

# **PONDICHERRY UNIVERSITY**

## **(A CENTRAL UNIVERSITY)**



### **Bachelor of Computer Applications (B.C.A)** (Choice Based Credit System)

Regulations & Syllabus

2017-18 onwards

**Pondicherry University**  
**Bachelor of Computer Applications (B.C.A)**  
**REGULATIONS**  
(Effective from the academic year 2017-2018)

**1. Aim of the Course**

The BCA course aims to impart the students with fundamental and hands on knowledge of computers, applications of computer science and modern computer science applications.

**2. Eligibility of Admission**

Candidates for admission to BCA shall be required to have passed 10 + 2 system of Examination or equivalent with Mathematics / Business Mathematics / Computer Science/ Computer Applications as one of the subjects of study.

**3. Lateral Entry Admission**

Candidates who have passed Diploma in Computer Science / Information Technology/ Computer Technology / Computer Application in I Class (10+3 years of study) are eligible to apply for the lateral entry to the 2<sup>nd</sup> year of the course subject to availability of seats, but limited to 10% of the sanctioned intake.

**4. Duration of the course**

The course shall be of three years' duration spread over six consecutive semesters. The maximum duration to acquire prescribed number of credits in order to complete the Programme of Study shall be twelve consecutive semesters (six years).

**5. Medium**

The medium of instruction shall be English.

## 6. Course Structure

Category	Course Name	Number Of Papers	Credits Per Paper	Total Credits
MIL	Modern Indian Languages	2	3	6
ENG	English	2	3	6
AECC	Ability Enhancement Compulsory Course	2	2	4
SEC	Skill Enhancement Course	4	2	8
GE	Generic Elective Course	2	3	6
DSC	Discipline Specific Core Course	Theory- 12 Practical – 9 Project -1	Theory- 3 Practical – 2 6	12x3=36 9 x 2 =18 1 x 6 = 6 Total = <b>60</b>
DSE	Discipline Specific Elective Course	6	4	6 x 4 =24
OE	Open Elective Course	2	3	2 x 3 =6
			<b>Total</b>	<b>120</b>

### MIL, ENG, AECC

The crediting of MIL, ENG and AECC courses is as per Pondicherry University UG CBCS regulations.

### DSC and DSE

At least 60% (72 credits) of the total minimum credit requirement must be earned by the student from DSC and DSE courses as follows in order to obtain the degree - 60 credits from Discipline Specific Core and 12 credits from Discipline Specific Elective courses.

### SEC

Out of the 4 Skill Enhancement Courses, one course viz. - Online Course / In-Plant Training (2 weeks) / One month Internship / mini project is mandatory. The Online Course to be studied, the organization to be chosen for In-Plant Training or One month internship is to be

validated or approved by a panel of members comprising of the Department Faculty, before a student pursues the same.

For the remaining 3 SEC courses, any of the 2 credit Skill Enhancement Courses specified in the curriculum (BCA) could be credited or substituted with Skill Enhancement Courses in the curriculum of other UG computer science courses or Skill Enhancement Courses of other UG Non-Computer Science Disciplines of study that constitute to skill development or an assortment of these without any overlap of courses.

### **GE**

Any 2 of the 3 credit Generic Elective Courses specified in the curriculum (BCA) could be credited to constitute the 6 credits or substituted with Generic Elective courses in the curriculum of other UG Computer Science Disciplines of study or UG Courses of Non-Computer Science Disciplines of study that add proficiency to the students - with the advice of the Faculty Advisor, or an assortment of these without any overlap of courses.

### **DSE**

The six 4 credit papers to be credited under DSE can be credited from Discipline Specific Elective specialization stream courses as follows:

- I. Three of the 4 credit courses should be credited from one specialization stream courses or across the different specialization stream courses specified in the curriculum.
  
- II. The remaining three of the 4 credit courses may be credited from
  - a. Another specialization stream courses of the curriculum or across the different specialization stream courses specified in the curriculum without any overlap of courses credited in I above.

or

- b. Another specialization stream courses or across the different specialization stream courses in the curriculum of other UG Computer Science Disciplines of study without any overlap of courses credited in I above.

or

- c. An assortment of the above options in II a and IIb.

### **OE**

Any 2 of the 3 credit Open Elective Courses specified in the curriculum (BCA) could be credited to constitute the 6 credits or substituted with Open elective courses in the curriculum of other UG Computer Science disciplines of study or substituted with UG Courses of Non-Computer Science Disciplines of study that add proficiency to the students - with the advice of the Faculty Advisor or an assortment of these without any overlap of courses.

## **7. Faculty to Students Ratio**

The Faculty to Student Ratio in all the practical / laboratory classes shall be maintained at 1:25.

## **8. Pattern of Examination**

- I. The End-Semester examination and internal assessments for MIL, ENG, AECC, DSC, GE and OE courses are as per Pondicherry University UG CBCS regulations.
- II. All SEC courses (except Online Course / In-Plant Training (2 weeks) / One month Internship) to be treated as a practical / laboratory course and the End-Semester examination to be conducted as per Pondicherry University UG CBCS regulations.
- III. The internal assessments for all practical / laboratory courses (for DSC, SEC courses) shall be as follows – 15 marks from two internal practical / laboratory assessment tests and 5 marks based on practical / laboratory course based mini application development.
- IV. The internal assessment for DSE courses shall be conducted as follows - 12 marks from two internal assessment tests and 8 marks based only on two internal practical / laboratory assessment tests.
- V. The marks for attendance (5 marks) applies to all courses and the awarding of attendance marks is as per Pondicherry University UG CBCS regulations.
- VI. The Project work is to be evaluated as follows:
  - i. The internal assessment (25 marks) is awarded as follows:

- a. 10 marks is awarded based on two internal project reviews conducted in periodic intervals by a panel comprising of members of the Department during the tenure of the project.
  - b. The student's project guide awards 10 marks for the project work and 5 marks for attendance (attendance marks as specified in the Pondicherry University UG CBCS regulations).
- ii. The End Semester Examination assessment (75 marks) is evaluated under two aspects viz – i)Project Work – (50 marks) ii)Project Report and Viva-Voce (25 marks)

### **Passing Minimum**

Passing Eligibility and classification for the award of the Degree is as per Pondicherry University UG CBCS regulations.

### **Lateral Entry**

The Lateral Entry students have to complete 102 credits from the DSC, DSE, GE, SE, OE courses as per curriculum (III<sup>rd</sup> to VI<sup>th</sup> semesters). In addition, they should complete the two AECC courses (4 credits) for the award of the degree. One MIL (3 credits) and one ENG (3 credit) courses also need to be completed, if it is not studied in the last three years of the course eligible for lateral entry admission.

Other aspects of CBCS not covered in this document by default conforms to the Pondicherry University UG CBCS regulations.

