphs – Subgraphs – Paths, Connectivity – The Bridges of Konigsberg, traversable Multigraphs – Tree Graphs – Planar Graphs – Spanning Tree – Minimal Spanning Tree – Euler's Formula

TEXT BOOKS

Seymour Lipschutz, Marc Lipson, "Discrete Mathematics", Second Edition, Tata McGraw Hill, 2019.

Chapters : **1, 2, 3, 4, 5, 8.1-8.10**

REFERENCE BOOKS

1. B.S. Vatsa, "Discrete Mathematics", Third Edition, Wishwa Prakashan, 2018.

2. K.D. Joshi, "Foundation of Discrete Mathematics", Wiley Eastern Ltd., 2019.

MS-WORD AND POWER POINT
(Course Code: 21UNM11)

SEMESTER - I

NME - 1

HOURS - 2

CREDITS - 2

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Define basic functions and new formatting features in Word 2010.(K1)
2. Describe the Header and Footer content and update page numbers and dates.(K2)
3. Examine the various features of Word. (K3)
4. Analyze the presentation techniques. (K4)
5. Evaluate presentations with video, pictures, and animations. (K5)
6. Design various presentations. (K6)

UNIT I GETTING STARTED WITH WORD

Introducing the New Features in Word 2010 – Creating a New Blank Document – Saving in Different Formats – Beginning a New Word Project – Formatting Text in the Documents – Inserting the Symbols and Changing Date Styles – Adding Bullets and Numbered Lists – Searching and Replacing in the Document.

UNIT II PAGE NUMBERS, HEADER AND FOOTER

Adjusting the Structure of Document – Changing the Margins – Changing the Page Orientation – Inserting Page Numbers – Inserting Header and Footer – Adding Foot notes and End notes – Creating Columns in a Longer Document.

UNIT III WORKING IN TABLE

Creating Table – Adding and Deleting Rows/Columns – Merging Cells – Modifying Borders – Working with Graphics and Effects – Inserting a Picture – Adding a Clip Art Image – Cropping an Image – Applying Picture Style and Effects – Inserting a Smart Art Diagram – Using Screenshots or Screen Clippings.

UNIT IV GETTING STARTED WITH MS POWERPOINT

Getting started with PowerPoint 2010 – Adding and Editing Text – Adding Slides with Bullets – Moving Slides – Applying Theme from the Design Tab – Using Slide Masters.

UNIT V WORKING WITH TABLE, CHART, ANIMATION

Creating Table – Adding Chart – Inserting a Picture – Adding Slide Transitions – Adding Animations to Content – Using the Animation Painter Tool – Inserting and Trimming Video – Using Online Video.

TEXT BOOK

Tom Bunzel, “Easy Microsoft Office 2010”, Que Publishing, First Edition, 2010.

REFERENCE BOOKS

1. Gary B. Shelly, Misty E. Vermaat, “Microsoft Office 2010: Introductory”, Cengage Learning, First Edition 2012.
2. Katherine Murray, “Microsoft Office 2010 Plain & Simple”, Microsoft Press, First Edition, 2010.

PRACTICAL LIST

1. Design a Bio-data in MS Word
2. Design an Invitation in MS Word
3. Newspaper formatting in MS Word
4. Bullets and Numbering in MS Word
5. Create a simple presentation using MS-Power Point
6. Presentation using Themes
7. Presentation using Animation

OBJECT ORIENTED PROGRAMMING WITH C++
(Course Code: 21UCA21)

SEMESTER - II	CORE - T2	HOURS - 4	CREDITS - 4
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the basic ideas of Object Oriented Programming & programming structure. **(K1)**
2. Interpret the functions and Classes concepts. **(K2)**
3. Usage of Constructors and operator overloading. **(K3)**
4. Infer the inheritance concept. **(K4)**
5. Summarize Virtual Functions and Stream Classes. **(K5)**
6. Create files and develop templates. **(K6)**

UNIT I OOPS CONCEPT

Principles of Object Oriented Programming – Software Crisis – Software Evolution – Procedure Oriented Programming – Object Oriented Programming Paradigm – Basic Concepts and Benefits of OOP – Object Oriented Languages – Applications of OOP – Beginning with C++ – Structure of C++ – Applications of C++ – Tokens – Keywords – Basic Data types – Declaration of variables – Operators in C++ – Manipulators – Control Structures.

UNIT II FUNCTIONS, CLASSES AND OBJECTS

Function in C++ : Function Prototyping – Call by Value and Reference – Inline Functions – Default and const Arguments – Function Overloading – Classes and Objects – Member Functions – Nesting of Member Functions – Private Member Functions – Memory Allocation of Object – Array with in a Class – Static Data Members – Static Member Functions – Array of Objects – Objects as Function Arguments – Friend functions – Pointers to Members.

UNIT III CONSTRUCTORS, OPERATOR OVERLOADING

Constructors – Parameterized Constructors – Multiple Constructor – Constructor with Default Parameters – Copy and Dynamic Constructors – Destructors – Operator Overloading – Overloading Unary and Binary Operators – Operator Overloading using Friend Function – Rules for overloading operators.

UNIT IV INHERITANCE, VIRTUAL FUNCTIONS

Inheritance – Defining Derived Classes – Single Inheritance – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance – Virtual Base Classes – Abstract Classes – Constructors in Derived Classes – Nesting of Classes – this Pointer – Virtual Functions – Pure Virtual Functions – C++ Stream Classes – Unformatted and Formatted I/O Operations.

UNIT V FILES AND TEMPLATES

Classes for File Stream Operations – Opening and Closing a File – File modes – Sequential Input and Output Operations – Random Access – Error Handling during File Operations – Command Line Arguments – Templates – Class Templates – Function Templates.

TEXT BOOK

E. Balagurusamy, “Object Oriented Programming with C++”, Eighth Edition, Tata McGraw Hill, 2020.

REFERENCE BOOKS

1. D. Ravichandran, “Programming with C++”, Third Edition, McGraw Hill Education, 2017.
2. Herbert Schildt, “The Complete Reference – C++”, Fourth Edition, McGraw Hill Education, 2017.

PRACTICAL: PROGRAMMING WITH C++
(Course Code: 21UCA22)

SEMESTER - II	CORE - P2	HOURS - 4	CREDITS - 2
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1. Program using Control Structures.
2. Program using Arrays.
3. Program using Default Arguments.
4. Program using Function Overloading.
5. Program using Class and Objects.
6. Program using Array of Objects.
7. Program using Constructor and Destructor.
8. Program using Operator Overloading.
9. Program using Friend Function.
10. Program using Inheritance.
11. Program using Files.
12. Program using Templates.

COMPUTER ORGANIZATION AND ARCHITECTURE
(Course Code: 21UCAA21)

SEMESTER - II	ALLIED - T2	HOURS - 4	CREDITS - 4
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the components of computer system and number system. **(K1)**
2. Discuss about the logic design and Arithmetic – Logic Unit. **(K2)**
3. Demonstrate the basic concepts of digital principles. **(K3)**
4. Classify the various memory elements. **(K4)**
5. Summarize the input-output devices and control unit. **(K5)**
6. Formulate the addressing techniques and RISC-CISC Architecture. **(K6)**

UNIT I NUMBER SYSTEM, BOOLEAN ALGEBRA AND GATE NETWORKS

Computer Operation: Basic Components of Digital Computer – Programming Overview – Assembly Languages – High level Languages. **Number Systems:** Binary Addition and Subtraction – Binary Multiplication and Division – Converting Decimal Numbers to Binary – Negative Numbers – Use of Complements to represent Negative Numbers – BCD Number Representation – Octal and Hexadecimal Number System **Boolean Algebra and Gate Networks:** Fundamental concepts of Boolean Algebra – AND and OR Gates – Complementation and Inverters – Evaluation of Logical Expressions – Basic Laws of Boolean Algebra.

UNIT II LOGIC DESIGN AND ARITHMETIC – LOGIC UNIT

De Morgan’s Theorem – Derivation of a Boolean Expression – Interconnecting Gates – Sum of Products and Product of Sums – Derivation of a Three – Input – Variable Expression – NAND and NOR Gates. **Logic Design:** Flip flops – Clocks – Flip flop Designs – Shift Register – Binary Counter – BCD Counters – Integrated Circuits – Medium, Large and Very Large – Scale Integration. **The Arithmetic – Logic Unit:** Construction of the ALU – Integer Representation – Binary Half Adder – Full Adder – A Parallel Binary Adder – Multiplexers.

UNIT III RAM, ROM, VIRTUAL AND CACHE MEMORY

The Memory Element: Random Access Memories – Static and Dynamic RAMs – ROMs – Magnetic Disk Memories – Flexible Disk Storage System – The Floppy Disk – Magnetic Tape – Optical Storage Devices – Computer Word Structures – Storage hierarchies – Virtual Memory – Cache memory.

UNIT IV INPUT – OUTPUT DEVICES AND CONTROL UNIT

Input Output devices: Terminals, Personal Computers and Workstations – Input Media – Character Recognition – Output Equipment – Error– Detecting and Error– Correcting codes – Buses for Personal Computers and Work stations. **Control Unit:** Construction of an Instruction Word – Instruction and Execution cycle Organization of Control Registers – Branch, Skip or Jump Instructions – Shift Instructions – Register Transfer Language.

UNIT V ADDRESSING TECHNIQUES, RISC AND CISC ARCHITECTURE

Computer Architecture: Instruction Word formats– Number of Addresses – Representation of Instructions and Data – Addressing techniques – Direct Addressing – Immediate Addressing – Relative Addressing – Indirect Addressing – Indexed Addressing – BRANCH and JUMP Instructions – Flags, Condition Codes and Status Registers – Subroutine calls – Interrupts – Pipelined computers – RISC and CISC architecture – Security and protection.

TEXT BOOK

Thomas C Bartee, “Computer Architecture & Logic Design”, Tata McGraw Hill, 2010.

Chapters:

UNIT I: 1.4 – 1.5 (Pg: 6-12), **1.7 – 1.8** (Pg: 16-19), **2.4 – 2.10** (Pg: 24-38), **3.1 – 3.5** (Pg: 55-65)

UNIT II: 3.6 – 3.11 (Pg: 65-78), **4.1 – 4.8** (Pg: 132-162), **5.1– 5.5**(Pg: 190-197), **5.13** (Pg: 227-229)

UNIT III: 6.1 (Pg: 245-247), **6.6 – 6.11** (Pg: 263-286), **6.14 – 6.18** (Pg: 288-309)

UNIT IV: 7.1 – 7.6 (Pg: 322-344), **9.1 – 9.2** (Pg: 417-424), **9.5 – 9.7** (Pg: 433-441)

UNIT V: 10.1 – 10.15 (Pg: 452-483)

REFERENCE BOOKS

1. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Tenth Edition, Pearson Education, 2019.
2. M. Morris Mano, “Computer System Architecture”, Revised Third Edition, Pearson Education, 2017.
3. SmutRanjan Sarangi, “Computer Organization and Architecture”, First Edition, McGraw Hill Education, 2017.

MS-EXCEL AND ACCESS
(Course Code: 21UNM21)

SEMESTER - II	NME - 2	HOURS - 2	CREDITS - 2
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the basic concepts of MS Excel and Access. **(K1)**
2. Summarize the usage of Excel. **(K2)**
3. Examine a chart in Excel. **(K3)**
4. Analyze database concepts in Access. **(K4)**
5. Evaluate the query processing in tables. **(K5)**
6. Create Reports in Access. **(K6)**

UNIT I GETTING STARTED WITH EXCEL 2010

The Excel Interface – Working and Worksheets – Cell and Range Selection – Entering data – Editing Data – Reorganizing a Worksheet – Filling Cells – Importing Data – Finding/Replacing Data – Sorting Data – Naming cells and Ranges – Password Protecting Workbooks.

UNIT II FORMATTING WORKSHEETS AND DATA

Setting Column Width and Row Height – About Data and Cell Formatting – Character and Paragraph Formatting – Fitting Text within a Cell – Number Formatting – Conditional Formatting – Adding Cell Backgrounds and Borders – Removing, Replacing and Reusing Formats – Worksheet Formatting.

UNIT III FORMULAS AND FUNCTIONS, CREATING CHARTS

Formulas and Functions: About Cell Reference – Formula Essential – Creating Formulas – Editing Formulas. **Creating Charts:** Chart Elements – Creating charts – Changing the Background – Adding and Formatting Text – Rows or Columns – Changing Layout Style – Displaying the Data Set – Working with Gridlines – Working with the Legend – Adding Trend Lines – Modifying the Axes – Creating Spark lines – Changing the Chart Data.

UNIT IV INTRODUCING ACCESS, BUILDING DATABASE TABLES

Introducing Access: What is a Database – Tables, Queries, Forms, and Other Objects – Creating a Database File – Finding Your Way around the Navigation Pane **Building Your Database Tables:** Creating a Database Table – Opening and Viewing Tables – Entering and Altering Table Fields – Field Properties for Making Sure that Data Entries are Accurate – Indexing for Faster Sorts, Searches, and Queries **Entering the Data:** The Two Ways to Enter Data – Finding and Replacing Data.

UNIT V SORTING DATA, PRESENTING DATA IN A REPORT

Sorting, Querying, and Filtering for Data: Sorting Records – Filtering to Find Information – Querying: The Basics – Six Kinds of Queries. **Presenting Data in a Report:** Creating a Report Opening and Viewing Reports.

TEXT BOOKS

Steve Schwartz, “Microsoft office 2010”, Dorling Kindersley (India) Pvt. Ltd, Pearson Education, 2012.

REFERENCE BOOKS

1. Prof. Satish Jain, M. Geetha, Kratika, “MS – OFFICE 2010 Training Guide”, 2017.
2. Joyce Cox, Joan Lambert, Curtis Frye, “Microsoft office Professional 2010 Step by Step”, Microsoft Publisher, 2011.
3. Peter Weverka, “Office 2010 ALL – IN – ONE FOR DUMMIES”, Wiley Publishing, Inc., Indianapolis, Indiana, 2010.

PRACTICAL LIST

1. Mark sheet preparation using MS-Excel
2. Mathematical Functions using MS-Excel
3. Text functions using MS-Excel
4. Electricity Bill Preparation using Access
5. Payroll Processing using Access
6. Report Generation using Access

PROFESSIONAL ENGLISH FOR COMPUTER APPLICATIONS
(Course Code: 21USB22)

SEMESTER - II

SBE - 3

HOURS - 2

CREDITS - 2

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Define their own ability to improve their own competence in using the language **(K1)**
2. Explain the importance of reading for life. **(K2)**
3. Use language for speaking with confidence in an intelligible and acceptable manner. **(K3)**
4. Illustrate unfamiliar texts with comprehension. **(K4)**
5. Evaluate the importance of writing in academic life. **(K5)**
6. Create simple sentences without committing error of spelling or grammar. **(K6)**

UNIT I COMMUNICATION

Listening: Listening to audio text and answering questions – Speaking: Pair work and small group work – Reading: Comprehension passages – Writing: Developing a story with pictures.

UNIT II DESCRIPTION

Listening: Listening to process description – Drawing a flow chart – Speaking: Role play (formal context) – Reading: Skimming/Scanning – Reading passages on products and gadgets – Writing: Process Description – Sentence Definition and Extended Definition – Free writing.

UNIT III NEGOTIATION STRATEGIES

Listening: Listening to interviews of inventors in fields (Subject specific) – Speaking: Brain Storming (Mind mapping) – Reading: Longer Reading text – Writing: Essay writing (250 words).

UNIT IV PRESENTATION SKILLS

Listening: Listening to lectures – Speaking: Short talk – Reading: Comprehension passages – Writing: Writing Recommendations – Interpreting Visual inputs.

UNIT V CRITICAL THINKING SKILLS

Listening: Listening for information – Speaking: Making presentations with Powerpoint – Reading: Comprehension passages – Note making Motivational article on Professional Competence, Professional Ethics and Life Skills – Writing: Creative writing – Summary writing.

TEXT BOOK

Contents from Study Material provided by Tamil Nadu State Council for Higher Education (TANSICHE) – Professional English for B.Sc. Physical Sciences.

PROGRAMMING IN JAVA
(Course.Code : 21UCA31)

SEMESTER - III	CORE - T3	HOURS - 4	CREDITS - 3
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe how object-oriented concepts are incorporated into Java language. **(K1)**
2. Discuss the problem-solving and programming skills using OOP concepts. **(K2)**
3. Use the Control Structures, Arrays and Interfaces. **(K3)**
4. Illustrate the Multithreaded Programming & Exception Handling. **(K4)**
5. Create User Defined Packages. **(K6)**
6. Develop Java applets using applet programming. **(K6)**

UNIT I FUNDAMENTALS OF JAVA

FUNDAMENTALS OF OBJECT-ORIENTED PROGRAMMING: Introduction – Object Oriented paradigm – Basic Concepts of OOP – Benefits of OOP – Applications of OOP – Java features: **OVERVIEW OF JAVA LANGUAGE:** Introduction – Simple Java program structure – Java tokens – Java Statements – Implementing a Java Program – Java Virtual Machine – Command line arguments. **CONSTANTS, VARIABLES AND DATA TYPES:** Introduction – Constants – Variables – Data Types – Declaration of Variables – Giving Value to Variables – Scope of variables – Symbolic Constants – Type casting – Getting Value of Variables – Standard Default values. **OPERATORS AND EXPRESSIONS.**

UNIT II TYPES OF STATEMENTS , CLASSES AND OBJECTS

DECISION MAKING AND BRANCHING: Introduction – Decision making with if statement – Simple if statement – if-else statement – Nesting of if-else statements – else-if ladder – switch statement – Conditional operator. **LOOPING:** Introduction – while statement – do-while statement – for statement – Jumps in loops. **CLASSES, OBJECTS AND METHODS:** Introduction – Defining a class – Adding variables – Adding methods – Creating objects – Accessing class members – Constructors – Method overloading – Static members – Nesting of methods.

UNIT III INHERITANCE, ARRAYS AND INTERFACES

INHERITANCE: Extending a class – Overloading methods – Final variables and methods – Final classes – Abstract methods and classes; **ARRAYS – STRINGS AND VECTORS:** Arrays – One-dimensional arrays – Creating an array – Two-dimensional arrays – Strings – Vectors – Wrapper classes; **INTERFACES:** Multiple Inheritance – Introduction – Defining interfaces – Extending interfaces – Implementing interfaces – Assessing interface variables.

UNIT IV MULTITHREADED PROGRAMMING AND EXCEPTION HANDLING

MULTITHREADED PROGRAMMING: Introduction – Creating Threads – Extending the Threads – Stopping and Blocking a Thread – Lifecycle of a Thread – Using Thread Methods – ThreadExceptions – Thread Priority – Synchronization – Implementing the ‘Runnable’. Interface. **MANAGING ERRORS AND EXCEPTIONS:** Types of errors: Compile-time errors – Runtimeerrors – Exceptions – Exception handling – Multiple Catch Statements – Using finally statement.

UNIT V PACKAGES, APPLETS AND INPUT/OUTPUT FILES

PACKAGES: Introduction – Java API Packages – Using System Packages – Naming conventions – Creating Packages – Accessing a Package – using a Package. **APPLET PROGRAMMING:** local and remote applets – Applets and Applications – Building Applet code – Applet Life cycle: Initialization state – Running state – Idle or stopped state – Dead state – Display state. **MANAGING INPUT/OUTPUT FILES:** Introduction – Concept of Streams – Stream classes – Byte Stream Classes – Input Stream Classes – Output Stream Classes – Character Stream classes: Reader stream classes – Writer Stream classes – Using Streams – Reading and writing files.

TEXT BOOK

E.Balaguruswamy, “Programming with JAVA”, Sixth Edition, McGraw Hill Education, 2019.

REFERENCE BOOKS

1. Herbert Schildt, “JAVA A Beginner’s Guide”, Seventh Edition, McGraw-Hill Education, 2017.
2. Herbert Schildt, “Java: The Complete Reference”, Tenth Edition, McGraw-Hill Education, 2017.

VISUAL BASIC
(Course Code: 21UCA32)

SEMESTER - III

CORE - T4

HOURS - 4

CREDITS - 3

COURSE OUTCOMES

On successful completion of the course, the learners will be able to

1. Describe the Visual Basic Components and Controls. **(K1)**
2. Interpret the Visual Basic's Integrated Development Environment. **(K2)**
3. Illustrate the Procedure and Function in Visual Basic programs. **(K3)**
4. Test the Connection between Visual Basic and Database. **(K5)**
5. Create Custom Menu in Visual Basic. **(K6)**
6. Design, Create and Build Visual Basic applications. **(K6)**

UNIT I VISUAL BASIC COMPONENTS AND CONTROLS

Working with Visual Basic Window Components: Menu Bar – Tool Bar – Project Explorer Window – Form Layout Window – properties Window – Toolbox – Code Editor Window Working with Forms: Properties – Events – Methods. **Working with Basic Controls:** Label – CommandButton – TextBox – OptionButton – Frame – CheckBox – ListBox – ComboBox – Image – Scroll – Picture – Timer – DriveListBox – DirListBox – FileListBox and Shape Controls.

UNIT II PROGRAMMING FUNDAMENTALS

Basic Programming Fundamentals: Variables – Data types – Constant – Conversion Function. **Scope of Variable:** Public – Private Static. Operators: Logical – Arithmetic – Concatenation – Comparison. **Decision Structure:** If.. Then – If..Then..Else – Select Case.. End Case. **Loop Structure:** Do..While – While.. Wend – For.. Next – With..EndWith.DoEvents().

UNIT III ARRAYS – PROCEDURE AND FUNCTION

Arrays: Dynamic Array – Preserve and Control arrays. **Procedure:** General procedure – General Methods for Passing Arguments to a Procedure – **Functions:** User-Interaction – String – Math – Date – And Conversion Functions. Modules: Form – Standard.

UNIT IV MENUS AND DATABASE HANDLING

Menus: Creating – Adding Menu Items – Creating Shortcut – Adding Separators Bars – Submenus – Code for Menus. Creating Popup Menu: System – Custom. **Database Handling:** Database Concepts – Creating and Accessing Database – Using Data Control. Using DAO object library.

UNIT V ADO DATA CONTROLS

Using ADO Data Control – Data Link – ODBC Data Source name – Using Connection String – Creating Navigating buttons. Working with Advanced **Data Controls:** DataList Control – DataCombo Control – DataGrid Control and Msflexgrid Control.

Handling Errors : Run Time – Trapping and Handling Error – ERR Object. Data Environment and Data Reports.

TEXT BOOK

Soma Dasgupta, “Visual Basic to Advance”, BPB Publications, 2008.

REFERENCE BOOKS

1. Steven Holzner, “Visual Basic 6 Programming Black”, Dreamtech Press, First Edition, 2000.
2. Mohammed Azam, “Programming with Visual Basic 6.0”, Vikas Publication House Pvt. Ltd., First Edition, 2001.

PRACTICAL: PROGRAMMING IN JAVA
(Course Code: 21UCA33)

SEMESTER - III	CORE - P3	HOURS - 4	CREDITS - 2
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1. Program to demonstrate the use of Harmonic Series.
2. Program to arrange the given strings in Alphabetic Order.
3. Program to implements Addition and multiplication of two Matrices.
4. Program to demonstrate the use of Constructor.
5. Program to display a use of method overloading.
6. Program to demonstrate the use of overriding Method.
7. Program for single Inheritance.
8. Program for implementing Interface.
9. Program for to implement Thread, Thread Priority.
10. Program to demonstrate Exception handling.
11. Program to demonstrate the use of Packages.
12. Program using Applet.

PRACTICAL: VISUAL BASIC
(Course Code: 21UCA34)

SEMESTER - III	CORE - P4	HOURS - 4	CREDITS - 2
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1. Program using conditional control structures.
2. Program using loop control structures.
3. Program to work with controls.
4. Program to Design a Calculator.
5. Program to perform matrix addition, subtraction and multiplication.
6. Program using Picture Box and Image Box.
7. Program using Scroll bar control.
8. Program using File Controls.
9. Program to find factorial for a given number using function.
10. Program to create a menu.
11. Database connectivity using DAO.
12. Database connectivity using ADO controls.

NUMERICAL AND STATISTICAL METHODS
(Course Code: 21UCAA31)

SEMESTER - III

ALLIED - T3

HOURS - 4

CREDITS - 4

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Analyze the different samples of data at different level of significance using various hypothesis testing. **(K4)**
2. Develop a framework for estimating and predicting the different sample of data. **(K6)**
3. Describe errors, source of errors and its numerical computations. **(K2)**
4. Examine how to obtain numerical solution of nonlinear equations using Bisection, Newton-Raphson and Iteration methods. **(K3)**
5. Solve system of linear equations numerically using direct and iterative methods. **(K1)**
6. Summarize the applications of Statistics & Probability in real life domain. **(K5)**

UNIT I APPROXIMATION AND ERRORS IN COMPUTATION

Introduction - numbers - Errors - Error in the approximation of a function - Errors in a series approximation - order of approximation - propagation error.

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Introduction - Basic properties of equations - bisection method - Regula falsi method - Secant method - Iteration method - Newton Raphson method

UNIT II SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS

Solution of linear simultaneous equations - Direct methods of solution - Gauss elimination method, Gauss - Jordan method, - Iterative methods of solution - Jacobi, Gauss - Seidal.

UNIT III INTERPOLATION AND INTEGRATION

Linear Interpolation – Newton’s Forward and Backward interpolation methods – Newton’s Divided Difference interpolation methods – Lagrange’s methods – Trapezoidal rule, Simpson’s One Third(1/3) & Three Eighth(3/8) rules – Weddle Rule.

DIFFERENTIAL EQUATIONS

Runge-Kutta Fourth order Method – Milne-Simpson Method and Adams Base Forth method – Moulton Method.

UNIT IV STATISTICS BASICS

Mean – Median – Mode – Standard Deviation – Variance – Coefficient of variation of frequency distribution

CURVE FITTING AND LEAST SQUARES

Fitting of a Straight line and Parabola, Conversion of Data to Linear form.

UNIT V CORRELATION AND REGRESSION

Correlation – Correlation Coefficient, Rank Correlation, Regression – Lines and Curves of Regression.

DISCRETE AND CONTINUOUS DISTRIBUTIONS:

Binomial, Poisson and Normal distributions – Fitting of these distributions

TEXT BOOKS

1. B.S. Grewal, “Numerical methods in Engineering & Science”, Khanna Publishers, Fifth Edition, April 2018.
2. S. Arumugam, A.Thangapandi Isaac, “Statistics”, New Gamma Publishing House, 2018.

REFERENCE BOOKS

1. R.S. Salaria, “Computer Oriented Numerical Methods”, Khanna Publishers, Fifth Edition, 2016.
2. S.C. Gupta, V.K. Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, Twelfth Edition, 2020.

PRACTICAL: NUMERICAL AND STATISTICAL METHODS (Course. Code 21UCAA32)

SEMESTER - III	ALLIED - P1	HOURS - 4	CREDITS - 2
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1. Solution for Bisection method
2. Solution for Newton-Raphson method
3. Solution of simultaneous equations using Gauss elimination method
4. Solution of simultaneous equations using Gauss-seidal iteration method
5. Numerical integration: Trapezoidal rule and Simpson's one-third rule
- 6.. Curve fitting, Fitting a straight line and Fitting a second degree parabola
7. Correlation: Computing Correlation Coefficient and Rank Correlation

MACROMEDIA FLASH
(Course Code: 21USB32)

SEMESTER - III	SBE - 5	HOURS - 2	CREDITS - 2
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Recognize, locate, and navigate through all aspects of the new Flash user interface. **(K1)**
2. Explain and utilize components to create interactivity. **(K2)**
3. Utilize and understand sound and sound formats in flash movies. **(K3)**
4. Analyze tweens and articulated motions with inverse kinematics to morph shapes. **(K4)**
5. Evaluate the Load, control, and remove movie clips and masks in movie content. **(K5)**
6. Design, create, edit, and manipulate animation using Adobe XD tools and techniques. **(K6)**

UNIT I INTRODUCTION TO FLASH CS6

The Flash Professional with Environment : Menu Bar – Tools Panel– Properties Panel – Library Panel – Timeline Panel –The Motion Editor Panel – Exploring Drawing Tools

UNIT II WORKING WITH FLASH TOOLS AND GRADIENTS

Using Brush Tool – Using Paint Bucket Tool – Using Eyedropper Tool – Exploring Selection and Modification Tools – Using Gradient Transform Tool – Using Bone Tool – Creating Custom Gradients – Altering the Opacity of Gradients.

UNIT III WORKING WITH TEXT FIELDS AND FRAMES

Creating Text Fields – Editing a Text Field – Inserting Frames and Keyframes – Converting a Keyframe into a Frame – Copying and Pasting a Frame or Frame Sequence – Changing a Length of a Frame Sequence – Deleting a Frame or Frame Sequence.

UNIT IV WORKING WITH SYMBOLS AND LAYERS

Creating symbols in Flash – Creating symbols from an Existing Object – Creating New Symbols – Creating a Layer – Locking and Unlocking a Layer – Hiding a Layer – Creating a Layer Folder – Deleting a layer.

UNIT V WORKING WITH ADOBE XD

Introducing Adobe XD – A typical UX design workflow – Starting Adobe XD and opening a file – The Home screen – Exploring the workspace – Getting to know the tools – Working with the Property Inspector – Working with panels – Prototype mode – Changing the view of artwork – Using view commands – Navigating art boards.

TEXT BOOK

1. Kogent Learning Solutions Inc., “Flash CS6 in Simple Steps”, Dreamtech Press, First Edition, 2013.
2. Brian Wood, “Adobe XD Classroom in a Book” , First Edition, Macromedia Press, 2020.

REFERENCE BOOKS

Prof. Satish Jain, KratikaBhagia, “Flash Professional CS6 Training Guide”, BPB Publications, First Edition, 2016.

PRACTICAL LIST

1. Designing a simple application using basic tools.
2. Designing an application using symbols and multiple layers.
3. Designing an application using shape tweening and motion tweening.
4. Creating an animation using Frame by Frame animation.
5. Creating an application using mask layer.
6. Pasting to Multiple Artboards using Adobe XD.

RELATIONAL DATABASE CONCEPTS
(Course Code: 21UCA41)

SEMESTER - IV	CORE - T5	HOURS - 4	CREDITS - 3
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Define the fundamentals of RDBMS. **(K1)**
2. Design database using ER diagram and normal forms. **(K2)**
3. Use Oracle for Creating and manipulating relational database. **(K3)**
4. Analyze Set Operators and making other transactions. **(K4)**
5. Apply SQL queries in procedural language, PL/SQL. **(K5)**
6. Develop Procedures and Exception Handling in PL/SQL. **(K6)**

UNIT I PURPOSE OF DATABASE SYSTEMS

View of Data – Database Languages –Relational Database – Database Architecture– Database Users and Administrators.

Structure of Relational Database– Database Schema–Keys –Schema Diagrams – Relational Query languages – Relational Operations.

UNIT II OVERVIEW OF DESIGN PROCESS

ER Model – E – R Diagrams– Extended E – R Features – Features of Good Relational Design – Atomic Domains and First Normal Form – 2NF – 3NF – BCNF – Decomposition Using Functional Dependencies – Functional Dependency Theory

UNIT III NAMING RULES AND CONVENTIONS

Data Types – Constraints – Creating Table – Displaying Information – Altering Existing Table – Dropping, Renaming and Truncating a Table.

Adding New Records – Updating and Deleting Records – Retrieving Data from Table – Arithmetic Operations – Where Clause – Sorting – CASE.

UNIT IV BUILT – IN FUNCTIONS

Grouping Data – Join – Set Operators – Subquery – Top – N Analysis – Correlated Subquery – Views – Sequences – Synonyms – Index – Transactions – Locking Rows for Update – Controlling Access.

UNIT V FUNDAMENTALS OF PL/SQL

PL/SQL Block Structure – Comments– Data Types– Variable Declaration – Bind Variable – Control Structures – SQL in PL/SQL – Data Manipulation in PL/SQL – Cursors – Exception Handling – Procedure – Function – Packages – Trigger.

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", McGraw Hill, Seventh edition, 2019. **(Units I & II)**
2. Nilesh Shah, "Database Systems using Oracle A simplified guide to SQL and PL/SQL", Prentice Hall of India, 2009. **(Units III, IV & V)**

REFERENCE BOOKS

1. Ivan Bayross, "SQL, PL/SQL, The Programming Language of Oracle", BPB Publications, 2020.
2. Alexis Leon and Mathews Leon, "Fundamentals of Database Management Systems", Vijay Nicole Imprints, 2010.
3. Scott Urman, "Oracle 9i PL/SQL Programming", Tata McGraw Hill, 2006.

DATA STRUCTURES AND ALGORITHMS
(Course Code: 21UCA42)

SEMESTER - IV

CORE - T6

HOURS - 4

CREDITS - 3

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Define the Data Structures. **(K1)**
2. Interpret Stack, Queue, List, Tree and Graph. **(K2)**
3. Examine the concepts of Divide and Conquer Techniques. **(K3)**
4. Analyze to select appropriate data structures for the problem definition. **(K4)**
5. Evaluate Kruskal's and Prim's Algorithms and Single source Shortest Path Algorithm. **(K5)**
6. Build programs for all the operations on the data structures. **(K6)**

UNIT I ARRAYS AND STACK

Arrays: The Abstract Data Type – Arrays – **Dynamically Allocated Arrays:** One Dimensional Arrays – Two Dimensional Arrays – **Polynomials:** Polynomial Representation – Polynomial Addition – Representation of Multidimensional Arrays – Stacks – Evaluation of Expressions – Evaluating Postfix Expressions – Infix to Postfix.

UNIT II QUEUES AND LINKED LISTS

Queues: Queues – Circular Queues. **Linked List:** Singly Linked Lists – Linked Stacks and Queues – List Operations.

UNIT III TREES

Trees: Terminology – Representation of Trees – **Binary Tree:** Properties of Binary Tree – Binary Tree Representation – Binary Tree Traversals – Binary Search Trees – Definition – Searching – Insertion – Deletion on Binary Search Tree.

UNIT IV GRAPHS

Graphs: Introduction – Definition – Graph Representations – Depth First Search – Breadth First Search – **Minimum Cost Spanning Trees:** Kruskal's Algorithm – Prim's Algorithm – Shortest Path Single Source/ All Destination: Nonnegative Edge Costs.

UNIT V DIVIDE AND CONQUER

Divide and Conquer: The General method – Binary Search – Finding Maximum and Minimum – Merge Sort – Quick sort – Selection Sort – The kth Smallest Element.

TEXT BOOKS

1. Ellis Horowitz, Sartaj Sahani, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Universities Press (India) private limited, Hyderabad.
(Units : I, II, III & IV)
2. Ellis Horowitz and Sartaj Sahani, “Fundamentals of Computer Algorithms”, Computer Science Press Inc, Galgotia Book Sources Publications, New Delhi, 2014.
(Unit : V)

REFERENCE BOOKS

1. A.Chitra, P.T.Rajan, “Data Structures”, Second Edition, Vijay Nicole Imprints Private Limited, 2016.
2. D. Samanta “Classic Data Structures”, Second Edition, PHI Learning, New Delhi, 2019.
3. Narasimha Karumanchi, “Data Structures and Algorithms Made Easy”, Fifth Edition, CareerMonk Publications, 2017.
4. Florian Dedov, “The Bible of Algorithms and Data structures: A Complex Subject Simply Explained”, Kindle Edition, Amazon Digital Services LLC - KDP Print US, 2020.

SOFTWARE ENGINEERING
(Course Code: 21UCA43)

SEMESTER - IV

CORE - T7

HOURS - 4

CREDITS - 3

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the Professional Software Development & Software Process Models. **(K1)**
2. Summarize the Software Requirement Analysis and Specifications. **(K2)**
3. Illustrate Different Software Testing Methodologies. **(K3)**
4. Analyze the Function Oriented & Object Oriented Software Design. **(K4)**
5. Decide the Benefits and Problems of reusing software when developing new systems. **(K5)**
6. Design the Basic Project Management Practices in real life projects. **(K6)**

UNIT I INTRODUCTION

Evolution – Software Development Projects – Exploratory Style of Software Development – Emergence of Software Engineering – **SOFTWARE LIFE CYCLE MODELS** – Waterfall Model and its Extensions – Rapid Application Development (RAD) – Agile Development Models – Spiral Model.

UNIT II REQUIREMENT ANALYSIS AND SPECIFICATION

Requirement Gathering and Analysis – Software Requirement Specification – Formal System Specification – Axiomatic Specification – Algebraic Specification – **SOFTWARE DESIGN** – Overview of the Design Process – Cohesion and Coupling – Layered Arrangement of Modules – Approaches to Software Design.

UNIT III FUNCTION ORIENTED AND OBJECT ORIENTED SOFTWARE DESIGN

Overview of SA/SD Methodology – Structured Analysis – Developing the DFD Model of a System – Structures Design – **OBJECT ORIENTED SOFTWARE DEVELOPMENT** – Introduction to Patterns – Common Design Patterns – OOAD Methodology – Applications of the Analysis and Design Pattern – **USER INTERFACE DESIGN** – Characteristics of Good Interface – Basic Concepts – Types of User Interface – Fundamentals of Component based GUI – A User Interface Design Methodology.

UNIT IV CODING AND TESTING

Coding – Code Review – Software Documentation – Testing – Unit Testing – Black-Box Testing – White-Box Testing – Debugging – Program Analysis Tools – Integration Testing – System Testing – General Issues Associated with Testing.

UNIT V SOFTWARE PROJECT MANAGEMENT

Software Project Management Complexities – Responsibilities of a Software Project Manager – Project Planning – Metrics for Project Size Estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Heuristic Estimation Technique – Risk Management – Software Configuration Management – **SOFTWARE MAINTENANCE** – Characteristics of Software Maintenance – Software Reverse Engineering – Software Maintenance Process Models – **SOFTWARE RESUSE** – A Reuse Approach – Reuse at Organization Level.

TEXT BOOK:

1. Rajib Mall, “Fundamentals of Software Engineering”, Fifth Edition, PHI Learning Private Ltd, 2018.

REFERENCE BOOKS:

1. Roger Pressman S., “Software Engineering: A Practitioner's Approach”, Eighth Edition, McGraw Hill, 2019.
2. Ian Sommerville, “Software Engineering”, Tenth Edition, Pearson Publication, 2016.

PRACTICAL: ORACLE
(Course Code: 21UCA44)

SEMESTER - IV	CORE - P5	HOURS - 4	CREDITS - 2
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1. Creating, modifying and dropping Tables.
2. Creating tables with Referential and Check Constraints.
3. Inserting, Modifying, Deleting Rows.
4. Retrieving rows with Operators in where Clause.
5. Retrieving rows with Character, Number and Date functions.
6. Retrieving rows with Group functions and Having.
7. Joining Tables. (Inner and Outer).
8. Retrieving rows with Sub Queries.
9. PL/SQL programs with Control Structures.
10. PL/SQL programs with Cursors.
11. PL/SQL programs with Exception Handling.
12. Creating and Calling Procedures and Functions.

PRACTICAL: DATA STRUCTURES USING C++
(Course Code: 21UCA45)

SEMESTER - IV	CORE - P6	HOURS - 2	CREDITS - 1
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1. Program to perform matrix operations.
2. Program to implement Stack Operations.
3. Program to implement Queue Operations.
4. Program to implement Tree traversals.
5. Program to implement Singly Linked List.
6. Program to implement Merge sort.

ESSENTIALS OF FINANCIAL ACCOUNTING
(Course Code: 21UCAE41)

SEMESTER - IV	ELECTIVE - I	HOURS - 4	CREDITS - 4
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the Accounting Principles and Standards. **(K1)**
2. Discuss about Journal and Ledger. **(K2)**
3. Interpret the Trial Balance. **(K2)**
4. Calculate Profit and Loss Account and Balance Sheet. **(K3)**
5. Categorize Company final accounts. **(K4)**
6. Create Annual Reports for a Company. **(K6)**

UNIT I ACCOUNTING

The Language of Business – Accounting as an Information System – Generally accepted Accounting Principles – Accounting Equations – Accounting Standards.

UNIT II TYPES OF ACCOUNTS

Process of Recording Financial Information – Journal and Ledger – Manual Accounting System and Computerized Accounting System.

UNIT III SUB-DIVISION OF JOURNAL

Cash Book – Bank Reconciliation Statement – Capital and Revenue Items – Trial Balance and Errors.

UNIT IV PREPARATION OF FINAL ACCOUNT

Manufacturing Account – Trading Account – Profit and Loss Account and Balance Sheet – Adjustments in Final Account.

UNIT V COMPANY ACCOUNTS

Share Capital and Loan Capital – Understanding Company Final Accounts – Annual Reports of the Company.

TEXT BOOKS

1. S N Maheshwari, Sharad K Maheshwari, Suneel K Maheshwari. “An Introduction to Accountancy”, Vikas Publishing, Twelfth Edition, 2018.
2. T.S. Grewal, S.C. Gupta, “Introduction to Accountancy”, S. Chand Publishing, Tenth Edition, 2016.

REFERENCE BOOKS

1. Agarwal, “Financial Accounting”, Advance, Pitamber.
2. Prasanna Chandra, “Managers Guide to Finance & Accounting”, TMH.

MANAGEMENT INFORMATION SYSTEMS
(Course Code: 21UCAE41)

SEMESTER - IV

ELECTIVE - I

HOURS - 4

CREDITS - 4

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. List the strategic views of management information system. **(K1)**
2. Interpret the information security threats and management. **(K2)**
3. Illustrate the applications of MIS in Manufacturing and Service sectors. **(K3)**
4. Use Object Oriented technology and system analysis and design. **(K3)**
5. Infer the new situations by applying the acquired knowledge. **(K4)**
6. Evaluate the development process and strategic design of MIS. **(K5)**

UNIT I STRATEGIC VIEW OF MIS

Management Information Systems (MIS): MIS in Digital Age - MIS: Definition – MIS support to management- Evolving Business and MIS relationship – Changing the role of MIS in Digital Age – Constituents of MIS – evaluation of MIS Development Approaches – Management effectiveness and MIS – Organization as a system. Strategic Management of Business Performance: Creating a model of organization Excellence - Essentiality of Strategic Planning – Tools of planning – Balance score card, score card and dash board – Strategic management of Business performance- Key performance indicators in Context of MIS - Strategy – Three approaches of Development Strategy –Class and Types of Strategy

UNIT II INFORMATION SECURITY, IMPACT ON SOCIETY AND DECISION MAKING

Information Security Threats and Vulnerability – Controlling Security Threat and Vulnerability – Managing Security Threat in E – business – Disaster Management – Network Security – Cyber Security. Impact on Society –Impact of IT on Privacy – Ethics – Technical Solutions for Privacy Protection – Intellectual Property, Copyright and Patents – Impact of Information Technology on the Workplace – Information System Quality and Impact – Impact on Quality of Life. Decision Making - Concepts – Decision Making Process – Decision Analysis by Analytical Modeling – Behavioural Concepts in Decision Making – Organizational Decision Making – MIS and Decision Making.

UNIT III BUSINESSINTELLIGENCE AND SYSTEM ANALYSIS AND DESIGN

Information Concepts – Information: A Quality Product – Classification of the Information – Methods of Data and Information Collection – Value of the Information – General Model of a human as an Information Processor – Summary of Information Concepts and their Implications – Knowledge and Knowledge Management Systems – Business Intelligence – MIS, and the Information and Knowledge – System Concepts – Types of System – Classes of Systems – General Model of MIS – The Need for System Analysis – System Development Model – Structured System Analysis and Design (SSAD) – Object Oriented Analysis (OOA) – System Development through OOT: A Use Case Model– OOSAD Development Life Cycle.

UNIT IV DEVELOPMENT PROCESS AND STRATEGIC DESIGN OF MIS

Development of Long Range Plans of the MIS – Ascertaining the Class of Information – Determining the Information Requirement – Development and Implementation of the MIS – Management of Information Quality in the MIS – Organisation for

Development of MIS – MIS: Development Process Model – Strategic Management of the Business – Strategic Design of MIS – Development Process Steps for Strategic Design (SD) of MIS – Illustrating SD of MIS for Big Bazaar – Strategic Management of Business and SD of MIS – Business Strategy Determination – Business Strategy Implementation.

UNIT V APPLICATIONS

Applications in Manufacturing Sector: Introduction – Personnel Management (PM) – Financial Management (FM) – Production Management (PM) – Raw Materials Management (RMM) – Marketing Management – Applications in Service Sector: Introduction to Service Sector – Creating a Distinctive Service – Service Concept – Service Process Cycle and Analysis – Customer Service Design – Service Management System – MIS Applications in Service Industry – MIS: Service Industry.

TEXT BOOK

Waman S. Jawadekar, Sanjiva Shankar Dubey, “Management Information Systems”, McGraw Hill Education, Sixth Edition, 2020.

REFERENCE BOOKS

1. Kenneth C. Laudon, Jane Price Laudon, “Management Information Systems: Managing the Digital Firm”, Pearson Education, Fifteenth Edition, 2017.
2. James A O’Brien, George M. Marakas, Ramesh Behl, “Management Information Systems”, McGraw Hill Education, Eleventh Edition, 2018.

E-COMMERCE
(Course Code: 21UCAE41)

SEMESTER - IV	ELECTIVE - I	HOURS - 4	CREDITS - 4
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Outline the scope of E-Commerce. **(K4)**
2. Develop the concept of electronic market and market place. **(K6)**
3. Describe the business models. **(K1)**
4. Discuss about the business standards. **(K2)**
5. Illustrate the legal and security issues. **(K3)**
6. Influence the different technologies in Online shopping. **(K5)**

UNIT I

Main Activities of E-Commerce – Broad Goals of E-Commerce – E-Commerce technical Components – Functions of E-Commerce – Prospectus of E-Commerce – Lessons from E-Commerce Evolution – Scope of E-Commerce.

UNIT II

E-Commerce Technical Architecture – E-Commerce Strategies – E-Commerce Essentials – E-Commerce applications – Foundation of E-Commerce – Growth of E-Commerce – Advantages of E-Commerce – Disadvantages of E-Commerce – Progress of E-Commerce in India.

UNIT III

Driving the E-Commerce Revolution – E-Commerce Activities – Matrix of E-Commerce models – B2C – B2B – B2B Boom – E-Commerce opportunity Framework – Developing an E-Commerce Strategy – International E-Commerce – International Strategy Development – Dotcom Companies.

UNIT IV

Electronic Market: Online Shopping – Online Purchasing – Electronic Market – Three models of Electronic Market – Markets category – International Marketing – One-to-one Marketing – Permission Marketing – Pull and Push technologies – B2B Hubs – B2B market places – B2B exchange.

UNIT V

Electronic Business applications Emerging applications – Electronic Business Architecture – AMR Model for Electronic Business – Evolution of Electronic Business Application – Dotcom companies – The Indian scenario for E-Business – Electronic business implementations – B2B E-Commerce – B2C E-Commerce – B2B Market Place.

TEXT BOOK

C.S.V Murthy, “E-Commerce Concepts. Models, Strategies”, Second Edition, Himalaya Publishing House, 2019.

REFERENCE BOOKS

1. David Whiteley, “E-Commerce: Strategy, Technologies and Applications”, McGraw Hill Education, 2018.
2. Chaffey, “E-Business and E-Commerce Management: Strategy, Implementation and Practice”, Sixth Edition, Pearson Education India, 2018.

OPERATIONS RESEARCH
(Course Code : 21UCAA41)

SEMESTER - IV

ALLIED - T4

HOURS - 4

CREDITS - 4

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Solve Integer Programming Problems. **(K1)**
2. Explain Multi-criteria decision techniques. **(K2)**
3. Compute various Transportation and Assignment Problems. **(K3)**
4. Classify the Methodology of Operations Research. **(K4)**
5. Compare and solve the different Linear programming Problems. **(K5)**
6. Design Network flow Diagram. **(K6)**

UNIT I

INTRODUCTION: The Nature and Meaning of OR – Management Applications of OR – Modeling in OR – General methods for solving OR models – Scope of OR.

LINEAR PROGRAMMING PROBLEM : Formulation of LP problems – Graphical solution of LP problems – General formulation of LPP – Slack and Surplus variables – standard form of LPP – Some important form of LPP – Simplex Method.

UNIT II

ARTIFICIAL VARIABLE TECHNIQUES : Two phase method:

.INTEGER PROGRAMMING PROBLEM: Importance – Definitions– Gromory's Pure Integer Programming Problem.

UNIT III

ASSIGNMENT PROBLEM: Mathematical formulation – Hungarian method – Unbalanced assignment problem – Various types.

TRANSPORTATION MODEL: Mathematical formulation – Matrix form – Methods for finding Initial Basic Feasible Solution and optimal solution – Degeneracy in Transportation problems – Unbalanced Transportation problem.

UNIT IV

SEQUENCING PROBLEM: Assumptions – Solutions to sequencing problems: Processing on jobs through 2 machines – Processing n jobs through 3 machines – Processing n jobs on m machines.

UNIT V

PERT AND CPM TECHNIQUES: Basic Steps – Network diagram representation – Rutes for Drawing Network diagram – Labeling Fulkerson's I-J Rule – Time Estimates and Critical Path in Network analysis – Examples on optimum duration and minimum duration cost – PERT.

TEXT BOOK

S.D. Sharma, "Operations Research", KedamathRamnath & Co. Meerut, 2018

REFERENCE BOOKS

1. Hamdy Taha, "Operations Research", Prentice Hall, 2010.
2. V.Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan, "Resource Management Techniques", A.R. Publications, 2016.

PRACTICAL : OPERATIONS RESEARCH
(Course Code : 21UCAA42)

SEMESTER - IV	ALLIED - P2	HOURS - 2	CREDITS - 1
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1. Program for formulation of Linear Programming Problems.
2. Program to implement Transportation Problems.
3. Program to implement Assignment Problems.
4. Program to implement PERT/CPM.

WEB DESIGNING LANGUAGES
(Course Code: 21USB41)

SEMESTER - IV

SBE - 6

HOURS - 2

CREDITS - 2

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the basics of HTML, CSS and XML. **(K1)**
2. Explain the designs with links and tables. **(K2)**
3. Use images and forms for designing web page. **(K3)**
4. Analyze the usage of CSS. **(K4)**
5. Evaluate XML and its components. **(K5)**
6. Design Web pages using web design languages. **(K6)**

UNIT I INTRODUCTION TO HTML

Fundamentals of HTML: Understanding Elements – Understanding Line Breaks – Understanding a Paragraph – Formatting Text with HTML Elements – Arranging Text– Displaying Lists.

UNIT II WORKING WITH LINKS, TABLES AND IMAGES

Exploring the Hyperlinks–Understanding Tables – Describing the TABLE Elements – Inserting Images in a Webpage.

UNIT III WORKING WITH FORMS

Exploring the FORM Element – Exploring Types of the INPUT Element – Exploring the BUTTON Element – Exploring the Multiple–Choice Elements – Exploring the TEXT AREA and LABEL Elements – Submitting a Form.

UNIT IV OVERVIEW OF CSS

Understanding the Syntax of CSS – Inserting CSS in an HTML Document – Internal style sheet – external style sheet –inline style sheet - Properties – background – color – font and text styles.

UNIT V XML

XML Basics: Creating Well – Formed XML – XML elements – XML Attributes – XML tree – XML comments – working with internal and external DTD.

TEXT BOOK

Kogent Learning Solutions Inc., “HTML5 Black Book”, Second Edition, DreamtechPress, 2016.

REFERENCE BOOKS

1. Mike McGrath, “HTML5 in Easy Steps”, BPB Publications, Second Edition, 2017.
2. Thomas A. Powell, “The Complete Reference – HTML& CSS”, McGraw Hill Education, Fifth Edition, 2017.
3. Heather Williamson, “The Complete Reference – XML”, Tata McGraw Hill Edition, 2011.

PRACTICAL LIST

1. Designing a simple web page.
2. Designing web page using lists.
3. Designing web page using hyperlinks.
4. Designing web page using tables.
5. Designing web page using forms.
6. Designing web page using CSS.
7. Designing web page using XML.

.NET PROGRAMMING USING C#
(Course Code: 21UCA51)

SEMESTER - V

CORE - T8

HOURS - 4

CREDITS - 4

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe Decision making and Looping statements. **(K1)**
2. Interpret the concepts of classes and objects and Inheritance. **(K2)**
3. Apply the process of defining and invoking methods. **(K3)**
4. Analyze about interfaces and operator overloading. **(K4)**
5. Evaluate the various String Methods. **(K5)**
6. Create Windows Applications and Web-based Applications. **(K6)**

UNIT I INTRODUCTION

Introduction: Evolution of C# – Characteristics of C# – Applications of C# – Origin of .NET Technology – Benefits of the .NET Approach – Simple C# Program – Literals, Variables and Data Types – Decision Making and Branching Statements – Looping Statements.

UNIT II METHODS, HANDLING ARRAYS AND STRINGS

Methods in C# – Declaring Methods – Invoking Methods – Nesting of Methods – Method Overloading – One-Dimensional Arrays – Two-Dimensional Arrays – Array List Class – Manipulating Strings – Creating Strings – String Methods – Inserting strings – Comparing Strings – Finding Substrings – Array of Strings.

UNIT III CLASSES AND OBJECTS AND INHERITANCE

Classes and Objects – Defining a Class – Adding variables and methods – Creating objects – Constructors – Member Initialization – this Reference – Nesting of Classes – Classical Inheritance – Containment Inheritance – Defining a subclass – Defining Subclass Constructors – Multilevel Inheritance – Hierarchical Inheritance.

UNIT IV INTERFACES AND OPERATOR OVERLOADING

Overriding Methods – Defining an interface – Implementing interfaces – Explicit interface implementation – Need for Operator overloading – Defining Operator Overloading – Overloading Binary Operators – Overloading Comparison Operators.

UNIT V EXCEPTIONS AND WEB-BASED APPLICATIONS

Exceptions – Types of errors – Multiple Catch Statements – Exception Hierarchy – General Catch Handler – Using Finally Statement – Creating Window Forms – Customizing a Form – Creating and Running a Windows Application – Creating Web-based Application on .NET – Creating a .NET application to send SMS to mobile phones.

TEXT BOOK

E. Balagurusamy, “Programming in C#”, Fourth Edition, Tata McGraw Hill Education, 2017.

REFERENCE BOOKS

1. John Sharp, “Microsoft Visual C# Step by Step”, Eighth Edition, PHI Publications, 2016.
2. Herbert Schildt, “C# - The Complete Reference”, First Edition, McGraw Hill Education, 2017.
3. Bill Wagner, “Effective C#”, Third Edition, Pearson Education, 2017.

OPERATING SYSTEMS AND LINUX
(Course Code: 21UCA52)

SEMESTER - V

CORE - T9

HOURS - 4

CREDITS - 4

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Define the basic concepts of the operating system. **(K1)**
2. Describe about the process concepts and scheduling. **(K2)**
3. Describe the LINUX Concepts and Applications. **(K2)**
4. Demonstrate the LINUX Shell Programming Scripts. **(K3)**
5. Categorize the methods of handling deadlocks in operating system. **(K4)**
6. Evaluate about the LINUX file systems. **(K5)**

UNIT I OPERATING SYSTEM INTRODUCTION

Introduction: Operating System – Computer System Organization – Operating System Structure – Operations – Process Management – Memory Management – Storage Management – Protection and Security **System structures:** Operating System Services – User Operating System Interface – System Calls – Types of System Calls – System Programs – Operating System Structure.

UNIT II PROCESS MANAGEMENT

Process Concept: Process Scheduling – Operations on Processes – Inter Process Communication **Process Scheduling:** Basic concepts – Scheduling Criteria – Scheduling Algorithms **Synchronization:** Background – Critical Section Problem – Mutex locks – Semaphores – Classic problems of synchronization.

UNIT III DEAD LOCKS

Deadlocks: System Model – Deadlock Characterization – Methods of Handling Deadlocks – Deadlock prevention – Deadlock Avoidance **Memory Management Strategies:** Background – Swapping – Contiguous Memory allocation – Segmentation – Paging Virtual Memory Management: Background – Demand Paging – Page replacement;

UNIT IV LEARNING THE SHELL

What is the Shell – Navigation – Understanding the File System Tree – Exploring the System – Manipulating Files and Directories – Working with Commands – Redirection – Redirecting Standard Output - Redirecting Standard Input – Pipelines – Filters - Permissions – Processes – **CONFIGURATION AND THE ENVIRONMENT** – A Gentle Introduction to Vi – Customizing the Prompt – Regular Expressions.

UNIT V SHELL SCRIPTING

Writing Shell Scripts – Script File Format – Executable Permissions – Variables and Constants – Shell Functions – Local Variables – FLOW CONTROL – Branching with IF – Looping with While/Until – Branching with CASE – Looping with FOR.

TEXT BOOKS

1. Abraham Silber Schatz, Peter Baer Galvin, Greg Gagne, “Operating System Concepts”, Ninth Edition, Wiley India, 2018.
2. William Shotts, “The Linux Command Line”, Second Edition, William Pollock Publisher, 2019.

REFERENCE BOOKS

1. Gary J.Nutt,“Operating Systems”, Second Edition, Pearson Education Asia, 2013.
2. H.M.Deital, “Operating Systems”, Second Edition, Addison-Wesley Publishing Company, 2011.
3. Richard Blum, Christine Bresnahan, “Linux Command Line and Shell Scripting Bible”, Third Edition, Wiley, 2015.

J2EE
(Course Code: 21UCA53)

SEMESTER - V	CORE - T10	HOURS - 4	CREDITS - 4
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe J2EE Multi-Tier Architecture. **(K1)**
2. Interpret the process of session tracking using Servlets. **(K2)**
3. Examine Remote Method Invocation. **(K3)**
4. Illustrate the use of JDBC with Servlet and JSP. **(K4)**
5. Create servlet programs using HTTPRequest and HTTPResponse objects. **(K6)**
6. Design JSP applications using JSP tags and JSP implicit objects. **(K6)**

UNIT I J2EE MULTI-TIER ARCHITECTURE

J2EE Multi-Tier Architecture – Client Tier Implementation – Web Tier Implementation – Enterprise JavaBeans Tier Implementation – Enterprise Information Systems Tier Implementation.

UNIT II SERVLETS

Java Servlets: Benefits of using a Servlet – A simple Java Servlet. Reading Data from a Client – Sending data to a Client – Working with Cookies – Tracking Sessions.

UNIT III JSP

JSP: JSP Tags – Variables and Objects – Methods – Control Statements – Loops – Cookies – JSP Implicit Objects.

UNIT IV RMI

RMI: Remote Method Invocation Concept – Remote Interface – Passing Objects – The RMI Process – Server Side – Client Side.

UNIT V JAVA DATABASE CONNECTIVITY

JDBC: Types of Drivers – Steps to establish connectivity – Example of connectivity.

TEXT BOOKS

1. Jim Keogh, “The Complete Reference J2EE”, Tata McGraw Hill Edition, 2017.
2. Dr. K. Somasundaram, “Programming in Java 2”, Jaico Publishing House, 2005. (Unit-V)

REFERENCE BOOKS

1. Santosh Kumar. K, “JDBC, Servlet 3.1 and JSP 2.3 Black Book”, Second Edition, Dreamtech Press, 2016.
2. Recommended by CDAC, ”Core and Advanced Java Black Book”, First Edition, Dreamtech Press, 2018.

PYTHON PROGRAMMING
(Course Code: 21UCA54)

SEMESTER - V	CORE - T11	HOURS - 4	CREDITS - 4
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the basic Programming Constructs of Python and Applications. **(K1)**
2. Interpret Objects and other entities of Python. **(K2)**
3. Develop proficiency in creating applications using the Python Programming Language. **(K3)**
4. Outline the Conditional structures and loops. **(K4)**
5. Compare the various data structures available in Python programming language and apply them in solving computational problems. **(K5)**
6. Compose a systematic approach to design, organize, write and debug programs. **(K6)**

UNIT I INTRODUCTION AND OVERVIEW

Introduction and overview: Introduction to Python, Origin, Features, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries. **Syntax and Style:** Statements and Syntax, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management, Python Application Examples.

UNIT II PYTHON OBJECTS, NUMBERS AND STRINGS

Python Objects: Python Objects, Standard Types, Other Built – in Types, Internal Types, Standard Type Operators, Standard Type Built – in Functions, Categorizing the Standard Types, Unsupported Types. **Numbers and Strings:** Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built – in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String – only Operators, Built – in Functions, String Built – in Methods, Special Features of Strings.

UNIT III LISTS, CONDITIONALS AND LOOPS

Lists: Operators, Built – in Functions, List Type Built – in Methods, Special Features of Lists, Tuples, Tuple Operators and Built – in Functions, Special Features of Tuples.

Conditionals and Loops: if statement, else Statement, else if Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement.

UNIT IV FILES AND INPUT/OUTPUT

Files and Input/output: File Objects, File Built – in Function, File Built – in Methods, File Built – in Attributes, Standard Files, Command – line Arguments, File System, File Execution, Persistent Storage Modules. **Errors and Exceptions:** Exceptions in Python – Detecting and Handling Exceptions – Context Management – Exceptions as Strings – Raising Exceptions – Assertions – Standard Exceptions – Creating Exceptions

UNIT V FUNCTIONS, OBJECT ORIENTED PROGRAMMING

Functions and Functional Programming: Functions – Calling Functions – Creating Functions – Passing Functions – Formal Arguments – Variable Length Arguments – Functional Programming – Variable Scope – Recursion – Generators. **Object Oriented Programming:** Classes – Class Attributes – Instances – Instance Attributes – Binding and Method Invocation – Static Methods and Class Methods – Composition – Sub classing and Derivation – Inheritance – Built – in – functions for Classes – Delegation

TEXT BOOK

Chun, J Wesley, “Core Python Programming”, Second Edition, Pearson, 2012.

REFERENCE BOOKS

1. John M Zelle, Python Programming: An Introduction to Computer Science Paperback – Illustrated”, Third edition, 2016.
2. John V. Guttag, “Introduction to Computation and Programming Using Python”, Revised and Expanded Edition, The MIT Press, 2013.
3. Mark Summerfield, “Programming in Python 3: A Complete Introduction to the Python Language”, Pearson Education, Second Edition, 2010.
4. Barry, Paul, “Head First Python”, O Reilly, Second Edition, 2010.

PRACTICAL: .NET PROGRAMMING USING C# (Course Code: 21UCA55)

SEMESTER - V	CORE - P7	HOURS - 4	CREDITS - 2
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1. Program using decision statements.
2. Program using iteration statements.
3. Program using method overloading.
4. Program using One Dimensional and Two Dimensional Arrays.
5. Program using Strings.
6. Program using classes and objects.
7. Program using inheritance.
8. Program using interface.
9. Program using binary operator overloading.
10. Program using exception handling with multiple catch statements.
11. Designing a Windows Application using Window Forms.
12. Designing a Web-based Application.

PRACTICAL: LINUX
(Course Code: 21UCA56)

SEMESTER - V	CORE - P8	HOURS - 2	CREDITS - 1
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1. Execution of various file/directory handling commands.
2. Simple shell script for basic arithmetic and logical calculations.
3. Shell scripts to check various attributes of files and directories.
4. Shell script using Else-if statement.
5. Shell script using While/Until Loop.
6. Shell script using For Loop.
7. Shell script using CASE.

PRACTICAL: J2EE
(Course Code: 21UCA57)

SEMESTER - V	CORE - P9	HOURS - 2	CREDITS - 1
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1. Simple Servlet Program.
2. Session Tracking using HttpSession Object.
3. Implementing Cookies using Servlet.
4. Simple JSP Program.
5. Accessing Database with Servlet and JSP using JDBC.
6. Program using JSP implicit objects.

PRACTICAL: PYTHON PROGRAMMING
(Course Code: 21UCA58)

SEMESTER - V	CORE - P10	HOURS - 2	CREDITS - 1
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1. Programs using Control Structures
2. Programs using Sequences
3. Programs using Strings
4. Programs using Lists
5. Programs using Tuples
6. Programs using Files
7. Programs for Exception Handling
8. Programs using Functions

DATA MINING
(Course Code: 21UCAE51)

SEMESTER - V	ELECTIVE - II	HOURS - 4	CREDITS - 3
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Define the Data mining Techniques and preprocessing methods for any given raw data. **(K1)**
2. Interpret the Data warehouse Design and Implementation. **(K2)**
3. Examine the useful patterns and associations in huge amount of data. **(K3)**
4. Categorize the interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes. **(K4)**
5. Evaluate and implement a wide range of emerging and newly – adopted methodologies and technologies to facilitate the knowledge discovery. **(K5)**
6. Generate frequent set of items using Association Rule Mining. **(K6)**

Unit I DATA MINING AND DATA PREPROCESSING

Introduction to Data Mining – Fundamentals of Data Mining – Data Mining Functionalities – Data and Attribute types – Statistical Description of Data – Data Preprocessing: Data Cleaning – Data Integration – Data Reduction – Data Transformation and Data Discretization.

Unit II DATA WAREHOUSING

Data Warehousing: Basic Concepts – Data Ware House Modelling Data Cube and OLAP – Data Warehouse Design and Implementation.

Unit III MINING FREQUENT PATTERN AND ASSOCIATIONS

Mining Frequent Patterns and Associations: Basic Methods – Frequent Item Set Mining Methods Any Two Algorithms – Pattern Evaluation Methods.

Unit IV CLASSIFICATION

Classification: Basic Concepts – Decision Tree Induction – Bayes Classification – Any Two Advanced Methods – Model Evaluation.

Unit V CLUSTER ANALYSIS

Cluster Analysis: Basic Concepts – Clustering Structures – Major Clustering Approaches – Partitioning Methods – Hierarchical Method – Density Based Methods – The Expectation Maximization Method – Cluster Based Outlier Detection Essential Reading.

TEXTBOOK

Jiawei Han, Micheline Kamber and Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann, 2012.

REFERENCE BOOKS

1. G.K. Gupta, “Introduction to Data mining with case studies”, Third Edition, PHI Learning Private limited, New Delhi, 2014.
2. Charu C. Aggarwal, “Data Mining”, Springer, 2015.

SOFTWARE TESTING
(Course Code: 21UCAE51)

SEMESTER - V	ELECTIVE - II	HOURS - 4	CREDITS - 3
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the concepts of Software testing process. **(K1)**
2. Explain the planning for testing. **(K2)**
3. Determine the various verifications of testing. **(K3)**
4. Illustrate the different types of testing. **(K4)**
5. Evaluate the testing processes. **(K5)**
6. Develop the testing procedures. **(K6)**

UNIT I OVERVIEW OF THE SOFTWARE TESTING PROCESS

Overview of the Software testing process: Advantages of Following a Process – The Cost of Computer Testing – The Seven Step Software Testing Process – Workbench Skills – Organizing for Testing: Objective – Workbench – Input – Do Procedures – Task 1 to 5 – Check Procedures – Output

UNIT II DEVELOPING THE TEST PLAN

Developing the test plan: Overview – Objective – Concerns – Workbench – Input – Do procedures – Task 1 to 6 – Check Procedures – Output

UNIT III VERIFICATION TESTING

Verification testing: Overview – Objective – Concerns – Workbench – Input – Do Procedures – Task 1 to 3 – Check Procedures – Output

UNIT IV VALIDATION TESTING

Validation testing: Overview – Objective – Concerns – Workbench – Input – Do Procedures – Task 1 To 3 – Check Procedures – Output
Analyzing and Reporting Test Results: Overview – Objective – Concerns – Workbench – Input – Do Procedures – Task 1 to 3 – Check Procedures – Output.

UNIT V ACCEPTANCE AND OPERATIONAL TESTING

Acceptance and operational testing: Overview – Objective – Concerns – Workbench – Input Procedures – Task 1 to 3 – Check Procedures – Output. **Post – Implementation Analysis:** Overview – Concerns – Workbench – Input – Do Procedures – Task 1 to 7 – Check Procedures – Output.

TEXT BOOK

William E. Perry, “Effective Methods for Software Testing”, Third Edition, Wiley India edition, 2006.

REFERENCE BOOK

Elfriede Dustin, “Effective Software Testing”, First Edition, Addison Wesley, 2003.

MACHINE LEARNING
(Course Code: 21UCAE51)

SEMESTER - V

ELECTIVE - II

HOURS - 4

CREDITS - 4

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the types of Machine Learning and its applications. **(K1)**
2. Discuss about Feature Engineering and Bayesian Concept Learning. **(K2)**
3. Illustrate the Supervised Learning and Model Representation. **(K3)**
4. Classify the Decision Tree Algorithms and Clustering Techniques. **(K4)**
5. Evaluate the Support Vector Machine and Unsupervised Learning Algorithms. **(K5)**
6. Design a Basic Artificial Neural Network using Deep Learning Techniques. **(K6)**

UNIT I INTRODUCTION TO MACHINE LEARNING

Need for Machine Learning – Types of Machine Learning: Supervised Learning – Unsupervised Learning – Reinforcement Learning – Applications of Machine Learning – Type of Data in Machine Learning – Data Quality and Data Pre-Processing – Tools in Machine Learning.

UNIT II MODELING, EVALUATION, FEATURE ENGINEERING AND BAYESIAN CONCEPT LEARNING

Selecting Model – Training Model – Model Representation and Interpretability – Evaluating performance of a model – Improving performance of model – Define Feature Engineering – Feature transformation – Feature subset selection – Bayesian theorem and concept learning.

UNIT III SUPERVISED LEARNING: CLASSIFICATION AND REGRESSION

Introduction to Supervised Learning – Its examples – Classification model – Classification learning steps – Classification algorithms: K-nearest Neighbor (KNN) – Decision Tree – Random forest – Support Vector Machine (SVM) – Introduction to Regression and its examples – Regression algorithms: Simple Linear Regression – Multiple Linear Regression – Problems in Regression Analysis – Logistic Regression.

UNIT IV UNSUPERVISED LEARNING: CLUSTERING AND FINDING PATTERNS

Introduction to Unsupervised Learning – Supervised Learning vs. Unsupervised Learning – Application of Unsupervised Learning – Clustering: Types of clustering techniques – Partitioning methods – K-Medoid – Hierarchical clustering – Density based methods – DBSCAN – Finding patterns using Association Rules – Apriori Algorithm.

UNIT V BASICS OF NEURAL NETWORK

Introduction – Artificial neuron – Types of activation functions – Implementation of ANN – Architectures of Neural Network – Learning process in ANN – Active Learning – Memory based Learning – Bootstrap aggregation (bagging) – Boosting – Gradient Boosting Machines (GBM) – Introduction to Deep Learning and its need and applications.

TEXT BOOK

Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, First Edition, Pearson, 2018.

REFERENCE BOOKS

1. Vincy Joseph, Anuradha Srinivasaraghavan, “Machine Learning”, First Edition, Wiley Publication, 2019.
2. Rajiv Chopra, “Machine Learning”, Second Edition, Khanna Publishing Ltd., 2018.

ANDROID PROGRAMMING
(Course Code: 21UCA61)

SEMESTER - VI	CORE - T12	HOURS - 5	CREDITS - 5
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Recite the building units of Android. **(K1)**
2. Differentiate Activities and Fragments. **(K2)**
3. Examine Various features in Android Application Development. **(K3)**
4. Infer various UI components. **(K4)**
5. Evaluate and debug the Android Applications. **(K5)**
6. Build new Innovative Android Applications. **(K6)**

UNIT I GETTING STARTED

Android: Versions – Features – Architecture – Android Studio – Android SDK – Creating Android Virtual Devices – Exploring IDE – Debugging Application – Setting Breakpoints – Navigating paused code – Publishing Application.

UNIT II ACTIVITIES FRAGMENTS, INTENTS

Activities: Understanding Activities – Applying styles and themes – Hiding activity title – Displaying Dialog window – Progress dialog – Linking Activities using Intents – Passing data and returning results using Intent. **Fragments:** Adding fragment dynamically – Life cycle of Fragment – Interactions between Fragments – Understanding Intent Object – Using Intent Filters.

UNIT III USER INTERFACE AND VIEWS

User Interface: Understanding the components of a screen – Adopting display Orientation – Managing Changes to screen Orientation – Utilizing Action Bar – Creating user interface programmatically. **Views:** Using Basic views – Picker views – List views – Understanding specialized fragments. **Displaying Pictures and Menus with Views:** Image views – Menus with Views – WebView.

UNIT IV DATA PERSISTENCE

Saving and Loading user Preferences: Accessing preferences – Retrieving and modifying preference values. **Persisting Data to Files:** Internal Storage – External Storage. **SQLite Database** – DBA helper class – Using DB programmatically.

UNIT V CONTENT PROVIDERS, MAPS

Content providers: Using Content Providers – Creating your own Content Providers. **Location Based Services:** Displaying Maps – Getting Location Data – Monitoring a Location.

TEXTBOOK

J.F. DiMarzio, “Beginning Android Programming with Android Studio”, Fourth Edition, John Wiley & Sons Inc., 2017.

REFERENCE BOOKS

1. Ian F. Darwin, Android Cookbook: Problems and Solutions for Android Developers, Second Edition, O’Reilly Media, Inc., 2017.
2. Wallace Jackson, “Android Apps for Absolute Beginners”, Fourth Edition, Apress, 2017.
3. James C. Sheusi, “Android Application Development for Java Programmers”, Cengage Learning India Private Limited, New Delhi, 2013.
4. Jeff Friesen, “Learn Java for Android Development”, Second Edition, Apress, 2013.

PHP PROGRAMMING
(Course. Code: 21UCA62)

SEMESTER - VI	CORE - T13	HOURS - 5	CREDITS - 5
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the basics of Programming Fundamentals. **(K1)**
2. Explain the Control Structures, arrays and Functions. **(K2)**
3. Discuss the Object Oriented Programming Concepts. **(K2)**
4. Determine the Various Categories of Functions. **(K3)**
5. Illustrate Web Form Handling, Cookies and Sessions. **(K4)**
6. Evaluate the SQL statements and Executing the queries. **(K5)**
7. Develop Web Applications in PHP. **(K6)**

UNIT I INTRODUCTION TO PHP

PHP History – Unique feature – Writing and running the script – Mixing PHP with HTML – Variables and Operators – Assigning Values to Variable – Destroying and inspecting Variable Content – PHP Data Types – Manipulating Variable with Operators.

LEARNING PHP LANGUAGE: Basic Building Blocks: Variable – Data Type – Operators & Expression – Constant. Control Structures: if – if else, if else if..else – for, foreach – do-while – while – break – continue – switch.

UNIT II ARRAY, FUNCTIONS, DATE– TIME

ARRAYS: Anatomy of an Array: indexed and Associative Array – Creating Arrays – Accessing Array Elements – Looping through Array – Multidimensional Array – and Manipulating Array using array functions.

FUNCTIONS: What and why function – User– Defined Function – Function Arguments– Returning values – Calling Function – Variable Function, and Recursive Function – String – Creating & Accessing String – String Manipulation using string functions

DATE–TIME: Understanding Timestamp – Getting current date & time – Extracting date time values – format character for date – Formatting Date String.

UNIT III CLASSES AND OBJECTS

Introduction to OOPs Concepts – Visibility Controls– Creating Class and Object – Create and using properties & methods – Overloading – Constructor – Destructor – Object Inheritance.

UNIT IV WEB FORM HANDLING , COOKIES & SESSION

Capturing form Data with PHP – Dealing with Multi-value Fields – Validating Form Input – Generating Web Forms – Storing Variable in Forms – Working with Multipage Forms – Creating File – Upload Forms – Redirecting form submission.

PRESERVING STATE IN PHP: Understanding cookies – Session & Query String – Saving State with Query String – Working with cookies – PHP Session to store data.

UNIT V DATABASE CONNECTIVITY & SQL

Database – Records – Primary and Foreign Key – SQL statements – Creating Database – Adding Tables – Adding Records – Executing Queries – Modifying and removing Records – Retrieving Data – Returning data as array and object.

TEXT BOOK

VikramVaswani, “PHP A beginner’s Guide”, First Edition, Tata McGraw Hill, 2008.

REFERENCE BOOKS

1. Steven Holzner , “The Complete Reference PHP 5.2” , McGraw Hill Education, 2017.
2. Luke Welling , “PHP and MySQL Web Development”, Fifth Edition, Addison-Wesley, 2016.

COMPUTER NETWORKS
(Course Code: 21UCA63)

SEMESTER - VI

CORE - T14

HOURS - 5

CREDITS - 5

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. List down the Network models and protocol suite. **(K1)**
2. Explain Various transmission media. **(K2)**
3. Illustrate digital and analog signals. **(K3)**
4. Analyze the flow of transmission and recovery methods. **(K4)**
5. Evaluate Various multiple access methods. **(K5)**
6. Generate solutions for congestion issues and formulate the ideas about DNS. **(K6)**

UNIT I NETWORK MODELS, TRANSMISSION MEDIA

Introduction: Data Communications – Networks – Internet Protocols and standards.
Network Models: Layered Tasks – The OSI Model – Layers in the OSI Model – TCP/IP Protocol Suite – Addressing. **Transmission media:** Guided Media – Unguided media.

UNIT II DIGITAL AND ANALOG TRANSMISSION, BANDWIDTH UTILIZATION

Digital Transmission: Digital-to-Digital conversion – Analog-to-Digital conversion – Transmission modes. **Analog Transmission:** Digital-to-Analog conversion – Analog-to-Analog conversion. **Bandwidth Utilization:** Multiplexing – Spread spectrum.

UNIT III SWITCHING, ERROR DETECTION AND CORRECTION , DATA LINK CONTROL

Switching: Circuit Switched Networks – Datagram Networks – Virtual-circuit Networks – Structure of Switch. **Error Detection and Correction:** Introduction – Block Coding – Linear Block Codes – Cyclic Codes – Checksum. **Data Link control:** Framing – Flow and Error Control – Noiseless Channel – Noisy Channel.

UNIT IV MULTIPLE ACCESS, WIRELESS LAN

Multiple Access: Random Access – ALOHA – CSMA – CSMA/CD – CSMA/CA – Controlled Access – Reservation – Polling – Token Passing – Channelization – FDMA – TDMA – CDMA.

WirelessLAN: Bluetooth – Architecture – Bluetooth Layers – Radio Layer – Baseband Layer – L2CAP – Other Upper Layers.

UNIT V NETWORK LAYER, CONGESTION CONTROL AND DNS

Network Layer: Delivery – Forwarding – Unicast Routing and Multicast routing. **Congestion Control:** Open Loop congestion control and Closed Loop congestion control. **Domain Name System:** Name Space – Domain Name space.

TEXT BOOK

Behrouz A Forouzan, “Data Communications and Networking”, Fifth Edition, McGrawHill Higher Education, 2017.

REFERENCE BOOKS

1. Andrew S Tanenbaum, “Computer Networks”, Fifth Edition, Pearson Publications, 2011.
2. Achyut and Godbole, “Data Communications and Computer Networks”, Tata McGraw Hill Edition, 2006.

PRACTICAL: ANDROID PROGRAMMING
(Course Code: 21UCA64)

SEMESTER - VI	CORE - P11	HOURS - 4	CREDITS - 2
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1. Program to display a message using Toast
2. Program to display alert messages
3. Application using different Layouts
4. Program to implement Activity Life Cycle
5. Program using Colors and Styles
6. Program using Check Boxes and Radio Buttons
7. Program using Spinner
8. Program for Menu Creation
9. Program using Implicit Intents
10. Program using Explicit Intents
11. Program using Fragments.
12. Program using SQLite database

PRACTICAL: PHP PROGRAMMING
(Course Code : 21UCA65)

SEMESTER - VI	CORE- P12	HOURS - 4	CREDITS - 2
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1. Program to display the sum of the given number using function.
2. Program for demonstration of string functions.
3. Program that will use the concept form.
4. Program to read the employee details using form component.
5. Program for demonstrating an Array.
6. Program to prepare student Mark sheet using switch statement.
7. Program for create and write the contents into the file.
8. Program to open and read the contents of the file.
9. Program for uploading the file.
10. Program to send Mail from PHP Script.
11. Program to count the number of visitors using session.
12. Program using database.

EXTRA CREDIT COURSES

FUNDAMENTALS OF COMPUTERS

(Course Code : 21UEC11)

SEMESTER - I

ECC

CREDITS - 3

COURSE OUTCOMES:

On successful completion of the course the students will be able to

1. Identify and analyze computer hardware, software, and network components. **(K1)**
2. Explain the needs of hardware and software required for a computation task. **(K2)**
3. Demonstrate the building up of Sequential and combinational logic from basic gates. **(K3)**
4. Analyze compression techniques and file formats to determine effective ways of securing, managing, and transferring data. **(K4)**
5. Make intelligent computer purchase decisions. **(K5)**
6. Integrating hardware and software. **(K6)**

UNIT I EVOLUTION OF COMPUTERS

Evolution of Computers: Generations – Types of computers – Computer system characteristics – Basic components of a Digital Computer – Control unit – ALU – Input/Output functions and memory – Memory addressing capability of a CPU – Word length of a computer – Processing speed of a computer – Computer Classification.

UNIT II INPUT AND OUTPUT UNITS

Input/Output Units: Keyboard – Mouse – Trackball – Joystick – Digitizing tablet – Scanners – Digital Camera – MICR – OCR – OMR - Bar-code Reader - Voice Recognition – Light pen – Touch Screen - Monitors and types of monitor – Digital – Analog – Size – Resolution – Refresh Rate – Dot Pitch – Video Standard – VGA – SVGA – XGA etc. – Printers & types – Daisy wheel – Dot Matrix – Inkjet – Laser – Line Printer – Plotter – Sound Card and Speakers.

UNIT III MEMORY

Memory: RAM – ROM – EPROM - PROM and other types of memory – Storage fundamentals – Primary vs. Secondary Data Storage – Various Storage Devices – Magnetic Tape – Magnetic Disks – Cartridge Tape – Hard Disk Drives – Floppy Disks (Winchester Disk) – Optical Disks – CD – VCD – CD-R – CD-RW – Zip Drive – Flash drives Video Disk – Blue Ray Disc – SD/MMC Memory cards – Physical structure of floppy & hard disk – Drive Naming Conventions in PC – DVD – DVD-RW – USB Pen drive.

UNIT IV SOFTWARE AND ITS TYPES

Software and its Need: Types of Software – System software – Application software – System Software – Operating System – Utility Program – Algorithms – Flow Charts – Symbols – Rules for making Flow chart – Programming languages – Assemblers – Compilers and Interpreter – Computer Applications in various fields.

UNIT V INTERNET CONCEPTS

Internet Concepts: Introduction to Internet – Connecting to the Internet Hardware – Software & ISPs – Search Engines – Web Portals – Online Shopping – Email – Types of Email – Compose and send a message – Reply to a message – Working with emails – Surfing in the Internet.

TEXT BOOK

P.K. Sinha, “Computer Fundamentals”, New Age International Publishers, 2014.

<https://www.edutechlearners.com/computer-fundamentals-p-k-sinha-free-pdf>

REFERENCE BOOKS

1. S.K. Basandra, “Computers Today”, Galgotia Publications.
2. Shree Sai Prakashan, “PC Software”, Meerut.

M-COMMERCE
(Course Code: 21UEC21)

SEMESTER - I

ECC

CREDITS - 3

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the infrastructure for M-commerce. **(K1)**
2. Understanding the Mobile Commerce Technology. **(K2)**
3. Demonstrate an understanding of the foundations and importance of M-commerce. **(K3)**
4. Analyze the concept of Mobile Commerce. **(K4)**
5. Assess electronic payment systems. **(K5)**
6. Develop an understanding of Mobile Service Providers and Mobile Network. **(K6)**

UNIT I MOBILE COMMERCE

Introduction to Mobile Commerce - Scope of Mobile Commerce - Mobile Commerce Framework - Mobile Commerce Business Models - Mobile Commerce Applications – Mobile Commerce Services.

UNIT II APPLICATIONS

Mobile Commerce Applications – Mobile Application Development – Software Platforms – Software Tools – Mobile Commerce Technology – Wireless and Mobile Communication – Communication Systems – Wireless Communication – Satellite Communication – Mobile Communication Systems.

UNIT III DIGITAL CELLULAR TECHNOLOGY, 2G AND 3G

Digital Cellular Technology – Cellular Communication – Cellular Networks – Mobile Phone Cellular Network – Mobile Access Technology – Evolution of Mobile Communication Systems – 2G Systems – 3G Systems.

UNIT IV 4G AND 5G

4G Systems – 4G Features – 4G Technologies – 4G Objectives and Goals – 4G Deployment Plans – 5G Systems – Mobile Devices – Mobile Service Providers – Mobile Network Operators.

UNIT V MOBILE BANKING

Mobile Products – Mobile Banking – Tickets On Mobile – Mobile Payment – Security and Legal Aspects – Future of Mobile Commerce.

TEXT BOOK

Karabi Bandyo Padhyay, “Mobile Commerce”, PHI Learning Press, 2013.

REFERENCE BOOKS

1. Jeanne Hopkins, Jamie Turner, “Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business”, John Wiley & Sons Inc., 2012.
2. Paul Skeldon, “M- Commerce”, Crimson Publishing, 2012.

COMPUTER GRAPHICS
(Course Code: 21UEC31)

SEMESTER - III	ECC	CREDITS - 3
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COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Define the principles and techniques of graphics design. **(K1)**
2. Interpret various algorithms. **(K2)**
3. Examine various transformations. **(K3)**
4. Analyze the 3D-concepts and illumination models, which paves way for more exploration. **(K4)**
5. Compare the visible surface detection methods. **(K5)**
6. Design illumination models. **(K6)**

UNIT I OUTPUT PRIMITIVES

Output Primitives: Points and Lines – Line-Drawing algorithms – Loading frame Buffer – Line function – Circle-Generating algorithms – Ellipse-generating algorithms. Attributes of Output Primitives: Line Attributes – Curve attributes – Color and Grayscale Levels – Areafill attributes – Character Attributes.

UNIT II 2D CONCEPTS

2D Geometric Transformations: Basic Transformations – Matrix Representations – Composite Transformations – Other Transformations. 2D Viewing: The Viewing Pipeline – Viewing Co-ordinate Reference Frame – Window-to-Viewport Co-ordinate Transformation – 2D Viewing Functions – Clipping Operations – Point, Line, Polygon, Curve, Text and Exterior clippings.

UNIT III 3D CONCEPTS

3D Concepts: 3D Display Methods – 3D Graphics Packages. 3D Object Representations: Polygon Surfaces – Curved lines and Surfaces – Quadric Surfaces – Super quadrics – Blobby Objects – Spline representations. 3D Geometric Modeling and Transformations: Translation – Rotation – Scaling – Other Transformations – Composite Transformations – 3D Transformation functions.

UNIT IV VISIBLE SURFACE DETECTION METHODS

Visible-Surface Detection Methods: Classification of Visible-Surface algorithms – BackFace Detection – Depth-Buffer Method – A-Buffer method- Scan- Line Method – DepthSorting Method – BSP-Tree Method – Area-Subdivision Method – Octree Methods – Raycasting Methods – Curved surfaces – Wire frame Methods – Visibility-Detection functions.

UNIT V ILLUMINATION MODELS

Illumination Models: Properties of Light – Standard Primaries and the Chromaticity Diagram – Intuitive color Concepts – RGB Color Model – YIQ Color Model – CMY Color Model – HSV Color Model – Conversion between HSV and RGB models – Color selection and Applications.

TEXT BOOKS

Donald Hearn, M. Pauline Baker, “Computer Graphics”, Fourth Edition, PHI, 2012.

REFERENCE BOOKS

1. Foley Van Dam, Feigner Hughes, “Computer Graphics Principles and Practices”, Second Edition.
2. ISRD Group, “Computer Graphics”, Tata MCGraw Hill, 2012.

WIRELESS TECHNOLOGY
(Course Code: 21UEC41)

SEMESTER - IV

ECC

CREDITS - 3

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the basics of Wireless Transmission. **(K1)**
2. Differentiate the frequencies of Spread Spectrum and Modulation. **(K2)**
3. Demonstrate GSM. **(K3)**
4. Illustrate GPRS. **(K4)**
5. Evaluate MAC techniques. **(K5)**
6. Summarize Satellite Communication. **(K6)**

UNIT I

Wireless Transmission-I : Frequencies for communication – Frequencies for mobile communication – Frequencies and regulations – Signals (physical representation of data, function of time and location) – Fourier representation of periodic signals – Different representations of signals (w.r.t. freq and amp) – Antennas (isotropic radiator, simple dipoles, directed and sectorized) – MIMO – Signal propagation ranges – Signal propagation – shadowing, reflection, refraction, scattering, diffraction) – Multipath propagation – Effects of mobility.

UNIT II

Wireless Transmission-II: Modulation – Digital – Analog – Spread spectrum technology – DSS – FHSS – Cell structure – Frequency planning – Cell breathing.

UNIT III

Wireless Telecommunication Systems: GSM: Overview – Performance characteristics of GSM (wrt. analog sys.) – **GSM:** Mobile Services – Architecture of the GSM system – System Architecture – GSM – TDMA/FDMA – GSM hierarchy of frames – GSM protocol layers for signaling – Mobile Originated Call – Mobile Originated Call – 4 types of handover – Handover decision – Handover procedure – Data services in GSM – GPRS quality of service – GPRS architecture and interfaces – GPRS protocol architecture.

UNIT IV

3G-The Universal Mobile Telecommunication System (UMTS): UMTS Network Architecture – Release 99, UMTS Interfaces, UMTS Network Evolution – UMTS Release 5 – UMTS FDD and TDD – UMTS Channels – Logical Channels – UMTS downlink transport and physical channels – UMTS uplink transport and physical channels – UMTS Time Slots – UMTS Network Protocol – Architecture – Mobility Management for UMTS Network.

UNIT V

Medium Access Control: Motivation for a specialized MAC – SDMA – FDMA – TDMA – CDMA – Wireless LANs – Characteristics of wireless LANs – Comparison: Infrared vs. radio transmission – Comparison – Infrastructure vs. ad-hoc networks – 802.11 – Architecture of an infrastructure network – 802.11 – Architecture of an ad-hoc network – Basics of Satellite communication.

TEXT BOOKS

1. William Stallings, “Wireless Communications and Networks”, Pearson/Prentice Hall of India, 2019.
2. Maral. G and Bosquet. M, “Satellite Communications Systems Techniques and Technologies”, John Wiley & Sons, Fifth Edition, 2011.

REFERENCE BOOKS

1. Dharma Prakash, Agrawal and Qing-An Zeng, “Introduction to Wireless Mobile Systems” Thomson India, 2015.
2. Vijay K Garg, “Wireless Communication and Networking”, Morgan Kaufmann Publishers, 2010.
3. Siva Ram Murthy C and Manoj B S, “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall, 2004.

INTERNET OF THINGS
(Course Code : 21UEC51)

SEMESTER - V

ECC

CREDITS - 3

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the characteristics, physical and logical design of IoT. **(K1)**
2. Classify various domain specific IoTs **(K4)**
3. Differentiate IoT and M2M. **(K2)**
4. Illustrate the IoT design methodology. **(K3)**
5. Develop applications using Raspberry Pi with Python. **(K6)**
6. Summarize the role of Cloud in IoT. **(K5)**

UNIT I INTRODUCTION AND DOMAIN SPECIFIC IoTs

Introduction – Definition and Characteristics of IoT – Physical design of IoT – Logical Design of IoT – IoT enabling technologies – IoT levels and Deployment templates – Domain Specific IoTs: Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Lifestyle.

UNIT II IoT SYSTEM MANAGEMENT AND DESIGN METHODOLOGY

IoT and M2M: Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT – Software Defined Networking – Network Function Virtualization – Need for IoT System Management SNMP – Network operator requirements – NETCONF – YANG – IoT System Management with NETCONF-YANG – IoT Design methodology.

UNIT III IoT SYSTEMS LOGICAL DESIGN AND PHYSICAL DEVICES

IoT Systems-Logical Design using Python - Python data types and data structures – Control flow – Functions – Modules – Packages – File Handling – Date/Time operations – Classes – Python packages for IoT – IoT Physical devices and endpoints: Basic building blocks of IoT devices – Exemplary device: Raspberry Pi – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python.

UNIT IV IoT PHYSICAL SERVERS, CLOUD OFFERINGS AND CASE STUDIES

Introduction to Cloud storage models and Communication APIs – WAMP-AutoBahn for IoT – Xively Cloud for IoT – Python Web Application Framework - DJANGO – Designing a RESTful Web API – Amazon Web Services for IoT – Amazon EC2 – Amazon Autoscaling – Amazon S3 – Amazon RDS – Case studies illustrating IoT – Smart Lighting – Home Intrusion System – Smart Parking – Weather Monitoring System – Forest Fire Detection – Smart Irrigation – IoT printer.

UNIT V DATA ANALYTICS AND TOOLS FOR IoT

Introduction – Apache Hadoop – Mapreduce Programming Model – Hadoop Mapreduce Job Execution – Mapreduce Job Execution Workflow – Hadoop Cluster Setup – Tools for IoT – Chef – Setting up Chef – Chef Case studies – Puppet – Puppet case study – IoT Code Generator.

TEXT BOOK

Arshdeep Bahga, Vijay Madisetti, “Internet of Things: A Hands-on Approach”, Second Edition, Universities Press, 2019.

REFERENCE BOOKS

1. Ammar Rayes, Samere Salam, “Internet of Things – From Hype to Reality”, Second Edition, Springer Publishers, 2019.
2. Raj Kamal, “Internet of Things Architecture and Design Principles”, Second Edition, McGraw Hill Education, 2018.

SOCIAL NETWORKS
(CourseCode : 21UEC61)

SEMESTER - VI

ECC

CREDITS - 3

COURSE OUTCOMES:

On successful completion of the course, the learners will be able to

1. Describe the basic concepts of Graph Theory. **(K1)**
2. Interpret the Power Law and Emergent Properties. **(K2)**
3. Analyze the Online Social Network Datasets. **(K3)**
4. Examine Homophily and Structural balance. **(K4)**
5. Evaluate Link Analysis and Link Prediction. **(K5)**
6. Assess the diffusion behavior in Networks. **(K5)**

UNIT I

Introduction to Graph Theory and Python – Analyzing Online Social Network Datasets.

UNIT II

Power Law and Emergent Properties – Strength of Weak Ties.

UNIT III

Homophily and Social Influence – Structural Balance.

UNIT IV

The Structure of the web – Link analysis and Web Search – Link Prediction.

UNIT V

Information Cascades – Diffusion Behavior in Networks – The Small World Phenomenon.

REFERENCE

NPTEL Online Course videos by Dr. S. R. Sudharshanlyengar, IIT, Ropar.