Scheme and Syllabus

V Semester

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration in Hrs.
18UHUC500	HU	Management, Entrepreneurship and IPR	4 - 0 - 0	4	50	100	3	-	-
18UECC500	PC	CMOS VLSI Design	4 - 0 - 0	4	50	100	3	-	-
18UECC501	PC	Communication Systems -II	4 - 0 - 0	4	50	100	3	-	-
18UECC502	PC	Digital Signal Processing	3 - 0 - 0	3	50	100	3	-	-
18UECC503	PC	Information Theory & Coding	3 - 0 - 0	3	50	100	3	–	–
18UECE5XX	PE	Program Elective-I	3 - 0 - 0	3	50	100	3	–	–
18UECL504	PC	Communication Systems Laboratory	0 - 0 - 3	1.5	50	–	–	50	3
18UECL505	PC	DSP Laboratory	0 – 0 - 3	1.5	50	–	–	50	3
18UECL506	PC	Minor Project-1	0 – 0 - 2	1	50	–	–	–	–
18UHUL507	HU	Soft skills/Aptitude	0 - 0 - 2	1	50	–	–	–	–
Total			**21- 0 -10**	**26**	**500**	**600**		**100**	

Program Elective-I

18UECE510	PE	Object Oriented Programming using C++	3 - 0 - 0	3	50	100	3	–	–
18UECE511	PE	Telecommunication Networks	3 - 0 - 0	3	50	100	3	–	–
18UECE512	PE	Scientific Computing using Python	3 - 0 - 0	3	50	100	3	–	–
18UECE513	PE	Sensors and Transducers	3 - 0 - 0	3	50	100	3	–	–

HU- Humanities, PC- Program Core

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
L: Lecture **T**: Tutorials **P**: Practical
*SEE for theory courses is conducted for 100 marks and reduced to 50 marks

18UECE512 Scientific Computing using Python (3-0-0)3

Contact Hours: 39

Course Learning Objectives (CLOs):

The course focuses on programming concepts in Python. It includes basic numerical algorithms covering interpolation, integration, differentiation, ordinary differential equations (ODE) and partial differential equations (PDE) solvers, and basic linear algebra.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1,12)/ PSOs (13, 14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Examine** Python syntax and semantics and use the Python flow control and functions.	-	1,2,13	3
CO-2	**Write** Python scripts for plotting functions and understand the core data structures like Lists, Dictionaries.	-	1,2,3	12,5
CO-3	**Understand and apply** the basic array methods to statistical problems.	-	1,2,3	12
CO-4	**Implement** the codes for manipulating the polynomials, matrices and understand the basics of Matplotlib.	-	1,2,3	12,5
CO-5	**Solve** the Integration and ordinary differential equations, and perform interpolation.	-	1,2,3	12

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	2	2	1.8	-	1	-	-	-	-	-	-	1	2	-

Pre-requisites: Programming Fundamentals

Contents:

Unit-I

The core Python language I: Introduction, The Python shell, Numbers, variables, comparisons and logic, Python objects I: strings, Python objects II: lists, tuples and loops, Control flow, File input/output, Functions. **08 Hrs**

Unit-II

Simple plotting with Pylab: Basic plotting, Labels, legends and customization, more advanced plotting.

The core Python language II: Errors and exceptions, Python objects III: dictionaries and sets, Pythonic idioms: "syntactic sugar", Modules and packages, An introduction to object-oriented programming. **08 Hrs**

Unit-III

Numpy I: Basic array methods: Creating an array, NumPy's basic data types, universal functions and special values, changing the shape of an array, indexing and slicing an array, sorting an array, structured arrays, arrays as vectors, Reading and writing an array to a file, Statistical methods: ordering statistics, averages, variance and correlations, histograms. **07 Hrs**

Unit-IV

Numpy II: Polynomials: defining and evaluating a polynomial, polynomial algebra, root finding, calculus, fitting polynomials, Linear algebra: basic matrix operations, Eigen values and Eigen vectors, solving equations, Matrices: creating a matrix, matrix operations.

Matplotlib: Matplotlib basics, bar charts and pie charts, multiple subplots. **09 Hrs**

Unit-V

SciPy: Integration: definite integrals of a single variable, integrals of two or more variables, Ordinary differential equations: single 1^{st} order ODE, single 2^{nd} order ODE, Interpolation: univariate and multivariate interpolations. **07 Hrs**

Reference Books:

1) Christian Hill, "Learning Scientific Programming with Python", Cambridge University Press, 2015.
2) Sandeep Nagar, "Introduction to Python for Engineers and Scientists: Open Source Solutions for Numerical Computation", Apress Publication, 2018.
3) T.R. Padmanabhan, "Programming with Python", Springer, 2016.
4) Allen B. Downey, "Think Python", Second Edition, O'Reilly Publication, 2015.

18UECE510 Object Oriented Programming using C++ (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

The course is aimed at the basics of object oriented programming. The language selected for illustrating the concepts is C++. The course deals with functions and discusses the classes and objects. Then inheritance and polymorphism are introduced. This is followed by templates and exception handling. Real life examples help in understanding the significance of the course.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs (13,14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Understand** and **Apply** the concepts of classes and objects to a given real-life problem.	-	1,2,13	3, 5
CO-2	**Implement** the constructor/ destructor functions and use the operator overloading concept to develop object oriented programs.	-	1,2,3	12
CO-3	**Develop** the code using inheritance.	-	1,2,3	12
CO-4	**Write** the object oriented code using virtual functions and illustrate the function overloading basics in developing the templates for different functionalities.	-	1,2,3	12,5
CO-5	**Understand** and **Implement** the operational aspects of error checking through exception handling to develop robust codes.	-	1,2,3	12

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	2	2	1.8	-	1	-	-	-	-	-	-	1	2	-

Pre-requisites: Basic Programming concepts

Contents:

Unit-I

Functions: Introduction, The main function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Default Arguments, const Arguments, Recursion, Function Overloading, Friend & Virtual Functions.

Classes and Objects : Introduction, Specifying a Class, Defining Member Functions, C++ program with Class, Making an outside Function Inline, Nesting of Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Array of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects, const Member Functions, Pointers to Members, Local Classes. **8 Hrs**

Unit-II

Constructors and Destructors : Introduction, Constructors, Parameterized Constructors, Multiple Constructors in a class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, const Objects, Destructors.

Operator Overloading and Type Conversions : Introduction, Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators Using Friends, Manipulation of Strings Using Operators, Rules for Overloading Operators, Operator Overloading Examples, Type Conversions. **8 Hrs**

Unit-III

Inheritance: Extending Classes, Introduction, Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Nesting of Classes. **7 Hrs**

Unit-IV

Pointers, Virtual Functions and Polymorphism: Introduction, Pointers, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions, Virtual Constructors and Destructors.

Templates: Introduction, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Overloading of Template Functions, Member Function Templates. **9 Hrs**

Unit-V

Exceptions: Introduction, Basic of Exception Handling, Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism, Rethrowing an Exception. **7 Hrs**

Reference Books:

1) Robert Lafore, "Object Oriented Programming using C++", Galgotia Publications, fourth edition, 2004.
2) Herbert Schildt, "C++: The Complete Reference", fourth edition, McGraw Hill OSBORNE publications, 2003.
3) K R Venugopal, Rajkumar, T Ravishankar, "Mastering C++", Second Edition, Tata McGraw Hill Publishing Company Limited, New-Delhi, 2006.
4) S. B. Lippman & J. Lajoie, "C++ Primer", third edition, Addison Wesley, 2000.

VI Semester

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration In Hrs.
18UECC600	PC	Analog & Mixed Mode VLSI Design	4 - 0 - 0	4	50	100	3	-	-
18UECC601	PC	IOT & Embedded System Design	4 - 0 - 0	4	50	100	3	-	-
18UECE6XX	PE	**Program Elective-II**	3 - 0 - 0	3	50	100	3	-	-
18UECE6XX	PE	**Program Elective-III**	3 - 0 - 0	3	50	100	3	-	-
18UECE6XX	OE	**Open Elective**	3 - 0 - 0	3	50	100	3	-	-
18UECL602	PC	Embedded Laboratory	0 - 0 - 3	1.5	50	–	–	50	3
18UECL603	PC	VLSI Laboratory	0 - 0 - 3	1.5	50	–	–	50	3
18UECL604	PC	Minor Project-2	0 - 0 - 4	2	50	–	–	50	3
18UHUL605	HU	Soft skills/Aptitude	0 - 0 - 2	1	50	–	–	–	–
		Total	**17 - 0 -12**	**23**	**450**	**500**		**150**	

Program Elective-II

18UECE610	PE	System Verilog	3 - 0 - 0	3	50	100	3	-	-
18UECE611	PE	Advanced Digital System Design	3 - 0 - 0	3	50	100	3	-	-
18UECE612	PE	Image Processing & Computer Vision	3 - 0 - 0	3	50	100	3	-	-
18UECE613	PE	Operating System	3 - 0 - 0	3	50	100	3	-	-

Program Elective-III

18UECE620	PE	Speech Processing	3 - 0 - 0	3	50	100	3	-	-
18UECE621	PE	Robotics	3 - 0 - 0	3	50	100	3	-	-
18UECE622	PE	Data structure using C++	3 - 0 - 0	3	50	100	3	-	-
18UECE623	PE	Artificial Intelligence	3 - 0 - 0	3	50	100	3	-	-

Open Elective

18UECO630	OE	Cryptography	3 - 0 - 0	3	50	100	3	–	–
18UECO631	OE	Soft Computing	3 - 0 - 0	3	50	100	3	–	–
18UECO632	OE	Automotive Electronics	3 - 0 - 0	3	50	100	3	–	–
18UECO633	OE	Multimedia Communication	3 - 0 - 0	3	50	100	3	–	–
18UMAO675	OE	Applied Mathematics	3 - 0 - 0	3	50	100	3	–	–

PC- Program Core, PE-Program Elective, OE- Open Elective and HU- Humanities

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
L: Lecture **T**: Tutorials **P**: Practical
*SEE for theory courses is conducted for 100 marks and reduced to 50 marks

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18UECE622 Data Structures using C++ (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

The course deals with the basics of data structures. Linked lists, stack, queues and trees etc. are included. An introductory chapter on pointers helps in the knowledge of data structures. Real life examples enhance the effectiveness of the course.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1,12)/ PSOs (13,14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Apply** various concepts of C++ such as Arrays, Strings, Structures, Unions, Files, Pointers and Functions in solving problems.	-	1,2,13	3
CO-2	**Understand and Implement** the operational aspects of linked lists (using pointers) such as creation, insertion, deletion and searching in problem solving.	-	1,2,3	5,12
CO-3	**Realize and Implement** the operational aspects of stack in problem solving using Arrays and Pointers.	-	1,2,3	12
CO-4	**Implement** the operational aspects of queue in problem solving using Arrays and Pointers.	-	1,2,3	5,12
CO-5	**Implement** the operational aspects of trees using Arrays and Pointers, and Hash concept in problem solving.	-	1,2,3	5,12

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	2	2	1.8	-	1	-	-	-	-	-	-	1	2	-

Pre-requisites: Object Oriented Programming using C++

Contents:

Unit-I

Structure, unions and Pointer Revisit: Motivation for using structures. Pointer, access data from memory through pointer, pointer to structures. Motivation for dynamic memory requirement. Realizing arrays using pointer and dynamic memory allocation. Importance of memory management during allocation and de-allocation of memory. **07 Hrs**

Unit-II

Lists: Constructing dynamic data structures using self-referential structure (using the same realized linked Lists), operations on lists. Doubly Linked list. Application of Lists in sorting. **08 Hrs**

Unit-III

Stack: Realization of stack and its operations using static and dynamic structures. Application of stack in converting an expression from infix to postfix and evaluating a postfix expression, Heterogeneous stack using Unions. **08 Hrs**

Unit-IV

Queues: Realization of queues (FIFO, Double-ended queue, Priority queue) and its operations using static and dynamic data structures. **07 Hrs**

Unit-V

Trees: Types of trees and their properties, Realization of trees using static and dynamic data structures. Operations on Binary trees and their application in searching (BST and AVL Tree), Binary heap as priority.

Hash Table: Realizing effective hash table with proper data structure and hash function, its application. **09 Hrs**

Reference Books:

1) Aaron M. Tenenbaum, Yedidyah Langsam and Moche J. Augenstein, "Data Structures using C & C ++" , Pearson Education / PHI, 2006
2) E. Balagurusamy, "Programming in ANSI C", 4th edition, Tata McGraw Hill, 2008.
3) Behrouz A. Foruzan and Richard F. Gilberg, "Computer Science: A Structured Programming Approach Using C", 2nd edition, Thomson, 2003.
4) Robert Kruse and Bruce Leung, "Data structures and Program Design in C", Pearson Education, 2007.