**PONDICHERY UNIVERSITY**

**Bachelor of Computer Applications (BCA)**

**PROPOSED STRUCTURE OF THE COURSE UNDER CBCS 2017-2018**

<b>Category</b>	<b>Number Of Papers</b>	<b>Credits Per Paper</b>	<b>Total Credits</b>
MIL	2	3	6
ENG	2	3	6
AECC	2	2	4
SEC	4	2	8
GE	2	3	6
DSC	Theory- 12 Practical – 9 Project -1	Theory- 3 Practical – 2 6	12x3=36 9 x 2 =18 1 x 6 = 6 Total = <b>60</b>
DSE	6	4	6 x 4 =24
OE	2	3	2 x 3 =6
		<b>Total</b>	<b>120</b>

**MIL** - Modern Indian Languages (Tamil, Hindi, Sanskrit, etc)

**ENG** – English

**AECC** – Ability enhancement Courses (Public Administration and Environmental Studies)

**SEC** – Skill Enhancement Courses

**GE** – Generic Elective

**DSC** – Discipline Specific Core

**DSE** - Discipline Specific Elective

**OE** – Open Elective

**FIRST SEMESTER**

S.No	COURSE	SUBJECT CODE	Paper	CREDITS		HOURS		
				Th	Prac	L	T	P
1	MIL	LTAM/LHIN/ LARA/ LMAL/ LFRE 111	Language-I	3	-	4	1	0
2	ENG	ENGL112	English-I	3	-	4	1	0
3	DSC – 1	CSCA113	Introduction to Problem Solving using C	3		4	2	
4	DSC – 2	CSCA114	Digital Electronics	3		4	2	
5	AECC-1	PADM115	Public Administration	2		2	0	0
6		CSCA116	Programming in C Lab		2*			3
7		CSCA117	Digital Lab		2*			3
<b>TOTAL</b>				<b>18</b>		<b>30</b>		

**SECOND SEMESTER**

S.No	COURSE	SUBJECT CODE	Paper	CREDITS		HOURS		
				Th	Prac	L	T	P
1	MI4L	LTAM/LHIN/ LARA/ LMAL/ LFRE 121	Language-II	3		4	1	0
2	ENG	ENGL122	English-II	3		4	1	0
3	DSC – 3	CSCA123	Python Programming	3		3	1	
4	DSC – 4	CSCA124	Data Structures and Algorithms	3		3	1	
5	GE-1 (1 out of 2)	CSCA125	Mathematics for Business	3		3	1	0
		CSCA126	Probability and Statistics					
6	AECC-2	ENVS127	EVS	2		2		
7		CSCA128	Python Programming Lab		2*			3
8		CSCA129	Data Structures & Algorithms Lab		2*			3
<b>TOTAL</b>				<b>21</b>		<b>30</b>		

**THIRD SEMESTER**

S.No	COURSE	SUBJECT CODE	Paper	CREDITS		HOURS		
				Th	Prac	L	T	P
1	DSC – 5	CSCA231	Programming with Visual Basic	3		3	1	
2	DSC – 6	CSCA232	Database Management System	3		3	1	
3	DSC – 7	CSCA233	Computer Networks	3		4	1	
4	DSC – 8	CSCA234	Software Engineering	3		4	1	
5	GE-2 (1 out of 2)	CSCA235	Discrete Mathematics	3		3	1	0
		CSCA236	Operations Research					
6	SEC-1	CSCA201	Office Automation Tools		2*			2
		CSCA202	Multimedia Tools					
7		CSCA237	Visual Basic and DBMS Lab		2*			3
8		CSCA238	Computer Networks Lab		2*			3
<b>TOTAL</b>				<b>21</b>		<b>30</b>		



**FOURTH SEMESTER**

S.No	COURSE	SUBJECT CODE	Paper	CREDITS		HOURS		
				Th	Prac	L	T	P
1	DSC – 9	CSCA241	Operating Systems	3		3	1	
2	DSC – 10	CSCA242	Object Oriented Programming using Java Programming	3		3	1	
3 4	DSE – 1 DSE – 2 (2 out of 5 stream s)	CSCA243	Data Warehousing	3	1	3	1	2
		CSCA244	Artificial Intelligence					
		CSCA245	Principles of Information Security					
		CSCA246	Wireless Communication Technologies	3	1	3	1	2
		CSCA247	IT Project Management					
5	OE-1 (1 out of 2)	CSCA248	Fundamentals of Accountancy	3		3	2	
		CSCA249	Financial Management					
6	SEC-2	CSCA203	Accounting Tools		2*			2
7		CSCA250	Object Oriented Programming using Java Lab		2*			3
<b>TOTAL</b>				<b>21</b>		<b>30</b>		

**FIFTH SEMESTER**

S.No	COURSE	SUBJECT CODE	Paper	CREDITS		HOURS		
				Th	Prac	L	T	P
1	DSC – 11	CSCA351	Visual Programming with C#	3		3	2	
2 3	DSE – 3 DSE – 4 (2 out of 5 streams)	CSCA352	Data Mining	3	1	3	1	2
		CSCA353	Neural Networks					
		CSCA354	Cryptography & Network Security					
		CSCA355	Introduction to Mobile Communication	3	1	3	1	2
		CSCA356	Software Testing					
4	OE-2 (1 out of 2)	CSCA357	Principles of Management	3		3	2	0
		CSCA358	Introduction to E-Business					
5	SEC-3 (1 out of 2)	CSCA301	Mobile Application Development		2*			2
		CSCA302	Linux and shell programming					
6	SEC-4 (1 out of 3)	CSCA303	On Job Training		2*			2
		CSCA304	Online Certification Course					
		CSCA305	Two week Field Training					
7		CSCA359	Visual Programming Lab		2*			4
<b>TOTAL</b>				<b>20</b>		<b>30</b>		

**SIXTH SEMESTER**

S.No	COURSE	SUBJECT CODE	Paper	CREDITS		HOURS		
				Th	Prac	L	T	P
1	DSC – 12	CSCA361	Web Technology	3		3	1	
2	DSC – 13	CSCA362	PROJECT		6*		1	10
3 4	DSE – 5 DSE - 6 (2 out of 5 streams)	CSCA363	Foundations of Data Analytics	3	1	3	1	2
		CSCA364	Soft Computing	3	1	3	1	2
		CSCA365	Ethical Hacking					
		CSCA366	Internet of Things					
		CSCA367	Software Quality Management					
5		CSCA368	Web Technology Lab		2*			3
<b>TOTAL</b>				<b>19</b>		<b>30</b>		

\*University Practical Exam/ Viva Should be conducted

<b>Discipline Specific Core – List of University Practical Courses</b>			
S.NO	SUBJECT CODE	Paper Name	Credits
			Practical
1	CSCA116	Programming in C Lab	2
2	CSCA117	Digital Electronics Lab	2
3	CSCA128	Python programming Lab	2
4	CSCA129	Data Structures & Algorithms Lab	2
5	CSCA237	Visual Basic and DBMS Lab	2
6	CSCA238	Computer Networks Lab	2
7	CSCA250	Object Oriented Programming using Java Lab	2
8	CSCA359	Visual Programming Lab	2
9	CSCA362	PROJECT	6
10	CSCA368	Web Technology Lab	2
<b>Skill Enhancement Courses - List of University Practical Courses</b>			
11	CSCA201	Office Automation tools	
12	CSCA202	Multimedia Tools	
13	CSCA203	Accounting Tools	
14	CSCA301	Mobile Application Development	
15	CSCA302	Linux and shell programming	
16	CSCA303/CSC A304/CSCA305	*One month On Job Training/ Online Certification Courses / 2 week Field Training/Mini Project	

<b>Discipline Specific Core – Theory</b>			
<b>S.NO</b>	<b>SUBJECT CODE</b>	<b>Paper Name</b>	<b>Credits</b>
			Theory
1	CSCA113	Introduction to problem solving using C	3
2	CSCA114	Digital Electronics	3
3	CSCA123	Python Programming	3
4	CSCA124	Data Structures and Algorithms	3
5	CSCA231	Programming with Visual Basic	3
6	CSCA232	Database Management Systems	3
7	CSCA233	Computer Networks	3
8	CSCA234	Software Engineering	3
9	CSCA241	Operating Systems	3
10	CSCA242	Object Oriented Programming with JAVA	3
11	CSCA351	Visual Programming using C#	3
12	CSCA361	Web Technology	3

<b>Discipline Specific Elective</b>				
<b>Course Code</b>	<b>Course</b>	<b>Paper Name</b>	<b>Credits</b>	
			<b>Theory</b>	<b>Practical</b>
<b>Stream – I (Business Intelligence)</b>				
CSCA243	DSE – 1 /DSE -2	Data Warehousing	3	1
CSCA352	DSE – 3/DSE - 4	Data Mining	3	1
CSCA363	DSE – 5 /DSE -6	Foundations of Data Analytics	3	1
<b>Stream – II (Artificial Intelligence)</b>				
CSCA244	DSE – 1 /DSE -2	Artificial Intelligence	3	1
CSCA353	DSE – 3/DSE - 4	Neural Networks	3	1
CSCA364	DSE – 5 /DSE -6	Soft Computing	3	1
<b>Stream – III (Information Security)</b>				
CSCA245	DSE – 1 /DSE -2	Principles of Information Security	3	1
CSCA354	DSE – 3/DSE - 4	Cryptography & Network Security	3	1
CSCA365	DSE – 5 /DSE -6	Ethical Hacking	3	1
<b>Stream – IV (Wireless Communication)</b>				
CSCA246	DSE – 1 /DSE -2	Wireless Communication Technologies	3	1
CSCA355	DSE – 3/DSE - 4	Introduction to Mobile Communication	3	1
CSCA366	DSE – 5 /DSE -6	Internet of Things	3	1
<b>Stream – V (Software Engineering)</b>				
CSCA247	DSE – 1 /DSE -2	IT Project Management	3	1
CSCA356	DSE – 3/DSE - 4	Software Testing	3	1
CSCA367	DSE – 5 /DSE -6	Software Quality Management	3	1

<b>OPEN ELECTIVE - OE (Management)</b>				
CSCA248 CSCA249	OE-1	1.Fundamentals of Accountancy 2. Financial Management	3	-
CSCA357 CSCA358	OE-2	1. Principles of Management 2. Introduction to E-Business	3	-

<b>General Elective – GE</b>			
	<b>Course</b>	<b>Paper Name</b>	<b>Credits</b>
CSCA125 CSCA126	GE-1	1. Mathematics for Business 2. Probability and Statistics	3
CSCA235 CSCA236	GE-2	1. Discrete Mathematics 2. Operations Research	3

<b>Skill Enhancement Courses</b>		
<b>Group – I</b>		
<b>Course Code</b>	<b>Name of the course</b>	<b>Credits – Practical</b>
CSCA101	Office Automation tools	2
CSCA102	Multimedia Tools	2
CSCA201	Accounting Tools	2
CSCA202	Linux and shell programming	2
CSCA203	Mobile Application Development	2
CSCA301/CSCA302/CSCA303	**One month On Job Training/ Online Certification Courses / 2 week Field Training / Mini Project	2

**\*\*Compulsory**

**Bachelor of Computer Applications**  
**under *CHOICE-BASED CREDIT SYSTEM(CBCS)***  
**(Effective from the academic year 2017- 2018)**

## DISCIPLINE SPECIFIC CORE - 1

**Paper Code: CSCA113**

**INTRODUCTION TO PROBLEM SOLVING USING C**

L	T	P	C
4	2	0	3

**Prerequisite:** - Basic knowledge of Mathematics and Computers

**Objectives:**

- To learn the concepts of “ C ” Programming
- To learn how to use develop software programs for day-to- day applications.

### **MODULE – I**

Introduction to Computers - Characteristics of Computers, Uses of computers, Types and generations of Computers – Basic Computer Organization -Modules of a computer – Planning the Computer Program - Debugging, Types of errors - Documentation – Techniques of Problem Solving – Problem solving aspects – Top-Down aspects – Implementation of algorithms – Program verification - Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

### **MODULE- II**

C Programming Language- C Standard Library- C++ and Other C-based Languages- Object Technology- Introduction to C Programming - Memory Concepts-Decision Making - Secure C Programming - Structured Program Development in C- Algorithms- Pseudocode- Control Structures- if Selection Statement- while Repetition Statement - Assignment Operators- Increment and Decrement Operators- C Program Control- for Repetition Statement - switch Multiple-Selection Statement - do...while Repetition Statement - break and continue Statements-Logical Operators

### **MODULE – III**

C Functions - Program Modules in C - Math Library Functions – Functions- Function Definitions -Function Prototypes: A Deeper Look - Function Call Stack and Stack Frames- Passing Arguments By Value and By Reference - Recursion vs. Iteration - C Arrays - Defining Arrays - Passing Arrays to Functions- Sorting Arrays- Searching Arrays - Multidimensional Arrays

### **MODULE – IV**

Structure & Union - C Pointers- Pointer Variable Definitions and Initialization- Pointer Operators- Passing Arguments to Functions by Reference - sizeof Operator - Pointer Expressions and Pointer Arithmetic- Relationship between Pointers and Arrays - Pointers to Functions - C Characters and Strings – Character - Handling Library- String- Conversion Functions - Standard Input/Output Library Functions- String-Manipulation Functions -C Formatted Input/Output

### **MODULE –V**

C File Processing - Files and Streams- Creating a Sequential-Access File- Reading Data from a Sequential-Access File - Random-Access Files - Creating a Random-Access File- Writing Data Randomly to a Random-Access File- Reading Data from a Random-Access File- C Preprocessor

**Text Books:**

1. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 2007.
2. R.G. Tromeey, "How to solve it by computer", Prentice Hall, 1982.
3. Paul Deital & Harvey Deital, "C How to Program", 7<sup>th</sup> edition, Pearson Education, 2013.

**Paper Code: CSCA116**

L	T	P	C
0	0	3	2

**PROGRAMMING IN C LAB**

**LIST OF EXERCISES**

1. Simple C programs
2. Program to illustrate control statements
3. Program to illustrate FOR loop
4. Program to illustrate SWITCH & WHILE statements
5. Program to illustrate functions
6. Program to illustrate user-defined functions
7. Program to illustrate arrays
8. Program to illustrate usage of pointers
9. Program to illustrate character handling libraries.
10. Program to illustrate string manipulation
11. Program to illustrate creation of files & streams.
12. Program to illustrate creation, reading & accessing sequential & random files



## DISCIPLE SPECIFIC CORE - 2

**Paper Code: CSCA114**

L	T	P	C
4	2	0	3

### **DIGITAL ELECTRONICS**

**Prerequisite:** Basic knowledge about computers

**Objectives:**

- To introduce the fundamentals of digital system design.
- To lay strong foundation to the combinational and sequential logic.
- To educate from basic concepts to advanced system design.

#### **MODULE – I**

Number systems & Conversions – Arithmetic of number systems – binary codes – BCD – The excess – 3code – the gray code – ASCII – EBCDIC

#### **MODULE – II**

Introduction to Logic Circuits – logic functions & gates – Inversion – truth tables – logic gates – truth table of basics gates – timing diagrams of NOT, AND & OR gates – Boolean algebra – NAND& NOR logic gates - truth table of a logic circuit – de morgan’s theorem

#### **MODULE – III**

Logic families – factors affecting performance of a logic family – register transistor logic – diode transistor logic – DCTL – ECL – TTL logic family – Karnaugh maps – two, three & four-variables K-map – loops in K-map – mapping of K-maps – don’t care condition

#### **MODULE – IV**

Sequential logic circuits – sequential circuits – SR flip flop – D flip flop – JK flip flop – T flip flop – flip flop triggering – Shift registers – data movements in digital systems – serial-in serial-out shift register - serial-in parallel-out shift register - parallel-in-serial-out(PISO) shift register - parallel-in-parallel-out shift register – bidirectional shift register – counters – classification of counters – designing a counter

#### **MODULE – V**

Combinatorial logic circuits – designing procedure – code converters – multiplexers – multiplexer tree – demultiplexers/decoders – half & full adder – half & full subtractor – encoders – BCD adder – D/A & A/D conversions - D/A converter with binary-weighted registers – D/A converter with R & 2R resistors – A/D converter

**TEXT BOOK:**

1. S.S. Bhatti & Ragul Malhotra, “A Textbook of Digital Electronics”, I.K. International publishing, New Delhi, 2013
2. Morris Mano M., “Digital Logic and Computer Design”, Pearson Education, 1/e, 2010.

**Paper Code: CSCA117**

L	T	P	C
0	0	3	2

**DIGITAL LAB**

**LIST OF EXERCISES**

1. Study of Logic Gates
2. Design of Adder and Subtractor
3. Design and Implementation of Code Convertors
4. Design of 4-Bit Adder and Subtractor
5. Design and Implementation of Magnitude Comparator
6. 16 Bit Odd/Even Parity Checker and Generator
7. Design and Implementation of Multiplexer and Demultiplexer
8. Design and Implementation of Encoder and Decoder
9. Design and Implementation of 3 Bit Synchronous Up/Down Counter
10. Design and Implementation of Shift Register
11. Simulation of Logic Gates
12. Simulation of Adder and Subtractor
13. Design of 4-Bit Adder and Subtractor

## DISCIPLE SPECIFIC CORE - 3

**Paper Code: CSCA123**

L	T	P	C
3	1	0	3

**PYTHON PROGRAMMING**

**Prerequisite:** Knowledge of any programming language

**Objectives:**

- To learn about the fundamentals of computers
- To learn how to install Python, start the Python shell
- To learn to perform basic calculations, print text on the screen and create lists, and perform simple control flow operations using if statements and for loops
- To learn how to reuse code with functions

### **MODULE – I**

Computer Systems - Python Programming Language Computational Thinking - Python Data Types - Expressions, Variables, and Assignments – Strings – Lists – Objects & Classes – Python standard library

### **MODULE – II**

Imperative programming – Python modules – print() function – functional eval() - Execution Control Structures – user-defined functions python variables & assignments parameter passing

### **MODULE – III**

Text Data, Files & Exceptions – Strings revisited – formatted output – files – errors & exceptions - Execution Control Structures – decision control & the IF statement

### **MODULE – IV**

Container and Randomness – Dictionaries – other built-in container types – character encodings & strings – module random

### **MODULE – IV**

FOR loop & Iteration Patterns – two-dimensional lists- while loop – more loop patterns – additional iteration control statements- namespaces – encapsulation in functions – global vs local namespaces exceptional flow control – modules as namespaces

**TEXT BOOKS:**

1. LjubomirPerkovic, "Introduction to Computing Using Python: An Application DevelopmentFocus", John Wiley & Sons, 2012

**Paper Code: CSCA128**

L	T	P	C
0	0	3	2

**PYTHON PROGRAMMING LAB**

**LIST OF EXERCISES**

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :
  - Grade A: Percentage  $\geq 80$
  - Grade B: Percentage  $\geq 70$  and  $< 80$
  - Grade C: Percentage  $\geq 60$  and  $< 70$
  - Grade D: Percentage  $\geq 40$  and  $< 60$
  - Grade E: Percentage  $< 40$
3. Program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. Program to display the first n terms of Fibonacci series.
5. Program to find factorial of the given number.
6. Program to find sum of the following series for n terms:  $1 - 2/2! + 3/3! - \dots - n/n!$
7. Program to calculate the sum and product of two compatible matrices.
8. Program to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula  $m=60/(t+2)$ , where t is the time in hours. Sketch a graph for t vs. m, where  $t \geq 0$ .
9. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:  
$$P(t) = (15000(1+t))/(15 + e^t)$$
where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.
10. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:
  - I. velocity wrt time ( $v=u+at$ )
  - II. distance wrt time ( $s=u*t+0.5*a*t*t$ )
  - III. distance wrt velocity ( $s=(v*v-u*u)/2*a$ )

## DISCIPLE SPECIFIC CORE - 4

**Paper Code: CSCA124**

L	T	P	C
3	1	0	3

### **DATA STRUCTURES AND ALGORITHMS**

**Pre-requisite:** Knowledge of any programming language

**Objectives:**

- To acquaint students with data structures used when programming for the storage and manipulation of data.
- The concept of data abstraction and the problem of building implementations of abstract data types are emphasized.
- Data Structure Algorithms for stack, queues, linked list, trees, graphs, sorting and searching.

#### **MODULE-I**

Definition of a Data structure - primitive and composite Data Types, Arrays, Operations on Arrays, Ordered lists - Stacks - Operations - Applications of Stack - Infix to Postfix Conversion.

#### **MODULE-II**

Recursion – Queue- operations - Singly Linked List – Operations - Application - Representation of a Polynomial - Polynomial Addition - Doubly Linked List - Operations.

#### **MODULE-III**

Trees: Binary Trees - Operations - Graph - Definition, Types of Graphs, Graph Traversal - DFS and BFS.

#### **MODULE-IV**

Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm – Algorithm Design Techniques – Iterative techniques - Divide and Conquer -Dynamic Programming, Greedy Algorithms.

#### **MODULE - V**

Role of algorithms in computing - Sorting and Searching Techniques - Elementary sorting techniques –Bubble Sort, Insertion Sort, Merge Sort, Quick Sort

#### **TEXT BOOKS**

1. Ellis Horowitz, Sartaj Sahni and Anderson, “Fundamentals of Data Structure in C”, University Press, 2<sup>nd</sup> edition, 2008.

2. T.H.Cormen, CharlesE. Leiserson, Ronald L. Rivest, Clifford Stein. "Introduction to Algorithms, PHI, 3rd edition. 2009.

**Paper Code: CSCA129**

L	T	P	C
0	0	3	2

**DATA STRUCTURES & ALGORITHMS LAB**

**LIST OF EXERCISES**

1. Implementation of stack
2. Implementation of Queue
3. Implementation of Singly Linked List
4. Implementation of Doubly linked list
5. Implementation of Binary tree and traversals (BFS & DFS)
6. Implementation of Insertion sort
7. Implementation of Selection Sort
8. Implementation of Quick sort
9. Implementation of Merge sort
10. Implementation of Infix to Postfix & Infix to Prefix notations.



## DISCIPLE SPECIFIC CORE – 5

**Paper Code: CSCA231**

**PROGRAMMING WITH VISUAL BASIC**

L	T	P	C
3	1	0	3

**Pre-requisite:** Knowledge of any programming language

**Objectives:**

1. To introduce the students to Event Driven programming.
2. To help the students in find solutions to real life problems using Visual Basic.
3. Students will learn about connecting and accessing databases.

### **MODULE –I**

Introduction to GUI - Visual Basic: Starting and Exiting Visual Basic – Project Explorer – Working with Forms – Properties Window – Using the Toolbox – Toolbars – Working with Projects – Programming Structure of Visual Basic applications – Event and Event driven procedures

### **MODULE –II**

Adding code and using events: Using literals – data types - declaring and using variables – using the operator – subroutines and functions – looping and decision control structures – if then else structure – select structure , for next, do.. loop and while.. wend.- Using intrinsic Visual basic Controls with methods and Properties: Label ,Text box, Command button, Frame, Checkbox, option button, List box, Combo box, Drive List box, directory List box and file list box – Formatting controls – control arrays, Tab order

### **MODULE –III**

Functions and Procedure - Passing arguments by value and reference – Arrays, dynamic arrays – User defined data types – symbolic constants – using Dialog boxes: Input box, Message box functions - String functions, date and Time function, numeric functions

### **MODULE –IV**

Menus: creating menus, adding code to menus, using MDI forms - MDI form basic – building MDI form – creating MDI Child Forms

### **MODULE –V**

Database object (DAO) and properties – accessing Recordset objects – Move first, MoveLast, MovePrevious and MoveNext methods – accessing Microsoft Access files. Active Data Objects (ADO) ADO and OLE DB – Connecting to the database – Retrieving a recordset - Adding records – Editing records –closing the database connection.

## **TEXT BOOKS**

1. Gary Cornwell “Visual basic 6”, Tata McGraw –Hill , 1998, reprint 2009
2. Scott warner “Teach yourself Visual basic 6”, Tata McGraw-Hill, 1998, digitized-2009
3. Noel Jerke “Visual Basic 6- The Complete Reference”, Tata McGraw-Hill, 1999, reprint 2009
4. Eric A. Smith, Valar Whisler, and Hank Marquis “Visual Basic 6 programming”

## DISCIPLE SPECIFIC CORE – 6

**Paper Code: CSCA232**

**DATABASE MANAGEMENT SYSTEMS**

L	T	P	C
3	1	0	3

**Prerequisite:** Knowledge of data structures and file-handling

**Objectives:**

- To learn about the basics of database management systems (DBMS), with an emphasis on how to organize, maintain and retrieve efficiently, and effectively the information from a DBMS.
- To learn the fundamental concepts of the relational model, including relations, attributes, domains, keys, foreign keys, entity integrity and referential integrity.
- To learn how to normalize the data using 1<sup>st</sup>, 2<sup>nd</sup> & 3<sup>rd</sup> normal forms
- To define and manipulate the relational databases in SQL.

### **MODULE - I**

Overview of Database Management System - Introduction, file-based system, drawbacks of file-Based System, Data and information, Database, Database management System, Objectives of DBMS, Evaluation of Database management system, classification of Database Management System, DBMS Approach, advantages of DBMS, Anis/spark Data Model, data models, Components and Interfaces of Database Management System - Database Architecture, situations where DBMS is not Necessary - DBMS Vendors and their Products.

### **MODULE - II**

Entity-Relationship Model - Introduction, the building blocks of an entity relationship diagram, classification of entity sets, attribute classification, relationship degree, relationship classification, reducing ER diagram to tables, enhanced entity-relationship model (EER model), generalization and specialization, ISA relationship and attribute inheritance, multiple inheritance, constraints on specialization and generalization, aggregation and composition - advantages of ER modeling.

### **MODULE - III**

Relational Model –Introduction -ACID property - CODD Rules, relational data model, concept of key, relational integrity – primary key – foreign key - normalization – 1<sup>st</sup> normal form, 2<sup>nd</sup> normal form & 3<sup>rd</sup> normal form.

### **MODULE - IV**

Structured Query Language - Introduction, History of SQL Standard, Commands in SQL, Data Types in SQL, Data Definition Language, Data Manipulation Language, Data Control Language - Table Modification Commands – primary & foreign keys

### **MODULE - V**

**PL/SQL:** Introduction, Shortcoming in SQL, Structure of PL/SQL, PL/SQL Language Elements, Data Types, Operators Precedence, Control Structure, steps to Create a PL/SQL, steps to create a Cursors, Procedure, Function, Packages, Exceptions Handling, Database Triggers, Types of Triggers.

**TEXT BOOKS**

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, “Database System Concepts”, 6<sup>th</sup> edition, McGraw Hill, 2010,
2. Bulusu, “Oracle PL/SQL Programming”, OReilly, 5<sup>th</sup> edition, 2009.
3. Steve Bobrowski, “Hands-On Oracle Database 10g Express Edition for Windows”, Tata McGraw Hill, 2010.

**Paper Code: CSCA237**

**VISUAL BASIC AND DBMS LAB**

L	T	P	C
0	0	3	2

**LIST OF EXERCISES:**

**Unit – I (Visual Basic)**

1. Building simple applications
2. Working with intrinsic controls and ActiveX controls
3. Application with multiple forms
4. Application with dialogs
5. Application with Menus
6. Application using data controls
7. Application using Common Dialogs
8. Drag and Drop Events
9. Database Management
10. Creating ActiveX Controls

**Unit – II (SQL)**

Use the concepts like data normalization, link between table by means of foreign keys and other relevant database concepts for the following applications. The implementation of each should have necessary input screen (forms) Menu-driven query processing and reports. Necessary validations should be made for each table

1. Library information system
2. Students mark sheet processing
3. Telephone directory maintenance
4. Gas booking and delivering
5. Electricity bill processing
6. Bank Transaction
7. Pay roll processing
8. Personal information system
9. Question database and conducting Quiz

## 10. Personal diary

## DISCIPLE SPECIFIC CORE - 7

**Paper Code: CSCA233**

**COMPUTER NETWORKS**

L	T	P	C
4	1	0	3

**Prerequisite:** Basic Knowledge of Computers

**Objectives:**

1. Given an environment, after analyzing the channel characteristics, appropriate channel access mechanism and data link protocols are chosen to design a network.
2. Given an environment, analyzing the network structure and limitations, appropriate routing protocol is chosen to obtain better throughput.
3. Given various load characteristics and network traffic conditions, decide the transport protocols and timers to be used.

### **MODULE –I**

Introduction to Networks – Topology - Network Architecture - Reference Models - Example Networks – Transmission Medias

### **MODULE –II**

Data link layer - Design Issues, Error Detection and Correction - Elementary Data link Protocols - Sliding Window Protocols - Network Layer - Design Issues, Routing Algorithms - Congestion Control Algorithms

### **MODULE –III**

Internetworking - Transport Layer - The Transport Service – Service provided to the Upper Layers, elements of Transport Protocols – Addressing, Connection Establishment, Connection Release, Flow Control & Buffering - TCP - Introduction, TCP Service model, TCP Protocol, TCP Segment Header, TCP connection Establishment, TCP Connection Release, TCP Transmission Policy, TCP Congestion Control

### **MODULE –IV**

Application layer - Domain Naming System - DNS Namespace, Resource Records, Name Servers - Electronic mail - Architecture and Services, The User Agent, Messages Formats, Message Transfer

### **MODULE –V**

The World Wide Web - Architectural Overview, Static Web Documents, Dynamic Web Documents, Hyper Text Transfer Protocol (HTTP) - Introduction to Security.

### **TEXT BOOK**

Andrew S. Tanenbaum, “Computer Networks”, Prentice Hall India, 5<sup>th</sup> edition, 2010.

**Paper Code: CSCA238**

**NETWORKS LAB**

L	T	P	C
0	0	3	2

**LIST OF EXERCISES:**

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Go back-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Study of Socket Programming and Client – Server model
6. Write a socket Program for Echo/Ping/Talk commands.
7. To create scenario and study the performance of network with CSMA / CA Protocol and compare with CSMA/CD protocols.
8. Network Topology - Star, Bus, Ring
9. Implementation of distance vector routing algorithm
10. Implementation of Link state routing algorithm
11. Encryption and decryption.



## DISCIPLE SPECIFIC CORE – 8

**Paper Code: CSCA234**

L	T	P	C
4	1	0	3

### **SOFTWARE ENGINEERING**

**Pre-requisite:** Basic knowledge of programming

**Objectives:**

- Identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
- Elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of a software project.
- Need to function effectively as a team member
- Understanding professional, ethical and social responsibility of a software engineer
- Participate in design, development, deployment and maintenance of a medium scale software development project.

#### **MODULE – I**

Introduction to Software Engineering – evolving role of software – defining software engineering – changing nature of software – software myths – terminologies – role of software development – software life cycle models – build & fix model – waterfall model – incremental model – evolutionary model – unified model – selection of a life cycle model

#### **MODULE – II**

Software Requirements: Analysis & Specifications – requirements engineering – type of requirements – feasibility studies – requirements elicitation – requirement analysis - – requirement documentation - – requirement validation - – requirement management – Case studies

#### **MODULE – III**

Software Project Planning – size estimation – cost estimation – models – Constructive cost model – software risk management – software design – what is design – modularity – strategy of design – function oriented design - object oriented design

#### **MODULE – IV**

Software Metrics – Software & Metrics: What & Why – token count – data structure metrics – information flow metrics – object oriented metrics – Use-Case metrics – metrics analysis - software reliability – basic concepts – software reliability models – capability maturity model

**MODULE – V**

Software testing – strategic approach to software testing – terminologies – functional testing – structural testing – levels of testing – validation testing – the art of debugging – testing tools

**TEXT BOOK:**

1. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International Publishers, 2012.
2. Roger S. Pressman, “Software Engineering: A Practitioner’s Approach”, McGraw Hill, 7<sup>th</sup> edition, 2010.

## DISCIPLINE SPECIFIC CORE - 9

**Paper Code: CSCA241**

**OPERATING SYSTEMS**

L	T	P	C
3	1	0	3

**Pre-requisite:** Knowledge of computers & computer organization

**Objectives:**

- To learn Structure and functions of OS
- To learn Processes and Threads, Scheduling algorithms
- To learn Principles of concurrency and Memory management
- To learn I/O management and File systems

### **MODULE - I**

Introduction - Mainframe systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection - System Components – Operating System Services – System Calls – System Programs - Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication.

### **MODULE - II**

Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors.

### **MODULE - III**

System Model – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks - Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging.

### **MODULE - IV**

Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing - File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection

## **MODULE - V**

File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Kernel I/O Subsystems - Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management - Case Study: The Linux System & Windows

### **TEXT BOOKS:**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 6<sup>th</sup> edition, John Wiley & Sons, 2003.
2. Harvey M. Deitel, “Operating Systems”, 2<sup>nd</sup> edition, Pearson Education, 2002.

## DISCIPLINE SPECIFIC CORE – 10

**Paper Code: CSCA242**

L	T	P	C
3	1	0	3

### **OBJECT ORIENTED PROGRAMMING USING JAVA**

**Prerequisite:** Basic Knowledge of programming

**Objectives:**

- On successful completion of the course the students should have understood the object oriented programming in java
- Should have idea about GUI bases programming
- Should have idea about database programming

#### **MODULE – I**

Introduction – Introduction to java applications – Introduction to classes, objects, methods & Strings - Control statements - Arrays

#### **MODULE – II**

Class & Objects – constructor – function overloading & overriding - Inheritance - Polymorphism – Interface – package - exception handling - Introduction to Multithreading

#### **MODULE – III**

Exception Handling – GUI components – Introduction – Overview of Swing components – Swing vs AWT –SWING: Displaying Text and Images in a Window - Text Fields and an Introduction to Event Handling with Nested Classes - Common GUI Event Types and Listener Interfaces - How Event Handling Works – various event handling – layout manager

#### **MODULE – IV**

Files, Streams & Object Serialization – Introduction – Files & Streams – Sequential Access Text Files – Object Sterilization

#### **MODULE – V**

Applets & Java Web Start – applet life-cycle – sandbox security model – Java web start & Java Network Launch Protocol (JNLP) – Accessing databases with java database connectivity (JDBC)

**Text Books:**

Paul Deital& Harvey Deital, "Java: How to Program", Pearson Education, 10<sup>th</sup> edition, 2015.

**Paper Code: CSCA250**

L	T	P	C
0	0	3	2

**OBJECT ORIENTED PROGRAMMING USING JAVA LAB**

**LIST OF EXERCISES**

1. Program to illustrate various data types in Java.
2. Program to illustrate class and objects.
3. Program to illustrate control structures ( if-then, while, switch ).
4. Program to illustrate the concept of arrays (creation, initialization and processing).
5. Program to illustrate Multidimensional arrays.
6. Program to illustrate Constructor and its overloading.
7. Program to illustrate Inheritance and Packages.
8. Program to illustrate Interface and static methods.
9. Program to illustrate modifiers protected, this, final and super.
10. Program to illustrate Exception Handling Technique.
11. Program to illustrate to input/output streams.
12. Program to illustrate File handling technique.
13. Program to illustrate threading.
14. Program to illustrate simple Java applets.
15. Program to illustrate database programming

## DISCIPLE SPECIFIC CORE – 11

**Paper Code: CSCA351**

L	T	P	C
3	2	0	3

### **VISUAL PROGRAMMING USING C#**

**Prerequisite:** Knowledge of C language and DBMS

**Objectives:**

- To understand the various types of applications
- To get expertise in visual programming
- To understand the functionalities of middleware platform

#### **MODULE – I**

Introduction - C, C++, Objective-C, Java and C# - Extensible Markup Language (XML) - Introduction to Microsoft .NET - The .NET Framework and the Common Language Runtime - Introduction to Object Technology - Introduction to C# Applications - Creating a Simple Application in Visual C# Express - Formatting Text with Console.WriteLine and Console.WriteLine - Another C# Application: Adding Integers – Arithmetic - Decision Making: Equality and Relational Operators - Strings and Characters

#### **MODULE – II**

Introduction to Classes and Objects – Introduction - Classes, Objects, Methods, Properties and Instance Variables - Declaring a Class with a Method and Instantiating an Object of a Class - Declaring a Method with a Parameter - UML Class Diagram with a Property - Software Engineering with Properties and set and get Accessors - Initializing Objects with Constructors - Floating-Point Numbers and Type decimal - Control Statements

#### **MODULE – III**

Classes and Objects: A Deeper Look – Introduction - Controlling Access to Members - Referring to the Current Object's Members with the this Reference – Indexers - Default and Parameterless Constructors – Composition - Garbage Collection and Destructors- static Class Members - Data Abstraction and Encapsulation - Object Initializers – Delegates Object-Oriented Programming: Inheritance - Polymorphism, Interfaces and Operator Overloading-Exception Handling

#### **MODULE – IV**

Graphical User Interfaces with Windows Forms – Introduction - Windows Forms - Control Properties and Layout - Labels, TextBoxes and Buttons - GroupBoxes and Panels - CheckBoxes and RadioButtons - NumericUpDown Control - Mouse-Event Handling- Keyboard-Event



Handling – Menus- various controls - Multiple Document Interface (MDI) Windows - Visual Inheritance - User-Defined Controls

**MODULE – V**

Databases and LINQ - Introduction - relational Databases - LINQ to SQL - Querying a Database with LINQ - Dynamically Binding Query Results - Retrieving Data from Multiple Tables with LINQ - Creating a Master/Detail View Application - Tools and Web Resources Case Study

**TEXT BOOK:**

Paul Deitel& Harvey Deitel, “C# 2010 for Programmers”, Pearson Education, 4<sup>th</sup>edition, 2011.

**Paper Code: CSCA359**

L	T	P	C
0	0	3	2

**VISUAL PROGRAMMING LAB**

**LIST OF EXERCISES**

1. Implement Classes and Objects, Inheritance & Polymorphism
2. Implement Interfaces, Operator Overloading, Delegates and Events
3. Implement Exception Handling & Multi-Threading
4. Create Console application & Window Applications.
5. Create programs using SDI & MDI
6. Create program using Database Controls
7. Develop any TWO case studies listed below:
  - I. Inventory Control
  - II. Retail Shop Management
  - III. Employee Information System
  - IV. Personal Assistant Program
  - V. Students' Information System

## DISCIPLE SPECIFIC CORE - 12

**Paper Code: CSCA361**

**WEB TECHNOLOGY**

L	T	P	C
3	1	0	3

**Pre-requisite:** Knowledge of Operating system, computer network, DBMS, and Java language.

### **Objectives:**

- To inculcate knowledge of web technological concepts and functioning of internet
- To learn and program features of web programming languages.
- To understand the major components of internet and associated protocols.
- To design an innovative application for web.

### **MODULE – I**

Web Essentials: Clients, Servers, and Communication - Internet - Basic Internet Protocols - The World Wide Web - World Wide Web - HTTP Request Message - HTTP Response Message - Web Clients - Web Servers

### **MODULE - II**

Markup Languages: XHTML - An Introduction to HTML - HTML's History and Versions - Basic XHTML Syntax and Semantics - Some Fundamental HTML Elements . - Relative URLs - Lists - Tables - Frames - Forms - Defining XHTML's Abstract Syntax: XML - Creating HTML Documents - Style Sheets: CSS- Introduction to Cascading Style Sheets - Cascading Style Sheet Features - CSS Core Syntax - Style Sheets and HTML - Style Rule Cascading and Inheritance - Text Properties - CSS Box Model

### **MODULE – III**

Client-Side Programming: JavaScript Language - History and versions of JavaScript - Introduction to JavaScript - JavaScript in Perspective - Basic Syntax - Variables and Data Types - Statements . - Operators - Literals - Functions - Objects - Arrays - Built-in Objects - Host Objects: Browsers and the DOM - Introduction to the Document Object Model- Intrinsic Event Handling - DOM History and Levels

### **MODULE – IV**

Server-Side Programming: Java Servlets- Model-View-Controller Paradigm - Servlet Architecture Overview - Servlets Generating Dynamic Content- Servlet Life Cycle - Parameter Data

## **MODULE – V**

Sessions- Cookies - URL Rewriting- Servlets and Concurrency – database programming using Servlet.

### **TEXT BOOK:**

1. Jeffery C. Jackson, “Web Technologies: A Computer Science Perspective”, Pearson Education, 2007.
2. Julie C. Meloni, ”Sams Teach Yourself; HTML, CSS, and JavaScript All in One”, SAMS, 2014.

**Paper Code: CSCA368**  
**WEB TECHNOLOGY LAB**

L	T	P	C
0	0	3	2

**LIST OF EXERCISES**

1. Creation of HTML Files
2. Working with Client Side Scripting
  - 2.1 JavaScript
3. Configuration of web servers
  - 3.1 Apache Web Server
  - 3.2 Internet Information Server (IIS)
4. Experiments in Servlet
  - 4.1 Implementing MVC Architecture using Servlets
  - 4.2 Data Access Programming (using ADO)
  - 4.3 Session and Application objects
  - 4.4 File System Management
5. Write programs in Java to create three-tier applications using servlets
  - 5.1 for conducting on-line examination.
  - 5.2 for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.

## DISCIPLINE SPECIFIC CORE - 13

**Paper Code: CSCA362**

L	T	P	C
0	1	10	6

### **PROJECT**

The objective of the project is to motivate them to work in emerging/latest technologies, help the students to develop ability, to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories.

The project is of 2 hours/week for one (semester VI) semester duration and a student is expected to do planning, analyzing, designing, coding, and implementing the project. The initiation of project should be with the project proposal. The synopsis approval will be given by the project guides.

The project proposal should include the following:

- Title
- Objectives
- Input and output
- Details of modules and process logic
- Limitations of the project
- Tools/platforms, Languages to be used
- Scope of future application

The project work should be either an individual one or a group of not more than three members and submit a project report at the end of the semester. The students shall defend their dissertation in front of experts during viva-voce examinations.

## GENERAL ELECTIVE –I PAPER I

**Paper Code: CSCA125**

**MATHEMATICS FOR BUSINESS**

L	T	P	C
3	1	0	3

### **OBJECTIVES:**

- To enable students to learn and apply mathematics skills to a business setting.

### **MODULE - I**

Ratio, Proportion and Percentage, Ratio- Definition, Continued Ratio, Inverse Ratio, Proportion, Continued Proportion, Direct Proportion, Inverse Proportion, Variation, Inverse Variation, Joint Variation, Percentage- Meaning and Computations of Percentages.

### **MODULE - II**

Profit and Loss-Terms and Formulae, Trade discount, Cash discount, Problems involving cost price, Selling Price, Trade discount and Cash Discount. Introduction to Commission and brokerage, Problems on Commission and brokerage.

### **MODULE - III**

Interest -Simple Interest, Compound interest (reducing balance & Flat Interest rate of interest), Equated Monthly Installments(EMI), Problems

### **MODULE - IV**

Matrices and Determinants (upto order 3 only)-Multivariable data, Definition of a Matrix, Types of Matrices, Algebra of Matrices, Determinants, Ad joint of a Matrix, Inverse of a Matrix via ad joint Matrix, Homogeneous System of Linear equations, Condition for Uniqueness for the homogeneous system, Solution of Non-homogeneous System of Linear equations (not more than three variables). Condition for existence and uniqueness of solution, Solution using inverse of the coefficient matrix, Problems.

### **MODULE - V**

Linear Programming problem (L.P.P.)-Meaning of LPP, Formulation of LPP, and solution by graphical methods. Transportation problem (T.P.)-Statement and meaning of T.P. methods of finding initial basic feasible solution by North West corner Rule, Matrix Minimum method and Vogel's approximation method. Simple numerical problems (concept of degeneracy is not expected).

**REFERENCE BOOKS:**

1. Business Mathematics by Dr. Amarnath Dikshit & Dr. Jinendra Kumar Jain.
2. Business Mathematics by V. K. Kapoor - Sultan chand & sons, Delhi
3. Business Mathematics by Bari - New Literature publishing company, Mumbai
4. Operations Research by Dr. S. D. Sharma – Sultan Chand & Sons.
5. Operations Research by Dr. J. K. Sharma – Sultan Chand & Sons.



## GENERAL ELECTIVE –I PAPER II

**Paper Code: CSCA126**

L	T	P	C
3	1	0	3

**PROBABILITY AND STATISTICS**

**Prerequisite:** Knowledge in basic mathematics

**Objectives:**

- To learn how to handle situations involving more than one random variable and functions of random variables.
- To learn the notion of sampling distributions and have acquired knowledge of statistical techniques useful in making rational decision in management problems.
- To learn statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.

### **MODULE – I**

Basic Probability - Random Experiments - Sample Spaces Events - The Concept of Probability - The Axioms of Probability - Some Important Theorems on Probability - Assignment of Probabilities -Conditional Probability -Theorems on Conditional Probability -- Independent Events -Bayes' Theorem or Rule Combinatorial Analysis - Fundamental Principle of Counting - Tree Diagrams -Permutations

### **MODULE – II**

Random Variables and Probability Distributions - Random Variables - Discrete Probability Distributions -Distribution Functions for Random Variables - Distribution Functions for Discrete Random Variables - Continuous Random Variables – Graphical Interpretations Joint Distributions Independent Random Variables - Change of Variables - Probability Distributions of Functions of Random Variables – Convolutions – Conditional Distributions Applications to Geometric Probability

### **MODULE – III**

Mathematical Expectation - Definition of Mathematical Expectation - Functions of Random Variables - Theorems on Expectation - Variance & Standard Deviation - Theorems on Variance - Standardized Random Variables - Special Probability Distributions - Binomial Distribution - Normal Distribution - Poisson Distribution

### **MODULE – IV**

STATISTICS - Sampling Theory - Population and Sample - Statistical Inference- Sampling With and Without Replacement Random Samples - Random Numbers - Population Parameters - Sample Statistics -Sampling Distributions - Sample Mean - Sampling Distribution of Means - Sampling Distribution of Proportions - Sampling Distribution of Differences and Sums - Sample Variance - Sampling Distribution of Variances - Computation of Mean, Variance, and Moments for Grouped Data

### **MODULE – V**

Curve Fitting, Regression, Correlation - Curve Fitting – Regression - The Method of Least Squares The Least-Squares Line -The Least-Squares Line in Terms of Sample Variances and Covariance - The Least-Squares Parabola - Multiple Regression Standard Error of Estimate The Linear Correlation Coefficient Generalized Correlation Coefficient Rank Correlation

**Text books:**

1. Murray R. Spiegel, John J. Schiller & R. Alu Srinivasan, "Probability and Statistics", Schaum outlines, McGraw Hill, 3<sup>rd</sup> edition, 2009.
2. S. P. Gupta, Statistical Methods, S. Chand and Sons.
3. S. C Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", 11<sup>th</sup> edition, S. Chand and Sons.

## GENERAL ELECTIVE –II PAPER I

**Paper Code: CSCA235**

**DISCRETE MATHEMATICS**

L	T	P	C
3	1	0	3

### **OBJECTIVES:**

1. Ability model data sets as mathematical functions and solve.
2. Ability to understand and model the discrete structures such as graphs and trees.

### **MODULE –I**

Matrices – definition – special types of matrices – operations – symmetric matrices – skew symmetric matrices – Hermitian and skew Hermitian matrices – Inverse – Orthogonal matrices – Solutions of Simultaneous equations – Rank of a matrix – Eigen values and eigenvectors – Cayley Hamilton Theorem.

### **MODULE –II**

Mathematical Logic – Connectives – Statement Forms – Paranthesis – Truth Table – Tautology and Contradiction/Logical Implications and equivalences – Disjunctive and Conjunctive normal forms.

### **MODULE –III**

Sets – Relation – functions – Poset – Hasse Diagram – Lattice and its Properties – Boolean Algebra – Properties – Karnaugh Map (Two, Three and Four Variables Only).

### **MODULE –IV**

Graph Theory: Introduction – application of graphs – Finite and Infinite Graphs – Incidence and Degree – Isolated Vertex, Pendant Vertex and Null Graph. Paths and Circuits – Connected Graph, Disconnected Graphs and components – Euler Graphs – Operations on Graphs – Hamiltonian Paths and Circuits

### **MODULE –V**

Trees and Fundamentals Circuits: Trees – Some properties of Trees – Pendant Vertices in a Tree – Distance and Centers in a Tree – Rooted and Binary Trees – On Counting Trees – Spanning Trees – Fundamental Circuits

### **TEXT BOOKS**

1. Manicavachagom Pillay and others, "Algebra", 11th Revised edition. Vol II., S.V. Publications, (Unit – 1)
2. Narsingh Deo, "Graph Theory with applications to Engineering and Computer Science", PHI, 1997. (Unit –4, 5)
3. Trembly & Manohar, "Discrete Mathematics for Computer Science", TMH, 1997 (Units – 2, 3).

## GENERAL ELECTIVE –II PAPER II

**Paper Code: CSCA236**

L	T	P	C
3	1	0	3

### **OPERATIONS RESEARCH**

#### **OBJECTIVES:**

1. Ability to analyze the given data set using mathematical models.
2. Ability to represent the dataset and solve using techniques such as linear programming, Game theory, PERT and CPM.

#### **MODULE –I**

Introduction to Operations Research - Principal components of decision problems - phases of OR study.

#### **MODULE –II**

Linear Programming - graphical solution - simplex method including artificial variable technique - duality.

#### **MODULE –III**

Transportation and assignment models - Sequencing

#### **MODULE –IV**

Game theory - optimal solution of two-person zero-sum games - mixed strategies - graphical solution of (2 X n) and (m X 2) games - solution of (m X n) games by linear programming.

#### **MODULE – V**

PERT and CPM - network diagrams - determination of the floats and critical path - probability considerations in project scheduling.

#### **TEXT BOOKS**

1. Treatment as in Hamdy A.Taha “Operations Research - An introduction (III edition)”, chapters 1, 2, 3 (omit 3.4), 4 (omit 4.4, 4.5), 5 (omit 5.4), 11 (omit all sections except 11.4 only), 12 (omit 12.3, 12.5).
2. R.L. Ackoff and M.W.Sasieni "Fundamentals of O.R.". (For Sequencing)

**DISCIPLINE SPECIFIC ELECTIVE**  
**SPECIALIZATION STREAM I (BUSINESS INTELLIGENCE) – PAPER I**

**Paper Code: CSCA243**

**DATA WAREHOUSING**

L	T	P	C
3	1	2	4(3+1)

**Pre-requisite:** Knowledge of database management system

**Objectives:**

- To learn the fundamentals of designing large-scale data warehouses using relational technology.
- To study the design aspects, planning and development.

**MODULE - I**

Introduction – Data warehouse delivery method – system process – typical process flow within a data warehouse – query management process – process architecture – meta data-data mart.

**MODULE - II**

Design aspects – Designing dimension tables – Designing star flake schema – Multi dimensional schema – partitioning strategy aggregations – Data mart- Meta data – System Data warehouse process manager.

**MODULE - III**

Hardware and operational design – server hardware, network hardware – parallel technology – Security input on design of Hardware – backup and recovery – Service level Agreement – Operating the data warehouse.

**MODULE IV**

Planning and Development - Capacity planning – Estimating the load – Tuning the data warehouse – Assessing performance – Tuning the data load and queries – Testing data warehouse – Development of test plan – Testing the data base and operational environment.

**MODULE - V**

Case Studies - Data Warehousing in the Tamil Nadu Government - Data Warehouse for the Ministry of commerce- Data Warehouse for the government of Andhra Pradesh- Data Warehousing in Hewlett –Packard- Data Warehousing in Levi Strauss- Data Warehousing in the World Bank- HARBOR, A Highly available Data Warehouse-A typical Business data Warehouse for a Trading company.

**TEXT BOOKS:**

1. Sam Anahory & Dennis Murray, "Data Warehousing in the real world", Pearson Education.
2. Prabhu C.S.R, "Data Warehousing: Concepts, Techniques, Products and Applications", PHI Learning, 3<sup>rd</sup> edition, 2009.

## DISCIPLINE SPECIFIC ELECTIVE – STREAM I – PAPER II

**Paper Code: CSCA352**

**DATA MINING**

L	T	P	C
3	1	2	4(3+1)

**Prerequisite:** Knowledge of database management system

**Objectives:**

- To understand the concepts of Data Mining.
- To learn about Classification, prediction and cluster analysis techniques.
- To learn about applications of Data and knowledge mining.

### **MODULE - I**

An Introduction to Data Mining - Introduction - The Data Mining Process - The Basic Data Types - The Major Building Blocks - Association Pattern Mining- Data Clustering - Outlier Detection- Data Classification - Impact of Complex Data Types on Problem Definitions- Scalability Issues and the Streaming Scenario - Some Application Scenarios

### **MODUEL – II**

Data Preparation – Introduction - Feature Extraction and Portability- Data Cleaning - Data Reduction and Transformation

### **MODULE – III**

Similarity and Distances- Introduction- Multidimensional Data- Text Similarity Measures - Temporal Similarity Measures - