VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
B.Sc., (COMPUTER SCIENCE)

(Candidates admitted from 2018-2019 onwards)

REGULATIONS

I. SCOPE OF THE PROGRAMME

Bachelor of Computer Science can be considered to be one of the most prominent UG level programs in our country. This program mainly deals with the development of Computer applications for the purpose of updating Computer programming languages. B.Sc.(CS) also aims at creating strong knowledge of theoretical Computer Science subjects who can be employed in software development and testing units of industries. The course has a time period of 3 years with 6 semesters.

II. SALIENT FEATURES

- Regular conduct of guest lectures and seminars
- Campus recruitment
- Provides facilities such as hi-speed Internet Access and in-house library
- Provides career guidance for Post Graduate courses like M.Sc.(CS), M.Sc.(IT), MCA and the certifications in programming languages
- Conduct of Personality Development Program
- Arranging visiting faculties from various industries

III. OBJECTIVES OF THE COURSE

The Course Objective of the B.Sc. Computer Science program is to provide advanced and in-depth knowledge of Computer Science and its applications to enable students pursue a professional career in Information and Communication Technology in related industry, business and research. The course designed to impact professional knowledge and practical skills to the students.

IV. ELIGIBILITY FOR ADMISSION

A Candidates seeking admission to the first year degree course (**B.Sc COMPUTER SCIENCE)** shall be required to have passed Higher Secondary Examination with Mathematics or Business Mathematics or Computer Science or Statistics (Academic Stream or Vocational Stream) as one of the subject under Higher Secondary Board of Examination, conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereto by the syndicate, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **B.Sc. Computer Science** Degree Examination of Periyar University after a course of study of three academic years.

V. DURATION OF THE PROGRAMME

- The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from July to November and the Second semester from December to April.
- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Computer Science, Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University.

VI. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously and the

Internal Assessment Marks for Theory papers

1.	Model Test	-	10 Marks
2.	Average of Two Tests	-	05 Marks
3.	Assignment	-	05 Marks
4.	Attendance	-	05 Marks
	Total	=	25 Marks

Internal Assessment Marks for Practical

1.	Test	-	20 Marks
2.	Attendance	-	10 Marks
3.	Observation	-	10 Marks
	Total	=	40 Marks

PASSING MINIMUM (Theory)

EXTERNAL

In the Autonomous Examinations, **the passing minimum shall be 40 % out of 75 Marks. (30 Marks)**

PASSING MINIMUM (Practical / Mini project)

EXTERNAL

In the Autonomous Examinations, **the passing minimum shall be 40 % out of 60 Marks. (24 Marks)**

Distribution of Marks

Problem Understanding	: 05 Marks
Program writing	: 10 Marks
Debugging	: 10 Marks
For Correct Results	: 05 Marks

VII. ELIGIBILITY FOR EXAMINATION

Distribution of marks for attendance

PERCENTAGE	MARKS	
	THEORY	PRACTICAL
75-80	1	2
81-85	2	4
86-90	3	6
91-95	4	8
96-100	5	10

A candidate will be permitted to appear for the University Examination only on earning 75 % of attendance and only when her conduct has

been satisfactory. It shall be opened to grant exemption to a candidate for valid reasons subject to conditions prescribed.

VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the examination of Core Courses (main and allied subjects) and securing marks

a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
b) 60% and above but below 75 % shall be declared to have passed the examinations in First class without Distinction.
c) 50%and above but below 60% shall be declared to have passed the examinations in Second class.
d) All the remaining successful candidates shall be declared to have passed the examinations in Third class.
e) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for ranking.

IX. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than three academic years comprising of six semesters and passed the examinations prescribed and fulfilled such conditions have been prescribed therefore.

X. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the semester examination in the concerned subject in subsequent semesters and shall pass the examination.

XI. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2017-18 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2017-2018 and thereafter.

XII. TRANSITORY PROVISIONS

Candidates who were admitted to the UG course of study before 2017-2018 shall be permitted to appear for the examinations under those regulations for the period of three years ie., upto and inclusive of the examinations of 2019-2020. Thereafter, they will be permitted to appear for the examinations only under the regulations then in force.

QUESTION PAPER PATTERN – Theory

Time Duration: 3 Hours Max. Marks: 75

PART- A: 20 x 1 = 20

Answer all the Questions

Two Questions from each unit

PART- B: 5 x 5 = 25

Answer all the Questions

One Question from each unit (either or type)

PART- C: 3 x 10 = 30

Answer Any Three Questions

One Question from each unit (3 Out of 5)

The Passing minimum shall be 40% out of 75 marks (30 marks)

QUESTION PAPER PATTERN – Practical

Time duration: 3 Hours Max. Marks: 60

1. One compulsory question from the given list of objectives : 30 Marks
2. One either / or type question from the given list of objectives : 30 Marks

The passing minimum shall be 40% out of 60 marks (24 marks)

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

Elayampalayam, Thirichengode, Namakkal (DT), Tamil Nadu 637 205

VISION OF THE COLLEGE

- To evolve into a centre of Excellence in higher education through creative and innovative practices to secure social equity for women.

MISSION OF THE COLLEGE

- To provide sufficient learning infrastructure to the students to pursue their studies.
- To provide good opportunity for higher education and conducive environment to students to acquire education.
- To provide quality academic programs, training activities and Research Facilities.
- To facilitate Industry-Institute interaction.

PG RESEARCH DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

VISION OF THE DEPARTMENT

- To provide high academic goals to the students and make them the world leaders both in educational and research through effective teaching.

MISSION OF THE DEPARTMENT

- To create, share and apply knowledge in Computer Applications including inter disciplinary areas that extends the scope of Computer Science and benefit humanity.
- To educate students to be successful, ethical and effective problem solvers.
- To prepare the students to contribute positively to the economic well being of our region and nation.

B.Sc. (COMPUTER SCIENCE)

PROGRAM OBJECTIVES

PO1: The B.Sc. Computer Science program is to provide advanced and in depth knowledge of Computer Science and its applications to enable students pursue a professional career in information and communication technology in related industry, business and research.

PO2: The course designed to impact professional knowledge and practical skills to the students.

PROGRAM SPECIFIC OUTCOMES

After completion of the program the graduates will be able to

PSO1: To understand the fundamental concepts of computer system, including hardware and networking.
PSO2: To Design, and analyze precise specifications of algorithms, procedures, and interaction behavior.
PSO3: Ability to communicate effectively in both verbal and written form in industry and society.
PSO4: Apply the technologies in various fields of Computer Science, including Mobile applications, Web site development and management, databases, and computer networks

DURATION OF THE PROGRAMME

- The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from July to November and the Second semester from December to April.
- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Computer Science, Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
[AUTONOMOUS]
ELAYAMPALAYAM, TIRUCHENGODE - 637 205
DEPARTMENT OF COMPUTER SCIENCE
B.Sc COMPUTER SCIENCE
COURSE PATTERN AND SCHEME OF EXAMINATIONS UNDER OBE

Sem	Course Code	Part	Courses	Hr	Credit	Marks		
						Int.	Ext.	Total
For the Candidates admitted from the year 2018- 2019(Onwards)								
I	18U1LT01	I	Tamil-I	6	3	25	75	100
	18U1LE01	II	English I	6	3	25	75	100
	18U1MAA04	III	Allied-I Numerical Methods	4	4	25	75	100
	18U1CSC01	IV	Core – I Computer Fundamentals and C Programming	5	5	25	75	100
	18U1CSCP01	IV	Core I P-I - Programming in C Lab	4	4	40	60	100
	18U1CSCP02	IV	Core II P-II - PC Hardware Assembling Lab	3	2	40	60	100
	18U1VE01		Value Added Course YOGA	2	2	25	75	100
	TOTAL			**30**	**23**	**205**	**495**	**700**
II	18U2LT02	I	Tamil-II	6	3	25	75	100
	18U2LE02	II	English-II	6	3	25	75	100
	18U2MAA08	III	Allied II- Discrete Mathematics	4	4	25	75	100
	18U2CSC02	IV	Core III - Programming in C++ and Data Structures	4	4	25	75	100
	18U2CSCP03	IV	Core III P-III Programming in C++ Lab	4	3	40	60	100
	18U2CSCP04	IV	Core IV P-IV System Software Installation and Configuring Lab	2	2	40	60	100
	18U2ES01		Environmental Studies	4	4	25	75	100
	TOTAL			**30**	**23**	**205**	**495**	**700**
III	18U3LT03	I	Tamil-III	6	3	25	75	100
	18U3LE03	II	English-III	6	3	25	75	100
	18U3CMA03	III	Allied-III Financial and Cost Accounting	4	4	25	75	100
	18U3CSC03	IV	Core V- JAVA Programming	5	5	25	75	100
	18U3CSCP05	IV	Core V P-V Programming in Java Lab	4	4	40	60	100
	18U3CSS01	VII	SBEC-I - Office Automation	2	2	25	75	100
	18U3CSCP06	IV	CORE VI P-VI Office Automation Lab	2	2	40	60	100
			Library	1	0	-	-	-
	TOTAL			**30**	**23**	**205**	**495**	**700**

IV	18U4LT04	I	Tamil-IV	6	3	25	75	100
	18U4LE04	II	English-IV	6	3	25	75	100
	18U4BAA01	III	Allied-IV Organizational Behavior	4	4	25	75	100
	18U4CSC04	IV	Core-VII- Relational Database Management System	5	5	25	75	100
	18U4CSCP07	IV	Core-VII P-VII Relational Database Management System Lab	4	4	40	60	100
	18U4CSS02	VII	SBEC-II- HTML and Web Designing	2	2	25	75	100
	18U4CSCP08	IV	CORE-VIII P-VIII HTML and Web Designing Lab	2	2	40	60	100
			Library	1	0	-	-	-
	TOTAL			**30**	**23**	**205**	**495**	**700**
V	18U5CSC05	IV	Core-IX VB.Net	5	5	25	75	100
	18U5CSC06	IV	Core-X Operating Systems	5	4	25	75	100
	18U5CSCP09	IV	Core-IX P-IX VB.Net Lab	5	3	40	60	100
	18U5CSCP10	IV	Core- X P-X Operating System Lab	5	3	40	60	100
	18U5CSE__	V	Elective – I	4	3	25	75	100
	18U5CSN__	VI	NMEC-I	2	2	25	75	100
	18U5CSS03	VII	SBEC –III Soft Skills	2	2	25	75	100
	18U5CSPR01		Mini Project	2	2	40	60	100
	TOTAL			**30**	**24**	**245**	**555**	**800**
VI	18U6CSC07	IV	Core- XI Computer Networks	5	4	25	75	100
	18U6CSC08	IV	Core-XII PHP Programming	5	4	25	75	100
	18U6CSCP11	IV	Core-XI P-XI -Network Lab	6	4	40	60	100
	18U6CSCP12	IV	Core-XII P-XII PHP Programming - Lab	6	4	40	60	100
	18U6CSE__	V	Elective – II	4	3	25	75	100
	18U6CSN__	VI	NMEC-II	2	2	25	75	100
	18U6CSS04	VII	SBEC –IV Java Script and VB Script	2	2	25	75	100
	18U6EX01		Extension Activities	-	1	-	-	-
	TOTAL			**30**	**24**	**205**	**495**	**700**
CORE TOTAL				**180**	**140**	**1270**	**3030**	**4300**

ELECTIVE – I			ELECTIVE – II		
Sem	**Course Code**	**Title**	**Sem**	**Course Code**	**Title**
V	18U5CSE01	Computer Graphics	**VI**	18U6CSE04	E-Commerce
	18U5CSE02	Grid Computing		18U6CSE05	Android Applications
	18U5CSE03	Software Engineering		18U6CSE06	Middleware Technologies
SKILL BASED PAPER			**NON-MAJOR ELECTIVE COURSES**		
Sem	**Course Code**	**Title**	**Sem**	**Course Code**	**Title**
III	18U3CSS01	SBEC- I Office Automation	**V**	18U5CSN01	Office Automation
IV	18U4CSS02	SBEC-II HTML and Web Designing			
V	18U5CSS03	SBEC–III Soft Skills	**VI**	18U6CSN02	Internet Applications
VI	18U6CSS04	SBEC-IV Java Script and VB Script			

Subject Title	COMPUTER FUNDAMENTALS AND C PROGRAMMING	Semester	I
Subject Code	18U1CSC01	Specialization	NA
Type	CORE –I THEORY	L:T:P:C	5:0:0:5

COURSE OBJECTIVE

- On successful completion of this subject the students have the computer fundamentals and programming ability in C Language

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Recall the concept of computer system and its components	K1
CO2	Conversion of number systems and illustrate the logic gates using Boolean Algebra	K2
CO3	Understand the basic concept of C Programming	K1
CO4	To Develop Programs using Branching and Looping statements, Usage of arrays and functions	K3 K4
CO5	To Explore the concept of pointers, structures, union and flies in C	K3 K4

Subject Title	COMPUTER FUNDAMENTALS AND C PROGRAMMING	Semester	I
Subject Code	18U1CSC01	Specialization	NA
Type	CORE –I THEORY	L:T:P:C	5:0:0:5
I	Introduction to computers: Introduction – Characteristics – Generation of computers – Classification of digital computer system – Functions & Components of computer system – Memory units - Input devices: Keyboard – mouse - OCR – OMR – Touch screen. Output Devices: Monitor – Printer: Dot matrix, laser printer.	K1	12
II	Number System : Decimal – Binary – Octal – Hexadecimal number system – Conversion – Binary Addition – Binary Subtraction – Complements – BCD – ASCII Code – EBCDIC Code. Boolean Algebra & Gate network: AND – OR – NOR – NAND - XOR Gates. Demorgan's Theorem.	K2	12
III	Overview of C: Introduction – Basic structure of C programs – Character set – C Tokens – Keywords & Identifiers – Constant – Variables and its types – Operators & expressions – Type conversions in expressions – Managing Input & Output Operations.	K3 K4	12
IV	Decision Making & Branching Statements: IF – IF-else – Nesting of IF-else – Switch – GOTO Statement. Looping Statement: While – Do..While statement – For statement. Arrays: Definition & Declaration – Simple Array – One dimensional – Multi dimensional. String Handling. Function: Introduction – Function calls – Function declarations & Return types – Recursion.	K3 K4	12
V	Structures & Unions: Defining a structure – Declaring structure variables – Accessing structure members – structure Initialization. Unions. Pointers: Introduction – Understanding pointers – Accessing the address of a variable – Initializing of pointer variables. File Management: Introduction – Defining & Opening a file – Closing a file – Input / Output Operation on files.	K3 K4	12

Learning Resources	
Text Books	1. "Fundamentals of Computer Science & Communication Engineering". Alexis Leon, Mathew's Leon, Vikas Publishing house, New Delhi, 2012 (Unit I: Chapters 2, 3, 4, 6, 7, 8, 9 & 10) 2. "Digital Computer Fundamentals" Thomas C Bartee, 6th Edition TMH Publisher, New Delhi, 2011 (Unit II: Chapters 2 & 3). 3. "Programming in ANSI C", E. Balagurusamy Tata MC Graw hill, New Delhi, 4th Edition, 2012. (Unit III: Chapters 1, 2, 3 & 4 Unit – IV: Chapters 5, 6, 7, 8 & 9 Unit – V: Chapters 10,11&12)
Reference Books	1. "The C programming language" Brain W.Kernighan, Dennis M.Ritchie, 2009. 2. "C Programming: A Modern Approach", K.N.King, 2010.
Website/Links	• www.tutorialspoint.com/cprogramming/ • www.programiz.com/c – programming

Pedagogy : Chalk and Talk, PPT ……..

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓	✓	
CO2	✓	✓	✓	✓
CO3	✓	✓	✓	✓
CO4	✓	✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	PROGRAMMING IN C LAB	Semester	I
Subject Code	18U1CSCP01	Specialization	NA
Type	CORE –I P-I PRACTICAL	L:T:P:C	0:0:4:4

COURSE OBJECTIVE

- On successful completion of this laboratory the students have the programming ability in C language

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To Design algorithm for the given problem specifications	K1
CO2	To Develop C programs for the designed algorithm specification	K2
CO3	To implement control and looping statements in real time applications	K3 K4
CO4	To Apply the concept of arrays and functions to solve the real time problems	K3 K4
CO5	To Apply the structure and file concepts	K3 K4

Subject Title	PROGRAMMING IN C LAB	Semester	I
Subject Code	18U1CSCP01	Specialization	NA
Type	CORE –I P-I PRACTICAL	L:T:P:C	0:0:4:4

S.No	List of Programs	Level
1	Program for simple formula evaluation	K1
2	Program for (i) Using IF Statement (ii) IF …ELSE Statement	K2
3	Program for (i) Using WHILE Statement (ii) Using DO...WHILE Statement (iii) Using FOR Statement	K2
4	Program to Sort given array of numbers in ascending order	K3
5	Program to implement Matrix Manipulation	K3
6	Program to Program to implement string handling functions (i) Check whether the given string is Palindrome or not (ii) Sorting the given names in ascending and descending order	K3
7	Program for finding factorial of a number using function	K2
8	Program to Swap two numbers using Pointers	K3 K4
9	Program to prepare Student Mark list using structure	K3 K4
10	Program to prepare Pay Bill using files.	K3 K4

Pedagogy : Chalk and Talk, PPT ……..

MAPPING WITH PROGRAM OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2		✓	✓	✓
CO3			✓	✓
CO4			✓	✓

Subject Title	PC HARDWARE ASSEMBLING LAB	Semester	I
Subject Code	18U1CSCP02	Specialization	NA
Type	CORE – II P – II – PRACTICAL	L:T:P:C	0:0:3:2

COURSE OBJECTIVE

- On successful completion of this laboratory the students have to assemble hardware components of a computer system.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Examine the computer and peripheral devices	K1
CO2	Understand the concept of motherboard and its types	K1
CO3	Assemble and disassemble the hardware components	K1
CO4	Installation of software and troubleshoot	K3 K4

Subject Title	PC HARDWARE ASSEMBLING LAB	Semester	I
Subject Code	18U1CSCP02	Specialization	NA
Type	CORE – II P - II – PRACTICAL	L:T:P:C	0:0:3:2

S.No	List of Programs	Level
1.	Inspect the computer and peripheral components	K1
2.	To revise of SMPS and UPS	K1
3.	Study on working keyboards and mouse	K2
4.	To study various types of cables & connectors	K1
5.	Find different ports and slots and its uses	K2
6.	Remove the PC system unit cover and examine internal components	K3
7.	To study different types of motherboard	K2
8.	Gather basic information about the Processor and RAM	K2
9.	Assembling and disassembling the system hardware components of the personal computer	K1
10.	Printer Installation and troubleshoot	K3 K4

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓			
CO2	✓			
CO3			✓	✓
CO4			✓	✓

Subject Title	PROGRAMMING IN C++ AND DATA STRUCTURES	Semester	II
Subject Code	18U2CSC02	Specialization	NA
Type	CORE – III THEORY	L:T:P:C	4:0:0:4

COURSE OBJECTIVE

On successful completion of this subject the students have to master all techniques of software development in C++ Programming Language and to demonstrate these techniques by implementing the solution for variety of problems

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Distinguish between Structured and Object Oriented problem solving approaches and apply them based on the problem given.	**K1**
CO2	Identify classes and objects from the given problem description and able to create classes and objects using C++	**K2**
CO3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism.	**K3**
CO4	Explain the organization and operations of data structures Stack, Queues, Trees.	**K3 & K4**
CO5	Demonstrate specific trees and sorting algorithms using data structures given specific user requirements	**K3& K4**

Subject Title	PROGRAMMING IN C++ AND DATA STRUCTURES	Semester	II
Subject Code	18U2CSC02	Specialization	NA
Type	CORE – III THEORY	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Level	Number of Sessions
I	Programming in C++: Introduction – Basic concepts of OOP – Applications of OOP – What is C++? – Applications of C++ – Structure of C++ program – Tokens – Keywords – Identifiers and constants – Data types – symbolic constants – Operators – Manipulators – Control Structures – Arrays.	K1	12
II	Functions in C++: Main Function – Function prototyping – call and return by reference – Inline Functions – Function overloading – Friend and virtual functions. Class and Objects: Introduction – Specifying a class – Defining Member Functions – C++ program with class – Memory allocation for objects – static data members – static member functions – Returning objects. Constructors – Default Constructors – Parameterized Constructors – Copy Constructors – Dynamic Constructors – Destructors	K2	12
III	Operator Overloading: Introduction – Overloading Unary, Binary Operators – Manipulation of strings using Operators – Type Conversions – Inheritance – Defining derived classes – single inheritance – multilevel inheritance – multiple inheritance – hierarchical inheritance – hybrid inheritance – virtual base class – this pointer – virtual functions.	K3	12
IV	Data Structures: Basic Abstract Data Types: The Abstract Data Type "List": Array implementation of lists – pointer implementation of lists – Doubly linked lists – Stacks: Array implementation of Stacks – Queues: Pointer Implementation – a Circular Array Implementation of Queues.	K3 & K4	12
V	Trees: Basic terminology – Preorder, post order, in – order of nodes – The ADT Tree – Array representation of Trees – Binary Search Tree. Sorting – The internal Sorting Model – Bubble sort – Insertion sort – Selection sort – Quick sort – Heap sort – Binary sort – Radix sort.	K3 & K4	12

Learning Resources	
Text Books	1. "Object Oriented Programming with C++", E.Balagurusamy 2011. (Unit – I: Chapters 1, 2 & 3 Unit – II:4,5&6, Unit – III: Chapters 7, 8, 9, 12 & 13) 2. "Data Structures and Algorithms", Alfred V. Aho, Murray Hill, John E.Hopcroft, Jeffrey D.Ullman, 2009. (Unit – IV: Chapter 2, Unit – V: Chapter 3)
Reference Books	1. "The C programming language" Brain W.Kernighan, Dennis M.Ritchie, 2009. 2. "C Programming: A Modern Approach" By K.N.King, 2010.
Website/Links	• www.tutorialspoint.com/cprogramming/ • www.programiz.com/c – programming

Pedagogy : Chalk and Talk, PPT ……..

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2	✓	✓		
CO3			✓	✓
CO4	✓			
CO5			✓	✓

Subject Title	PROGRAMMING IN C++ LAB	Semester	II
Subject Code	18U2CSCP03	Specialization	NA
Type	CORE – III P – III – PRACTICAL	L:T:P:C	0:0:4:3

COURSE OBJECTIVE

Formulate all techniques of software development in the C++ Programming Language and demonstrate these techniques by the solution of a variety of problems spanning the breadth of the language.

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
CO1	Design algorithms for the given problem specifications	K1
CO2	Implement the techniques and features of the Object Oriented Programming constructs to build an application.	K2
CO3	Implement method overloading and method overriding for different user specifications	K3 & K4
CO4	To Apply the linear data structures using arrays to solve the real time problems.	K3 & K4
CO5	Implement sorting and searching techniques	K3 & K4

Subject Title	PROGRAMMING IN C++ LAB	Semester	II
Subject Code	18U2CSCP03	Specialization	NA
Type	CORE – III P – III – PRACTICAL	L:T:P:C	0:0:4:3

	List of Programs	Level
1.	Write a C++ program to create a class and access class members	K1
2.	Write a C++ program for Inline function	K2
3.	Write a C++ program for Friend function	K2
4.	Write a C++ program for Function overloading	K1
5.	Write a C++ program for operator overloading i) Binary operator overloading ii) Unary operator overloading	K3
6.	Write a C++ program for implementing Inheritance Concepts i) Single Inheritance ii) Multiple Inheritance	K3 & K4
7.	Implement push, pop Operations of a stack using Array	K4
8.	Implement Add, Delete Operations of a Queue using Array Write a Program to Create a Linked List and do Insertion and Deletion operations	K4
9.	Write a C++ program to sort a set of integers using bubble sort	K3 & K4
10.	Write a C++ program to sort a set of integers using Binary Search Algorithm	K3 & K4

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2		✓	✓	✓
CO3			✓	✓
CO4			✓	✓
CO5			✓	✓

Subject Title	SYSTEM SOFTWARE INSTALLATION AND CONFIGURATION LAB	Semester	II
Subject Code	18U2CSCP04	Specialization	NA
Type	CORE –IV P-IV-PRACTICAL	L:T:P:C	0:0:2:2

COURSE OBJECTIVE

- To gain knowledge about installing operating system and partitioning hard disk and how to install LINUX operating system.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Examine boot disks	K1
CO2	Installation of Windows OS and other OS	K1 K2
CO3	Planning to partition disk drives	K3
CO4	Planning to partition disk drives	K2 K3
CO5	Evaluate OS	K3 K4

Subject Title	SYSTEM SOFTWARE INSTALLATION AND CONFIGURATION LAB	Semester	I
Subject Code	18U2CSCP04	Specialization	NA
Type	CORE –IV P-IV-PRACTICAL	L:T:P:C	0:0:2:2

S.No	List of Programs	Level
1	To creating boot disks.	K1
2	Installing a Windows Operating System.	K1 K2
3	Creating drive partitions.	K2
4	Formatting drive partitions.	K2 K3
5	Install and Configure Dual OS Installation.	K3 K4
6	Linux Operating System Installation	K1 K2

Pedagogy : Talk,Demo ……..

MAPPING WITH PROGRAM OUTCOMES

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓			
CO2			✓	
CO3		✓	✓	
CO4		✓	✓	✓
CO5			✓	✓

Subject Title	JAVA PROGRAMMING	Semester	III
Subject Code	18U3CSC03	Specialization	NA
Type	CORE V-THEORY	L:T:P:C	5:0:0:5

COURSE OBJECTIVE

- The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism.
- Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections.
- How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
- How to test, document and prepare a professional looking package for each business project using javadoc.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Identify classes, objects, members of a class and relationships among them needed for a specific problem	K1
CO2	Demonstrate OOP principles and proper program structuring	K2
CO3	Demonstrate the concepts of polymorphism and inheritance	K2 K3
CO4	Demonstrate program structure using applet	K3
CO5	Demonstrate the concepts of AWT,Files and Streams	K3

Subject Title	JAVA PROGRAMMING	Semester	III
Subject Code	18U3CSC03	Specialization	NA
Type	CORE V-THEORY	L:T:P:C	5:0:0:5

Unit	Syllabus Contents	Level	Number of Sessions
I	**Overview of Java Language:** Introduction – simple java program-Java program structure-Java Tokens-Implementing a Java program Constants, variables, Data Types and Operators: Constants-variables-Data Types-Declaration of variables-Operators and Expression.	K1	12
II	**Classes, objects and Methods:** Defining a classes-Field and method declaration-creating objects-constructors-methods overloading-static members-Abstract class. Array: Introduction – One Dimensional Array-Creating Array-Two dimensional Array	K2	12
III	**Inheritance:** Extending a class –Overriding methods. Interfaces: Defining Interface-Extending Interface. Packages: Java API package-creating package-Accessing Package	K2 K3	12
IV	**Applet Programming:** Building Applet Code-Applet Life Cycle-Designing a web page-Applet Tag-Running the Applet. Graphics Programming: The Graphics Class – Lines and Rectangle-Drawing Arcs-Drawing polygons-Line graphics-Drawing bar Chart	K3	12
V	**AWT Event Handling:** Introduction to AWT package-Introduction to swings. Input/Output Files: Introduction to Files and Streams	K3	12

Learning Resources	
Text Books	1. Balagurusamy, "Programming in Java", 4th Edition 2010, TMH, New Delhi. Unit–I (Chapter – 3.1,3.2,3.5,3.6,3.9,4.1 – 4.5, 5) Unit –II(Chapter – 8.2 -8.5,8.7 -8.9,8.16,9.1-9.4) Unit – III (Chapter – 8.11, 8.12,10.2,10.311.2,11.5,11.6) Unit – IV (Chapter – 14.4,14.5,14.7,14.814.10) Unit –V (Chapter – 15.2,15.3,15.5-15.7,15.9-15.11,16.1-16.12)
Reference Books	1. Herbert Scheldt, "Java2 The complete Reference" -McGraw Hill Publication 2. John R. Hubbard, "Programming With Java", 2nd Edition, TMH.
Website/ Links	• www.learnjavaonline.org • www.javaworld.com • www.onjava.com • www.java.sun.com

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2	✓		✓	
CO3			✓	
CO4			✓	
CO5			✓	✓

Subject Title	PROGRAMMING IN JAVA LAB	Semester	III
Subject Code	18U3CSCP05	Specialization	NA
Type	CORE V P-V-PRACTICAL	L:T:P:C	0:0:4:4

COURSE OBJECTIVE

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Implement the fundamental concepts and features of Java Programming language	K1
CO2	Implements Multiple Inheritance in Java.	K1
CO3	Implement Exception Handling in Java	K2
CO4	Use and create Packages and Interfaces in a Java program	K3
CO5	Develop Graphical User Interface applications and Web based applications in Java by importing applet, AWT	K3 K4

Subject Title	PROGRAMMING IN JAVA LAB	Semester	III
Subject Code	18U3CSCP05	Specialization	NA
Type	CORE V P-V-PRACTICAL	L:T:P:C	0:0:4:4

	List of Programs	Level
1.	Write a Java Applications to extract a portion of a character string and print the extracted string.	K1
2.	Write a Java Program to implement the concept of multiple inheritance using Interfaces.	K1
3.	Write a Java Program to create an Exception called payout-of-bounds and throw the exception.	K2
4.	Write a Java Program to demonstrate the Multiple Selection List-box	K3
5.	Write a Java Program to create a frame with four text fields name, street, city and pin ode with suitable tables. Also add a button called"my details", When the button is clicked its corresponding values are to be appeared in the text fields.	K3 K4
6.	Write a Java Program to demonstrate the Multiple Selection List-box	K1
7.	Write a Java Program to draw circle, square, ellipse and rectangle at the mouse click positions.	K1
8.	Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown	K2
9.	Develop an applet that displays a simple message.	K3
10.	Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button "Compute" is clicked	K3 K4

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓	✓	✓
CO2	✓			✓
CO3	✓	✓		✓
CO4		✓		✓
CO5				

Subject Title	OFFICE AUTOMATION	Semester	III
Subject Code	18U3CSS01	Specialization	NA
Type	SBEC – I THEORY	L:T:P:C	2:0:0:2

COURSE OBJECTIVE

- To provide knowledge in the field of office automation and to sketch out the hidden talent of students towards the same.
- Office automation refers to the varied computer machinery and software used to digitally create, collect, store, manipulate, and relay office information needed for accomplishing basic tasks.
- To create a document using MS-Word.
- Write functions in MS-Excel to perform basic calculations and to convert number to text and text to number.
- Create a presentation in MS_Powerpoint that is interactive and legible content.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic concepts of MS-Word	K1 K2
CO2	Understand the basic concepts of MS-Excel	K1 K2
CO3	Understand the basic concepts of MS-Powerpoint	K1K2
CO4	Understand and Implement the basic concepts of MS-Access	K1 K2 K3
CO5	Understand the basic concepts of MS-Frontpage	K2

Subject Title	OFFICE AUTOMATION	Semester	III
Subject Code	18U3CSS01	Specialization	NA
Type	SBEC – I THEORY	L:T:P:C	2:0:0:2

Unit	Syllabus Contents	Level	Number of Sessions
I	**MS – WORD:** Introduction to Ms – Office.MS – word: Introduction to Word Basics – Commands – Copying and Moving Text – Working with Text – Find and Replace – Formatting Text – Mail Merge – Table – Spell Check and Grammar	K1 K2	4
II	**MS – EXCEL:** Excel Basics – Introduction – Menus – Toolbars – Icons – Opening Excel – Cells – Entering and Editing Data – Creation of Chart – Naming Formulas – Functions	K1 K2	4
III	**MS – POWER POINT:** Introduction – Menus – Toolbars – Creating and Editing Slides – Working with PowerPoint	K1K2	4
IV	**MS – ACCESS:** Introduction – Starting Microsoft Access – Creating New Database – Opening Existing Database – Access Database Wizards – Tables – Creating Query	K1 K2 K3	4
V	**MS – FRONT PAGE:** Introduction – Menus – Toolbars – Creating Webpage – With Wizard – Hyperlinks	K2	4

Learning Resources	
Text Books	1. "MS – OFFICE 2000 for Everyone", Sanjay Saxena, Vikas Pub. House New Delhi, 2010. Chapter – II,III, IV, V, VI & IX
Reference Books	1. "Step by Step 2007 Microsoft Office System", Joyce Cox & Team , PHI Learning Private limited, New Delhi, 2009
Website/ Links	• www.tutorialspoint.com/word/ • www.officeskills.org/microsoft – office – tutorials.html • www.microsoft.com/en – us/learning/training.aspx

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓			
CO2	✓	✓		
CO3	✓	✓		
CO4			✓	✓
CO5				✓

Subject Title	OFFICE AUTOMATION LAB	Semester	III
Subject Code	18U3CSCP06	Specialization	NA
Type	CORE VI P-VI-PRACTICAL	L:T:P:C	0:0:2:2

COURSE OBJECTIVE

- On successful completion of this practical subject students will be trained in MS Word, MS Access, MS power point etc.
- To create a document, biodata, mailmerge using MS-Word.
- To perform basic calculations and create charts and to store the data in table.
- Create a presentation in MS_Powerpoint that is very interactive and legible content.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To perform documentation	K1
CO2	To perform accounting operation	K1
CO3	To use drawing and graphics tool	K2
CO4	To perform presentation skill	K2
CO5	To create database and table	K3

Subject Title	OFFICE AUTOMATION LAB	Semester	III
Subject Code	18U3CSCP06	Specialization	NA
Type	CORE VI P-VI-PRACTICAL	L:T:P:C	0:0:2:2

	List of Programs	Level
1.	Prepare a student bio – data using MS – Word	K1
2.	Create letters using Mail Merge in MS – Word	K1
3.	Create a word document to implement Table and Sort the data	K1
4.	Create an Excel Worksheet to sort the data	K2
5.	Create an Excel worksheet to implement charts	K2
6.	Create an Excel worksheet to implement Mathematical & Trigonometry functions	K2
7.	Create a slide show for a seminar using power point	K2
8.	Design an advertisement by using power point	K2
9.	Create a student mark list using MS – Access	K3
10.	Create a employee personal information using MS – Access	K3

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MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2			✓	
CO3	✓	✓		
CO4		✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	RELATIONAL DATABASE MANAGEMENT SYSTEMS	Semester	IV
Subject Code	18U4CSC04	Specialization	NA
Type	CORE-VII- THEORY	L:T:P:C	5:0:0:5

COURSE OBJECTIVE

- To inculcate knowledge on RDBMS concepts and Programming with Oracle.
- To understand a role of database management system in an organization.
- To understand basic database concept including the structure and operation of the relational data model.
- To construct simple and moderately advanced database queries using structure query language.
- To understand the concept of PL/SQL.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the database concepts, different database models, and database management systems and design database schema.	K1
CO2	Develop the ER structures for real world examples using the concept of Entity Relationship models with constraints and cardinalities.	K1
CO3	Apply the concepts of Normalization and design database which possess no anomalies.	K2
CO4	Apply the concepts of relational database theory to manage relational database management system.	K2
CO5	Exhibit database programming skills in SQL	K3

Subject Title	RELATIONAL DATABASE MANAGEMENT SYSTEMS	Semester	IV
Subject Code	18U4CSC04	Specialization	NA
Type	CORE-VII- THEORY	L:T:P:C	5:0:0:5

Unit	Syllabus Contents	Level	Number of Sessions
I	**Introduction to DBMS:** Information – Data and Data Management – File based data management – Organization of a database – Characteristics of a data in a database – DBMS: Benefits of DBMS – Functions of DBMS – Components of DBMS – data dictionary – data base users.Data Base Architecture and Design: Introduction – Data base architecture – data abstraction – ANSI/SPARC Architecture – Database Language – Data base Design – Design Constraints.	K1	12
II	**Data Models :** Introduction – Types – Comparison between the various model Entity Relationship Model: Introduction – ER Model – Components of ER model – ER diagram conversions – Relationships – Composite entities – Entity list – ER diagrams – ER modeling symbols	K1	12
III	**RDBMS:** Introduction – RDBMS terminology – relational data structure – codd's rules – Relational data integrity and database constraints: Introduction – Integrity constraint – Data Normalization: Introduction – Types of Normal forms – Pitfalls in Relational Database Design – Decomposition – Functional Dependencies – Denormalization. Relational Algebra: Introduction – Relational Algebraic Operations – Aggregate functions – update operations. Relational calculus**:** Introduction – tuple relational calculus – domain relational calculus.	K2	12
IV	**SQL:** Introduction – history of SQL – characteristics of SQL – Advantages of SQL – SQL data types and literals – Types of SQL commands – SQL operators – Tables, views and Indexes**:** Introduction – Views – Indexes. Aggregate functions – INSERT, UPDATE and DELETE operations – join and union	K2	12
V	**PL/SQL:** Programming language: History – Fundamentals – Block structure – commends – Data types – other data types – Declaration – Assignment operation – Bind variables – Substitution variables – printing.Pl/SQL cursor and exceptions – PL/SQL Composite data types**:** Records – Tables. PL/SQL Named block**:** Procedure – Function – Package – Triggers.	K3	12

Learning Resources	
Text Books	1. "Fundamentals of Data base management System", Alexix Leon and Mathew Leon, TMH Publications, 2010. (Chapter 1, 2,3,4,5,6,7,8,9,10,11). 2. "Database system using ORACLE", Nilesh Shah, PHI publication, 2nd Edition, 2010 (Chapter 10,11,12,13,14).
Reference Book	1. "Database System Concepts "– Silberschatz, Korth, MCH International, Sixth Edition, 2010.
Website/Links	• www.w3schools.com • www.techfaq360.com • www.databasedir.com

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓	✓	✓
CO2	✓	✓	✓	✓
CO3	✓	✓	✓	✓
CO4	✓	✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	RELATIONAL DATABASE MANAGEMENT SYSTEM LAB	Semester	IV
Subject Code	18U4CSCP07	Specialization	NA
Type	CORE-VII P-VII-PRACTICAL	L:T:P:C	0:0:4:4

COURSE OBJECTIVE

- To create RDBMS Programming skill and to sketch out the hidden talent of students community.
- To construct simple and moderately advanced database queries using structure query language.
- To introduce the concept of table creation, data manipulation, and built in functions.
- PL/SQL is a procedural language used to create applications.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand, appreciate and effectively explain the underlying concepts of database technologies	K1
CO2	Design and implement a database schema for a given problem-domain	K2
CO3	Normalize a database	K2
CO4	Populate and query a database using SQL DML/DDL commands	K2
CO5	Programming PL/SQL including stored procedures, stored functions, cursors,packages.	K2 K3

Subject Title	RELATIONAL DATABASE MANAGEMENT SYSTEM LAB	Semester	IV
Subject Code	18U4CSCP07	Specialization	NA
Type	CORE-VII P-VII-PRACTICAL	L:T:P:C	0:0:4:4

	List of Programs	Level
1.	Table Creation i) Create the table with the following attribute Table Name: Employee Attributes: Eno (PK), Ename, Dept, Design, Salary, Phone Number ii) Alter the table employee, adds the column age, community.	K1
2.	2. Data Manipulation a. Insert the values to the above table b. Display the employee names who is working as "Lecturer" c. Display the table in ascending order Update the table employee; add 20% Bonus to each employee	K2
3.	3. Execute the following queries i) Select ename from employee table such that salary greater than 8000. ii) Select Eno, Ename from employee whose salary between 6000 and 15000. Create a view tick from employee with Ename, Phone, and Department.	K2
4.	Write simple queries to implement built in functions	K2
5.	Write simple queries using set operations	K2 K3
6.	Write PL/SQL queries i) Creation of student information records containing Reg.No, Name, Subject Code, Marks, Course and Grade. ii) Find the Total and average for each student table. iii) Record Manipulations such as deletion, Modification, Addition and counting the record.	K3
7.	Writing a PL/SQL Program to find the total amount based on rules similar to the following i) If UNIT <= 100 then Price is 85 paise per UNIT ii) If UNIT >101 and <= 150 then Price is 1.50 paise per UNIT If UNIT > 151 then Price is 2.00 paise per UNIT	K3
8.	Write a PL/SQL block to count the number of students in each department. If the count value is greater than 60 in each department, then transfer the excess records into another table department wise. Use exception handler to handle this routine.	K3
9.	Write a database trigger to implement the concept of master detail relationship.	K3
10.	Write a PL/SQL procedure to design Pay Bill.	K3

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓	✓	✓
CO2	✓	✓	✓	✓
CO3	✓	✓	✓	✓
CO4	✓	✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	HTML AND WEB DESIGNING	Semester	IV
Subject Code	18U4CSS02	Specialization	NA
Type	SBEC-II-THEORY	L:T:P:C	2:0:0:2

COURSE OBJECTIVE

- To inculcate knowledge on HTML concepts and Programming knowlege.
- To understand basic concepts of style sheets and graphics.
- Students will understand the basic structure of webpage creation and to know the impact of HTML tags.
- Understanding the basic structure of website and ability to build website.
- Students will learn about image types and use cases.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic concepts of HTML	K1
CO2	Discuss about cascading style sheet	K1
CO3	Applying graphics for web use	K2
CO4	Creation of table	K2
CO5	Creation of frames	K2

Subject Title	HTML AND WEB DESIGNING	Semester	IV
Subject Code	18U4CSS02	Specialization	NA
Type	SBEC-II-THEORY	L:T:P:C	2:0:0:2

Unit	Syllabus Contents	Level	Number of Sessions
I	**HTML Basics :** Understanding HTML – Setting Up the Document Structure – Formatting text by Using Tags – Using Lists and Backgrounds – Creating Hyperlinks and Anchors.	K1	4
II	**Style Sheets and Graphics**: Introduction to Style Sheets – Formatting Text by using Style Sheets – Formatting Paragraphs by using Style Sheets.	K1	4
III	**Displaying Graphics :** Selecting a graphics format – Preparing graphics for web use – Inserting graphics – Arranging elements on the page – Controlling image size and Padding – Hyper linking from graphics – Utilizing Thumbnail graphics – Including alternate text for graphics.	K2	4
IV	**Navigation:** Creating Navigational Aids – Creating Tables – Formatting Tables.	K2	4
V	**Layouts:** Creating Division – based Layouts – Creating User Forms – Using Frames for layout – Incorporating Audio and Video.	K2	4

Learning Resources	
Text Book	1. "Microsoft Step by Step – HTML and XHTML", Faithe Wempen. PHI, 2009
Reference Book	1. "Web design with HTML", C. Xavier, TMH Publisher, 2000
Website / Links	• www.w3schools.com/html/ • www.w3schools.com/html/html_responsive.asp • www.how – to – build – websites.com/

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓			✓
CO2	✓			✓
CO3		✓		
CO4			✓	
CO5	✓			✓

Subject Title	HTML AND WEB DESIGNING LAB	Semester	IV
Subject Code	18U4CSCP08	Specialization	NA
Type	CORE-VIII P-VIII-PRACTICAL	L:T:P:C	0:0:2:2

COURSE OBJECTIVE

- To inculcate knowledge on HTML concepts and Programming knowlege.
- Understanding the basic structure of website and ability to build website.
- Students will learn about the how to link pages.
- Learn how to use graphics in webdesign.
- Design and develop the website text,image,link,list and tables for navigation layout.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the formatting text	K1
CO2	Understand word document	K2
CO3	To create a Web page with image as hyperlink	K2
CO4	Using table creation for mark sheet	K3
CO5	Demonstrate web page creation for biodata	K2

Subject Title	HTML AND WEB DESIGNING LAB	Semester	IV
Subject Code	18U4CSCP08	Specialization	NA
Type	CORE-VIII P-VIII-PRACTICAL	L:T:P:C	0:0:2:2

	List of Programs	Level
1	Create a web page illustrating text formatting tags	K1
2	Create a web page to demonstrate font variations	K1
3	Create a web page that describes different types of heading and different paragraph alignment	K1
4	Create a web page with moving text	K1
5	Create a web page with hypertext link to a word document	K2
6	Create a web page with Image as hyperlink	K2
7	Prepare a sample code to illustrate three types of lists in HTML	K2
8	Using Nested tables create your Mark sheet	K3
9	Create a web page to display your Curriculum Vitae	K2
10	Create a form that accepts the information from the subscriber of a mailing system	K2

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2	✓	✓	✓	
CO3	✓	✓		✓
CO4	✓	✓	✓	✓
CO5	✓	✓		✓

Subject Title	VB.NET	Semester	V
Subject Code	18U5CSC05	Specialization	NA
Type	CORE-IX-THEORY	L:T:P:C	5:0:0:5

COURSE OBJECTIVE

- Introduction to Networking and the world wide web.
- Building multi-tier enterprise applications.
- Introduction to the .NET framework
- .NET Interoperation services.
- Client side programming: HTTP, CGI, Cookies, JavaScript, HTML, XML.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Explain the overview of .NET framework	K1
CO2	Explain the classes ,objects & control statements	K1
CO3	Explain objects and Inheritance	K2
CO4	Perform Exception Handling mechanism and Multithread	K3
CO5	Understand database connectivity that can be applied in different applications	K4

Subject Title	VB.NET	Semester	V
Subject Code	18U5CSC05	Specialization	NA
Type	CORE-IX-THEORY	L:T:P:C	5:0:0:5

Unit	Syllabus Contents	Level	Number of Sessions
I	**Net Framework And Vb.Net:** Evolution of the .NET Framework – Overview of the .Net Framework – VB.NET – Simple VB.Net Program. Variables, Constants And Expressions: Value Types and Reference Types – Variable Declarations and Initializations – Value Data Types – Reference Data Types – Boxing and Un boxing – Arithmetic Operators– Textbox Control – Label Control – Button Control.	K1	12
II	**Control Statements:** If Statements – Radio Button Control – Check Box Control – Group Box Control – Listbox Control – Checked List Box Control – Combo box Control – Select Case Statement – While Statement – Do Statement – For Statement. Methods And Arrays: Types of Methods– One Dimensional Array – Multi Dimensional Arrays – Jagged Arrays. Classes: Definition And Usage of a Class – Constructor Overloading – Copy Constructor – Instance and Shared Class Members – Shared Constructors.	K1	12
III	**Inheritance And Polymorphism:** Virtual Methods – Abstract Class and Abstract Methods – Sealed Classes. Interfaces, Namespaces And Components**:** Definition of Interfaces – Multiple Implementations of Interfaces – Interface Inheritance – Namespaces – Components – Access Modifiers. Delegates, Events And Attributes: Delegates – Events– Attributes – Reflection.	K2	12
IV	**Exception Handling:** Default Exception Handling Mechanism – User Defined Exception Handling Mechanism – Throw Statement – Custom Exception. Multithreading: Usage Of Threads – Thread Class – Start(), Abort(), Join(), and Sleep() Methods – Suspend() And Resume() Methods – Thread Priority – Synchronization. I/O Streams: Binary Data Files – Text Files - Data Files – FileInfo and DirectoryInfo Classes.	K3	12
V	**Additional Controls:** Timer – ProgressBar – LinkLabel – Panel – TreeView – Splitter – Menu – SDI & MDI – Dialog Boxes – Toolbar – StatusBar. Database Connectivity: Advantages Of ADO.NET – Developing a Simple ADO.NET Based Application	K4	12

Learning Resources	
Text Books	1. C.Muthu "Visual Basic.Net" McGraw-Hill Education(India) Pvt.Ltd Reprint 2012 (Unit I – Chapter 1.2, 1.3, 1.5, 1.6, 3.2 to 3.10), (Unit II Chapter 4.2 to 4.12, 5.2 to 5.6 6.2 to 6.6), (Unit III Chapter 7.2 to 7.4,8.2 to 8.7, 9.2 to 9.5), (Unit IV Chapter 10.2 to 10.6, 11.2 to 11.7, 12.3 to 12.6), (Unit V Chapter 14.3 to 14.14,15.2 to 15.8)
Reference Books	1. David S Platt, "Introducing Microsoft .Net", Prentice Hall of India, New Delhi, 2003. 2. David Chappell, Understanding .Net, Addison-Wesley Professional; 2 Edition,2006
Website / Links	• www.Vb-informations.com • www.vbcodesource.com/netlinks.php • www.ni.com

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓		✓	
CO2	✓		✓	
CO3	✓	✓	✓	✓
CO4	✓	✓	✓	✓
CO5	✓		✓	✓

Subject Title	OPERATING SYSTEMS	Semester	V
Subject Code	18U5CSC06	Specialization	NA
Type	CORE-X -THEORY	L:T:P:C	5:0:0:4

COURSE OBJECTIVE

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
- To know the components and management aspects of concurrency management
- To learn programmatically to implement simple OS mechanisms

COURSE OUTCOMES

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Describe and explain the fundamental components of a computer operating system	K1
CO2	Explain the policies for deadlock	K1
CO3	Design and construct the OS components by system calls, schedulers, Memory Management system	K2
CO4	Discuss about the implementation of file system	K3
CO5	Discuss about LINUX operating system	K3

Subject Title	OPERATING SYSTEMS	Semester	V
Subject Code	18U5CSC06	Specialization	NA
Type	CORE-X -THEORY	L:T:P:C	5:0:0:4

Unit	Syllabus Contents	Level	Number of Sessions
I	**Introduction** - OS goals and functions – History of operating system- Different kinds of operating system- Computer hardware review – Operation system concept- System calls-Operating system structure.	K1	12
II	**Processes and Threads**: Processes – threads – thread model and usage – inter process communication; **Deadlocks:** Resources- introduction to deadlocks – deadlock detection and recovery – deadlocks avoidance – deadlock prevention.	K1	12
III	**Memory management**: Basis memory management – virtual memory – page replacement algorithms; **Input/Output**: principles of I/O hardware - principles of I/O software.	K2	12
IV	**Files systems**: Files – directories - files systems implementation; **Multiple processor system:** multiprocessors – multi computers - distributed systems.	K3	12
V	**LINUX:** An introduction to Linux- Getting started in Linux-Managing Linux Files and Folders.	K3	12

Learning Resources	
Text Books	1. Modern Operating Systems‖, Second Edition, Andrew S. Tanenbaum, PHI private Limited, New Delhi, 2008 ,Linux Learning the Essentials‖,K.L.James, PHI.
Reference Books	1. Operating Systems – Internals & Design Principles, William Stallings. Prentice – Hall of India P.Ltd, New Delhi – 110001. 5th Edition&3) 2. Operating Systems W.Mary Maggdalene Viola ,V.Mahalakshmi,Charulatha Publications
Website/Links	www.businessinsider.com www.vnsgu.ac.in

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2		✓		✓
CO3	✓	✓		✓
CO4	✓	✓		✓
CO5	✓	✓		✓

Subject Title	VB.NET LAB	Semester	V
Subject Code	18U5CSCP09	Specialization	NA
Type	CORE-IX P – IX PRACTICAL	L:T:P:C	0:0:5:3

COURSE OBJECTIVE

- Design/develop programs with GUI interfaces
- Code programs and develop interface using Visual Basic.Net
- Perform tests, resolve defects, and revise existing code

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Perform a simple application program	K1
CO2	Apply tools for paint brush	K2
CO3	Develop an application using controls	K3
CO4	Develop an application using files	K4
CO5	Developing an application using ADO.NET	K4

Subject Title	VB.NET LAB	Semester	V
Subject Code	18U5CSCP09	Specialization	NA
Type	CORE-IX P - IX PRACTICAL	L:T:P:C	0:0:5:3

	List of Programs	Level
1	Develop an Image Viewer Application	K1
2	Simulate a Scientific Calculator	K1
3	Simulate a Paint Brush Application	K2
4	Develop a Notepad Editor using Dialog Control	K3
5	To Move an object using Timer Control	K3
6	Develop a Simple Student Information System Using Files	K4
7	Develop a College Admission Form Using MDI	K4
8	Validate a Bio – Data Application Form	K4
9	Develop an Inventory Control System Using ADO.NET	K4
10	Develop a CIA SYSTEM Using Grid Control	K4

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓		✓	
CO2		✓		
CO3	✓			
CO4	✓		✓	✓
CO5		✓	✓	✓

Subject Title	OPERATING SYSTEM LAB	Semester	V
Subject Code	18U5CSCP10	Specialization	NA
Type	CORE-X P-X -PRACTICAL	L:T:P:C	0:0:5:3

COURSE OBJECTIVE

- To familiarize students with the architecture of Unix OS and provide necessary skills for developing programs in Unix.
- Students can able to understand and appreciate the principles in the design and implementation of operating systems software.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Develop and debug C programs created on UNIX platform and shell programming	K1
CO2	Implement file allocation strategies	K2
CO3	Implement different kinds of algorithm for detection and recovery	K2 K3
CO4	Implement file optimization techniques	K3
CO5	Implement threading and synchronization mechanism	K3

Subject Title	OPERATING SYSTEM LAB	Semester	V
Subject Code	18U5CSCP10	Specialization	NA
Type	CORE-X P-X -PRACTICAL	L:T:P:C	0:0:5:3

	List of Programs	Level
1	Basics of UNIX commands.	K1
2	Shell Programming.	K1
3	Implement the following CPU scheduling algorithms 1.Round Robin 2. SJF 3. FCFS 4. Priority	K2
4	Implement all file allocation strategies 1. Sequential 2. Indexed 3. Linked	K2
5	Implement Semaphores	K2
6	Implement all File Organization Techniques 1. Single level directory 2. Two level 3. Hierarchical 4. DAG	K2
7	Implement Bankers Algorithm for Dead Lock Avoidance	K2 K3
8	Implement an Algorithm for Dead Lock Detection	K2 K3
9	Implement e all page replacement algorithms 1. FIFO 2. LRU 3. LFU	K2 K3
10	Implement Shared memory and IPC	K3
11	Implement Paging Technique of memory management.	K3
12	Implement Threading & Synchronization Applications	K3

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓			
CO2	✓			
CO3	✓	✓		
CO4	✓	✓	✓	✓
CO5	✓	✓		✓

Subject Title	SOFT SKILLS	Semester	V
Subject Code	18U5CSS03	Specialization	NA
Type	SBEC-III THEORY	L:T:P:C	2:0:0:2

COURSE OBJECTIVE

- Develop their communicative competence in English with specific reference to speaking and listening
- Enhance their ability to communicate effectively in interviews.
- Strengthen their prospects of success in competitive examinations.
- To teach students the four basic communication skills, Listening, Speaking, Reading and Writing

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To develop communication skills and to know about the stages of communication	K2
CO2	To understand about the listening and speech process	K1
CO3	Able to know how to face the interview and to prepare for the interview	K4
CO4	Making to discuss a topic with friends or classmates helps in learning the topic with perfection. It involves sharing of learning by the participants which equally benefits all the participants	K5
CO5	To provide an opportunity to make it easier to engage the audience, flexibility, consistency and versatility	K6

Subject Title	SOFT SKILLS	Semester	V
Subject Code	18U5CSS03	Specialization	NA
Type	SBEC-III THEORY	L:T:P:C	2:0:0:2

Unit	Syllabus Contents	Level	Number of Sessions
I	**Nature of technical communication:** Stages of communication – Channels of communication – Nature of technical communication – Importance and need for technical communication – Technical communication skills.	K2	4
II	**The Listening process:** Types of listening – Listening with a purpose – Barriers to listening – The speech process – Conversion and oral skills – Body language.	K1	4
III	**Job interviews:** Pre – interview preparation techniques – Interview questions – Answering strategies – Frequently asked interview questions – Projecting a positive image – Alternative interview formats.	K4	4
IV	**Group Discussion:** Nature of group discussion – Characteristics of successful group discussions – Selection group discussion – Group discussion strategies – Techniques for individual contribution – Group interaction strategies.	K5	4
V	**Presentation Skills:** Planning the presentation – Preparing the presentation – Organizing your presentation – Rehearsing the presentation – Improving delivery	K6	4

Learning Resources	
Text Books	1. Effective Technical Communication , M. Ashraf Rizvi, Tata McGraw – Hill Publishing Company Limited , New Delhi.
Reference Books	1. Soft Skills - Enhancing Employability: Connecting Campus with Corporate,M.S.Rao,I.K.International Publishing House Pvt.Ltd,New Delhi,2010.
Website / Links	• https://www.thebalancecareers.com › Finding a Job › Job Searching › Resumes • https://en.wikipedia.org/wiki/Soft_skills

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MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2	✓	✓		
CO3			✓	✓
CO4			✓	✓
CO5		✓	✓	✓

Subject Title	COMPUTER NETWORKS	Semester	VI
Subject Code	18U6CSC07	Specialization	NA
Type	CORE- XI-THEORY	L:T:P:C	5:0:0:4

COURSE OBJECTIVE

- To understand the basics of Computer Networks.
- To understand the layers of computer Networks.
- Become familiar with the basics of computer network architectures and protocols

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Describe the functions of each layer in OSI Model	K1
CO2	Explain the types of transmission media that are applied in real time applications	K1
CO3	Describe the functions of data link layer design issues and its services	K2
CO4	Classify the routing algorithm and analyze how to assign the IP addresses for the give network	K3
CO5	Describe the transport layer , application layer and how to secure data	K4

Subject Title	COMPUTER NETWORKS	Semester	VI
Subject Code	18U6CSC07	Specialization	NA
Type	CORE- XI-THEORY	L:T:P:C	5:0:0:4

Unit	Syllabus Contents	Level	Number of Sessions
I	**Introduction:** Business Applications - Home Applications – LAN – WAN- MAN- Protocol Hierarchies – Protocols and Standards- Connection Oriented and Connection less Services – OSI Reference Model.	K1	12
II	**Physical Layer** Transmission Media: Guided Transmission media - Wireless Transmission - Communication Satellites - Public Switched Telephone Network.	K1	12
III	**Data Link Layer:** Data Link Layer Design Issues - Error Detection and Correction – Elementary data link protocols - Sliding Window Protocols - Protocols Verification.	K2	12
IV	**Network Layer:** Network Layer Design Issues. Routing Algorithms: Shortest Path- Link State – Distance Vector. Congestion Control Algorithms: Principles – Load Shedding. Internetworking: Tunneling – Fragmentation – IP Addresses – Protocols – OSPF.	K3	12
V	**Transport Layer:** Transport Services – Elements of Transport protocols – **Application layer:** DNS– Electronic mail-World Wide Web. **Network Security:** Cryptography-Symmetric and Public-key algorithms-Digital signatures.	K4	12

Learning Resources	
Text Books	1. "Computer Networks" Andrew S. Tanenbaum, Fifth edition, PHI private Ltd, New Delhi , 2009.
Reference Books	1. Behrouz A. Forouzan, " Data Communication and Networking", Tata MC-Hill, 2009. 2. William Stallings, 'Data and Computer Communication', 8th Edition, Pearson Education, 2003 / PHI.
Website / Links	• https://en.wikipedia.org • www.tutorialspoint.com • https://www.coursera.org

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓		✓	
CO2	✓		✓	
CO3	✓			
CO4		✓	✓	
CO5		✓		✓

Subject Title	PHP PROGRAMMING	Semester	VI
Subject Code	18U6CSC08	Specialization	NA
Type	CORE-XII-THEORY	L:T:P:C	5:0:0:4

COURSE OBJECTIVE

- How to Write Coding in PHP
- Learn MySQL server as a backend.
- To Use the Connectivity of PHP with MySQL.
- PHP is a server-side scripting language, mainly used for web development to create dynamic content that interact with databases.
- You will be able to learn all of the PHP basics and immediately apply the knowledge you've learned in practice.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic concepts PHP	K1
CO2	Execute Queries using PHP	K2 K3
CO3	Implement Functions and Arrays in PHP	K4
CO4	Apply OOPS concepts in PHP	K3
CO5	Implement Web Forms	K4

Subject Title	PHP PROGRAMMING	Semester	VI
Subject Code	18U6CSC08	Specialization	NA
Type	CORE-XII-THEORY	L:T:P:C	5:0:0:4

Unit	Syllabus Contents	Level	Number of Sessions
I	**Introduction to PHP:** History – General Language Features – PHP Basics: Embedding PHP Code in your Web Pages – Commanding Your Code – Output Data to the Browser. PHP's Supported Data Types – Identifiers – Variables – Constants – Expressions – String – Interpolation. **Control Structures:** Conditional Statements – Looping Statements – File Inclusion Statements	K1	12
II	**Introduction to MySQL:** Naming Database Elements – Choosing Your Column Types – Choosing other Column Properties – Accessing MySQL. **Using PHP With MySQL** Modifying The Template – Connecting To MySQL – Executing Simple Queries – Retrieving Query Results – Ensuring Secure SQL – Counting Returned Records – Updating Records With PHP.	K2 K3	12
III	**Functions**: Invoking a Function – Creating a Function – Function Library. **Arrays:** Creating an Array – Adding and Removing Array Elements – Locating Array Elements – Traversing Array – Merging – Slicing – Splicing and Dissecting Array.	K4	12
IV	**Object Oriented PHP:** Benefits of OOP – Key OOPs Concepts – Constructors and Destructors – Static Class Members – The instance of Keyword – **Error and Exception Handling –** Configuration Directives – Error Logging – Exception Handling	K3	12
V	**Strings and Regular Expression:** Other String Specific Function – Alternatives for Regular Expression Functions**. Forms:** PHP and Web Forms – Taking Advantage of Pear: HTML_QuickForm – Installing HTML_QuickForm – Creating a Simple Form – Using Auto – Completion	K4	12

Learning Resources	
Text Books	1. "Beginning PHP and Oracle From Novoice to professional", W.Jason Gilmore and Bob Brylr, 2008 2. "PHP 6 and my SQL 5 ", Larry Ullman, 2008
Reference Books	1. "Spring into PH5 the Small Professional choice", Steven Holzner, Pearson education, 2006. 2. "PHP and my SQL for dynamic websites", Larry Ullam, Fourth Edition, 2015 3. "PHP 6 and my SQL", Tim converse, Joy Park, 2009.
Website/Links	• www.6.470.scripts.mit.edu/2013/assets/resources/php_ppt.pdf • www.msu.ac.zw/elearning/material/1296460382php%20module.pdf • www.tutorialspoint.com/php/php_tutorial.pdf • www.downloads.mysql.com/docs/apis – php – en.pdf

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MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓	✓	
CO2	✓	✓		
CO3	✓	✓	✓	✓
CO4	✓			✓
CO5	✓	✓	✓	✓

Subject Title	NETWORK LAB	Semester	VI
Subject Code	18U5CSCP11	Specialization	NA
Type	CORE–XI P–XI– PRACTICAL	L:T:P:C	0:0:6:4

COURSE OBJECTIVE

- To create Network Programming skill and to sketch out the hidden talent of students community.
- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms
- To know the concept of data transfer between client/server

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Detecting errors by applying different methods	K3 K4
CO2	Implement Asynchronous communication	K3 K4
CO3	Implement protocol for different user specifications	K3 K4
CO4	Apply algorithm to solve real time problems	K4
CO5	Implement client server communication through file transfer	K2

Subject Title	NETWORK LAB	Semester	VI
Subject Code	18U5CSCP11	Specialization	NA
Type	CORE–XI P–XI– PRACTICAL	L:T:P:C	0:0:6:4

	List of Programs	Level
1	Write a program to Detect Errors using Vertical Redundancy Check (VRC)	K3 K4
2	Write a program to Detect Errors using Longitudinal Redundancy Check (LRC)	K3 K4
3	Write a program to Detect Errors using Cyclic Redundancy Check (CRC)	K3 K4
4	Write a Socket program to implement Asynchronous Communication	K3 K4
5	Write a Socket program to implement Isochronous Communication	K3 K4
6	Write a program to implement Stop & Wait Protocol	K3 K4
7	Write a program to implement Sliding Window Protocol	K3 K4
8	Write a program to implement the Shortest Path Routing using Dijkstra algorithm	K4
9	Write a Socket Program to Perform file transfer from Server to the Client	K2
10	Write a Program to implement Remote Procedure call under Client / Server Environment	K2

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2	✓		✓	
CO3	✓	✓		✓
CO4	✓	✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	PHP PROGRAMMING – LAB	Semester	VI
Subject Code	18U6CSCP12	Specialization	NA
Type	CORE–XII P–XII – PRACTICAL	L:T:P:C	0:0:6:4

COURSE OBJECTIVE

- To develop an ability to design and implement static and dynamic website.
- Gain the PHP programming skills needed to successfully build interactive, data-driven sites.
- Test and debug a PHP application programs.
- Working with regular expressions, hashing functions, and date and time functions
- Students will develop practical skills , design and implementation of software based projects.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To understand the basic concepts of PHP	K1
CO2	Implement using controls and functions	K3 K4
CO3	Solve real time problems	K3 K4
CO4	To understand the validation of input and output	K4
CO5	Implement Hashing function for different user specifications	K3 K4

Subject Title	PHP PROGRAMMING – LAB	Semester	VI
Subject Code	18U6CSCP12	Specialization	NA
Type	CORE–XII P–XII – PRACTICAL	L:T:P:C	0:0:6:4

	List of Programs	Level
1	Write a PHP Program to display the Display "Hello" and today's date	K1
2	Develop a PHP program using controls and functions	K3 K4
3	Develop a PHP program and check message passing mechanism between pages	K2
4	Develop a PHP program using String function and Arrays	K3 K4
5	Database connectivity in PHP with MySQL	K3 K4
6	Develop a PHP program to display student information using MYSQL table	K3 K4
7	Develop a PHP program to design a college application form using MYSQL table	K3 K4
8	Develop a PHP program Validating Input and Formatting the Output	K4
9	Develop a PHP program and check Regular Expression, HTML functions, Hashing functions	K3 K4
10	Develop a PHP program and check File System functions, Date and time functions	K3 K4

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2	✓	✓	✓	
CO3	✓	✓	✓	
CO4	✓	✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	JAVA SCRIPT AND VB SCRIPT	Semester	VI
Subject Code	18U6CSS04	Specialization	NA
Type	SBEC-IV-THEORY	L:T:P:C	2:0:0:2

COURSE OBJECTIVE

- To understand the essentials of Java script
- To understand the features of VB script
- To improve the web designing skill of the students

COURSE OUTCOMES

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To understand the basic concept of Java Script	K1
CO2	To understand functions and objects in Java Scrip	K1 K2
CO3	To analyze the flow of data with conditions and loops	K2 K3
CO4	To learn the basic concepts of VB Script	K1
CO5	Examine the types of error handling and debugging	K3 K4

Subject Title	JAVA SCRIPT AND VB SCRIPT	Semester	VI
Subject Code	18U6CSS04	Specialization	NA
Type	SBEC-IV-THEORY	L:T:P:C	2:0:0:2

Unit	Syllabus Contents	Level	Number of Sessions
I	Understanding JavaScript: Learning Web Scripting Basics – How Java Script fits into a Web page - Browsers and JavaScript. Creating Simple Scripts: Tools for Scripting – Beginning the Script – Adding JavaScript Statements – Creating Output.	K1	4
II	Using Variables, String and Arrays: Using Variables – Expressions and Operators - Data Types in JavaScript – String Objects – Using Numeric and String Arrays. Functions and Objects: Using Functions – Introducing Objects – Using Objects to simplify Scripting – Extending Built-in Objects.	K1 K2	4
III	Controlling Flow with Conditions and Loops : The if Statement – Using Shorthand Conditional Expressions – Testing Multiple Conditions with If and Else – Using Multiple Conditions with switch – Using for Loops – Using While Loops – Using Do . . . While Loops. Using Built-in Functions and Libraries: Using the Math Object – Working with Math Functions.	K2 K3	4
IV	What VB Script Is and Isn't?: VB Script is Scripting Language-Advantage of using VB Script-VBScript Fits in with the Visual Basic Family-What Can You Do with VBScript? Data Types: The Variant, VBScript's Only Data Type-Arrays as Complex Data Types. Variables and Procedures: Naming Variables-Procedures and Functions-By Ref and By Val.	K1	4
V	Error Handling and Debugging: Types of Errors-Error Visibility and Context-Handling Errors. Classes in VBScript (Writing Your Own COM Objects): Objects, Classes, and Components-The Class Statement- Defining Properties- Defining Methods- Class Events.	K3 K4	4

Learning Resources	
Text Books	1. "Teach Yourself Java Script in 24 Hours" by Michael Moncur, Fourth Edition, published by Pearson Education. 2. "VB Script Programmer's Reference" by Adrian Kingsley-Hughes, Kathie. Kingsley-Hughes, Daniel Read, Wrox Publishing, Third Edition 2007.
Reference Books	1. "Microsoft VBScript: Step by Step" by Ed Wilson,Microsoft Press,2007 2. "JavaScript" by Joel Murach and Michael Urban, 2nd Edition, 2010
Website/Links	• www.w3schools.com • www.tutorialspoint.com • https://msdn.microsoft.com

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2	✓	✓	✓	
CO3	✓	✓	✓	
CO4	✓	✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	COMPUTER GRAPHICS	Semester	V
Subject Code	18U5CSE01	Specialization	NA
Type	ELECTIVE - I	L:T:P:C	4:0:0:3

COURSE OBJECTIVE

- The goal of this course is to provide an introduction to the theory and practice of computer graphics.
- The course will assume a good background in programming in C or C++ and a background in mathematics including familiarity with the theory and use of coordinate geometry and of linear algebra.

COURSE OUTCOMES

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understanding the basic concepts of Computer Graphics and generating algorithms.	K1 K2 K4
CO2	Exploring the different attributes types along with the basic transformations.	K1 K4 K5
CO3	Able to understand about the principles of 2D Viewing concepts along with the various clipping levels.	K2 K3 K5
CO4	To easy recognize and find the way for Designing Models.	K3 K4
CO5	To create an significance in Animation process.	K3 K4 K5

Subject Title	COMPUTER GRAPHICS	Semester	V
Subject Code	18U5CSE01	Specialization	NA
Type	ELECTIVE - I	L:T:P:C	4:0:0:3

Unit	Syllabus Contents	Level	Number of Sessions
I	**INTRODUCTION TO COMPUTER GRAPHICS:** GUI - Video Display Devices – CRT - Raster and Random scan displays – Input Devices - Hard Copy Devices - Line Drawing Algorithm - DDA Algorithm - Line Function – Circle Generating Algorithm.	K1 K2 K4	12
II	**ATTRIBUTES OF OUTPUT PRIMITIVES:** Line Attributes - Curve Attributes - Color and Gray Scale Levels -Area Fill Attributes - Character Attributes - Bundled Attributes. TWO DIMENSIONAL GEOMETRIC TRANSFORMATIONS: Basic Transformations – Matrix Representations -Composite Transformation – Translation – Rotation – Scaling - Reflection and Shear.	K1 K4 K5	12
III	**TWO DIMENSIONAL VIEWING:** Viewing Pipeline - Viewing Functions - Point Clipping and Line Clipping - Cohen Sutherland Line Clipping - Polygon Clipping – Sutherland – Hodgeman Clipping - Curve and Text Clipping - Exterior Clipping.	K2 K3 K5	12
IV	**GUI AND INTERACTIVE INPUT METHODS:** Input of Graphical Data - Input Functions - Picture Construction Techniques. COLOR MODELS: XYZ - RGB - YIQ - CMY Color Models.	K3 K4	12
V	**MULTIMEDIA:** Images and Graphics. VIDEO AND ANIMATION: Computer Based Animation – Basic Concepts – Animation Languages – Methods of Controlling Animation – Display of Animation – Transmission of Animation – Comments.	K3 K4 K5	12

Learning Resources	
Text Books	1. COMPUTER GRAPHICS"-Donald Hearn And M. Puelin Baker- SECOND EDITION UNIT I Chapter 1, 2, 3, UNIT II Chapter 4, 5, UNIT III CHAPTER 6, UNIT IV Chapter 7, 8 & 15. 2. "MULTIMEDIA COMPUTING, COMMUNICATIONS & APPLICATIONS", Ralf Steinmetz & Klara Nahrstedt.
Reference Books	1. "MULTIMEDIA SYSTEM DESIGN", Prabhat K, Andleigh & Kiran Thakrar.
Website/Links	• https://www.javatpoint.com/computer-graphics-tutorial • ecomputernotes.com › Computer Graphics › Basic of Graphics

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2		✓	✓	
CO3	✓			✓
CO4		✓		✓
CO5	✓		✓	

Subject Title	GRID COMPUTING	Semester	V
Subject Code	18U5CSE02	Specialization	NA
Type	ELECTIVE - I	L:T:P:C	4:0:0:3

COURSE OBJECTIVE

- To understand the concept of grid computing
- To know the application of grid computing
- To understanding the technology and tool kits to facilitated the grid computing
- To understand the Grid computing processor architecture that combines computer resources from various domains
- To know the Grid works on various tasks within a network, but it is also capable of working on specialized applications.

COURSE OUTCOMES

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To understand the concept of Grid activities and infrastructure	K1
CO2	To learn Grid computing organization and their roles	K1 K2
CO3	Apply Grid computing applications	K3 K4
CO4	Understand Grid computing technologies	K1 K2
CO5	Apply Grid computing tool kits in applications	K3 K4

Subject Title	GRID COMPUTING	Semester	V
Subject Code	18U5CSE02	Specialization	NA
Type	ELECTIVE - I	L:T:P:C	4:0:0:3

Unit	Syllabus Contents	Level	Number of Sessions
I	**GRID COMPUTING** : Introduction – Early and Current Grid activities – Grid Business areas – Grid Applications – Grid Infrastructure	K1	12
II	**GRID COMPUTING INITIALIVES:** Grid Computing Organizations and their Roles: Organization s developing Grid standards, best practice guidelines, Global grid forum (GGM), Grid Computing Toolkits and the frameworks – Grid based solutions to solve computing. The Grid computing Anatomy: Grid Architecture – Relationship to other distributed Technologies. The Grid computing Road map.	K1 K2	12
III	**GRID COMPUTING APPLICATIONS**: Merging the Grid Services Architecture with the Web Devices Architecture: Service oriented Architecture – E-Web service, SOAP .Service message description Mechanisms – Relationship between web service and grid service.	K3 K4	12
IV	**GRID COMPUTING TECHNOLOGIES**: Open grid service architecture – Use cases that drive the OGSA – Sample use cases – The OGSA platform components – Open grid service infrastructure (OGSI) – OGSA Basic Services.	K1 K2	12
V	**GRID COMPUTING TOOL KITS**: Globus GT3 Toolkit – Architecture – Programming model, – A Sample implementation – High level services: Introduction – Information service Index services – Resource information provider Services – Resource management service – Data Management service.	K3 K4	12

Learning Resources	
Text Books	1. "Grid Computing", Joshy Joseph & Craig Fellenstein, PHI, 2nd Edition, 2013
Reference Books	1. "Grid and Cloud Computing", D.Janakiram, TMH, 1st Edition, 2010
Website/Links	✓ www.gridcomputing.com. ✓ www.cloudbus.org/reports ✓ www.redbooks.ibm.com

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MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓			
CO2	✓			
CO3	✓	✓	✓	
CO4	✓	✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	SOFTWARE ENGINEERING	Semester	V
Subject Code	18U5CSE03	Specialization	NA
Type	ELECTIVE - I	L:T:P:C	4:0:0:3

COURSE OBJECTIVE

- To inculcate knowledge on Software engineering concepts in turn gives a roadmap to design a new software project.

COURSE OUTCOMES

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understanding the basic concepts of Software Engineering.	K1
CO2	To Understanding about the various process models and Agile development.	K1 K2
CO3	Able to understand about the principles in software engineering and requirements.	K3 K4
CO4	Understanding clearly about the new methodologies used in modeling.	K4
CO5	To easy recognize and find the way for Designing Models.	K5

Subject Title	SOFTWARE ENGINEERING	Semester	V
Subject Code	18U5CSE03	Specialization	NA
Type	ELECTIVE - I	L:T:P:C	4:0:0:3

Unit	Syllabus Contents	Level	Number of Sessions
I	**SOFTWARE AND SOFTWARE ENGINEERING:** The nature of software – Software Engineering-software process-software engineering practice-software myths	K1	12
II	**PROCESS MODELS:** Generic process models-prescriptive process models-specialized process models-unified process. AGILE DEVELOPMENT: Agile process-Extreme programming-Agile process models-	K1 K2	12
III	**PRINCIPLES THAT GUIDE PRACTICE:** core principles-Framework activity. UNDERSTANDING REQUIREMENTS: Requirements Engineering-Eliciting requirements.	K3 K4	12
IV	**REQUIREMENT MODELING:** Requirement Analysis-Scenario based modeling-Data modeling concepts-Class based modeling. –Flow oriented modeling-patterns for requirements modeling-requirements modeling for WebApps.	K4	12
V	**DESIGN CONCEPTS:** Design concepts - Design model. ARCHITECTURAL DESIGN**:** Software Architecture-Architectural styles-Architectural design. COMPONENT LEVEL DESIGN**:** Designing class based components-Designing Traditional components-component based development.	K5	12

Learning Resources	
Text Books	1.Roger S.Pressman, "Software Engineering A Practitioner's Approach"-Mc Graw Hill International, 7th Ed 2010 (Chapter 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 14, 17, 18, 28, 30)
Reference Books	1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach" - 6th Edition, Tata McGraw Hill International Edition. 2. "Fundamentals of SOFTWARE ENGINEERING" – Rajib Mall, 2nd edition, PHI 3. "SOFTWARE ENGINEERING" – Stephen Schach, 7th edition, TMH.
Website/Links	• www.en.wikipedia.org

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MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓	✓		
CO2		✓		✓
CO3	✓		✓	✓
CO4	✓			✓
CO5	✓		✓	✓

Subject Title	E-COMMERCE	Semester	VI
Subject Code	18U5CSE04	Specialization	NA
Type	ELECTIVE - II	L:T:P:C	4:0:0:3

COURSE OBJECTIVE

- ✓ To learn about the business over internet, and to promote and encourage use of computers.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To understand the growth of internet,advantages and diaadvantages of commerce	K1
CO2	To understand the Characteristics of address system,ISP	K2
CO3	Analyze the concept of E-marketing and E-Advertising	K4
CO4	Analyze the Concepts of E-Security and firewall concept	K3
CO5	To know about the mobile commerce	K6

Subject Title	E-COMMERCE	Semester	VI
Subject Code	18U5CSE04	Specialization	NA
Type	ELECTIVE - II	L:T:P:C	4:0:0:3

Unit	Syllabus Contents	Level	Number of Sessions
I	History of E-commerce: Emergence of the internet: Commercial use of internet –Growth of the Internet-Origins of the web-Advantages of E-commerce-Disadvantages of E-commerce-the information Technology ACT 2000. Business models for E-commerce: B2B, B2C, C2C, C2B E-business model: Brokerage model: characteristics –Advantages of the Brokerage model-price discovery mechanisms	K1	12
II	Enabling Technologies of the World Wide Web: Internet client server Applications: Telnet –FTP-Chat on the web-MIME. Networks and internet: Internet protocol suite-IP address system-Domain Name-URLs-Defining URLs-IPVs-TCP. Internet service Provider (ISP): Architecture of public access provide-NAPs and ISPs – terms related to ISPs-Broadband Technologies-Types of Broadband Technologies	K2	12
III	E-marketing: Traditional Marketing-Identifying Web presence Goals-Achieving web presence Goals-uniqueness of the web-site adhesion: Content, Format and Access-Maintaining a website-metrics defining internet units of measurement. E-advertising: Means of Advertising –Conductions Online Market research-market segmentation- Data mining & market research.	K4	12
IV	E-security: Security on the internet-Network and security risks-How are sites hacked?-Security incidents on the internet –Security and E-mail- Network and web based security. Business risk management issues: The firewall concept-Firewall Components–Benefits of an Internet Firewall-Secure physical Infrastructure. E-Payment System: Classification of new payment system-Digital signature.	K3	12
V	Information system for mobile commerce: Mobile Commerce-Wireless Applications –Wireless Spectrum-Technologies for mobile Commerce-Wireless Technologies. Legal and Ethical Issues: Computer as targets for crime-privacy is at risk in the internet age-cookies and privacy-Phishing – copyright-internet Gambling-Threats to children.	K6	12

Learning Resources	
Text Books	1. E-commerce An Indian Perspective P.T. Joseph, S.J., PHI, 4th Edition.
Reference Books	1. "E-Commerce Strategy, Technologies and Applications" David Whiteley Tata Mc-Graw-Hill
Website/Links	✓ https://www.google.com/ E-Commerce + Strategy. ✓ https://www.google.com/search/E-Commerce

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MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓			
CO2	✓			
CO3	✓	✓	✓	✓
CO4	✓	✓	✓	✓
CO5	✓	✓		

Subject Title	ANDROID APPLICATIONS	Semester	VI
Subject Code	18U6CSE05	Specialization	NA
Type	ELECTIVE - II	L:T:P:C	4:0:0:3

COURSE OBJECTIVE

- To understand the concept of Android Technology
- To understand applications of android
- To understand android web apps
- To learn how to develop apps for Android. Android is a mobile operating system that powers all kinds of devices: phones, tablets, cameras and even cars.
- Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To know the basic concepts of Android and its components	K6
CO2	To understand different types of Android resources	K2
CO3	Analyze Android application designing interfaces with layout and screening elements	K4
CO4	Analyze the concept of Android Data and Storage API	K3 K4
CO5	Implement Application with DDMS	K3 K4

Subject Title	ANDROID APPLICATIONS	Semester	VI
Subject Code	18U6CSE05	Specialization	NA
Type	ELECTIVE - II	L:T:P:C	4:0:0:3

Unit	Syllabus Contents	Level	Number of Sessions
I	Introduction to Open Source: What is Open Source – License Issues (MPL, GPL, and LGPL) and Open Source Vs Traditional Development Methodologies. Introduction to Android: Introducing Android – History of Mobile Software Development – Layers of Android – Android SDK – Kinds of Android Components – Building a Sample Android Application.	K6	12
II	Android Application Design Essentials: Anatomy of an Android Applications – Android Terminologies – Application Context – Actives – Services – Intents – Receiving and Broadcasting Intents – Android Manifest File and its common settings – Managing Application resources in a hierarchy – Working with different types of resources.	K2	12
III	Android Application Design Essentials: User Interface Screen Elements – Designing User Interfaces with Layouts – Drawing and Working with Animation.	K4	15
IV	Using Common Android APIs:Using Android Data and Storage APIs – Managing data using SQLite – Sharing Data between Applications with Content Providers – Using Android Networking APIs – Using Android Web APIs and Using Android Telephony APIs.	K3 K4	15
V	DDMS – Debug and Other View:DDMS – Dalvik Debug Monitor Server – LogCat View – File explorer – Breakpoints and Debug.	K3 K4	06

Learning Resources	
Text Books	1. "Android Wireless Application Development", Lauren Darcey and Shane Conder, Pearson Education, 2nd Edition, 2011. 2. "Android in Action", W. Frank Ableson, Robi Sen, Chris King, Manning Publications Co., 2nd Edition, 2011.
Reference Books	1. "Android Essentials", Chris Haseman, A Press Publications, 2008. 2. "The Android Developer's Cookbook – Building Applications with the Android SDK", James Steele, Nelson To, Addison – Wesley Publications, 2011.
Website/Links	• www.developer.android.com • www.android.com • www.source.android.com

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MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓			
CO2	✓	✓	✓	
CO3	✓	✓	✓	✓
CO4	✓	✓	✓	✓
CO5	✓	✓	✓	✓

Subject Title	MIDDLEWARE TECHNOLOGIES	Semester	VI
Subject Code	18U6CSE06	Specialization	NA
Type	ELECTIVE - II	L:T:P:C	4:0:0:3

COURSE OBJECTIVE

- To understand the concept of Client Server computing
- To understand the importance of CORBA, XML and ADO.NET
- Middleware technologies are often employed to eliminate the pain of integration.
- A middleware solution is essentially a layer between two systems that makes it easy to communicate.
- To understand the applications of c# and .net applications.

COURSE OUTCOMES

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To understand the concept of client server computing	K1
CO2	To know the concept of CORBA with Java	K6
CO3	To understand the concept of C# and .NET Platform	K2 K3
CO4	To build C# application with XML	K3 K4
CO5	To understand the types of core CORBA	K2 K3 K4

Subject Title	MIDDLEWARE TECHNOLOGIES	Semester	VI
Subject Code	18U6CSE06	Specialization	NA
Type	ELECTIVE - II	L:T:P:C	4:0:0:3

Unit	Syllabus Contents	Level	Number of Sessions
I	Introduction to client server computing: Evolution of corporate computing models from centralized to distributed computing, client server models. Benefits of client server computing, pitfalls of client server programming.	K1	12
II	CORBA with Java: Review of Java concept like RMI, RMI API, JDBC. Client/Server CORBA – style, The object web: CORBA with Java.	K6	12
III	Introducing C# and the .NET Platform; Understanding .NET Assemblies; Object – Oriented Programming with C#; Callback Interfaces, Delegates, and Events.	K2 K3	12
IV	Building c# applications: Type Reflection, Late Binding, and Attribute – Based Programming; Object Serialization and the .NET Remoting Layer; Data Access with ADO.NET; XML Web Services.	K3 K4	12
V	Core CORBA / Java: Two types of Client/ Server invocations – static, dynamic. The static CORBA, first CORBA program, ORBlets with Applets, Dynamic CORBA – The portable count, the dynamic count multicount.	K2 K3 K4	12

Learning Resources	
Text Books	1. "Client/Server programming with Java and CORBA Robert Orfali and Dan Harkey", John Wiley & Sons ,SPD, 2nd Edition, 2010 2. "The Complete Reference C# 4.0", Herbert Schildt, TMH Publishers, 2010 3. "Java programming with CORBA", G.Brose, A Vogel and K.Duddy, Wiley – Dreamtech, India John wiley and sons, 3rd Edition, 2003
Reference Books	1. "Middleware for Communications", Qusay H. Mahmoud, John Wiley and Sons, 2004. 2. "JavaTM Programming with ORBATM: Advanced Techniques for Building Distributed Applications", Gerald Brose, Andreas Vogel, Keith Duddy, Wiley, 3rd edition, 2004.
Website/Links	• www.en.wikipedia.org • www.mulesoft.com • www.apprenda.com

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MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	✓			
CO2		✓	✓	
CO3				
CO4	✓	✓		✓
CO5	✓	✓	✓	✓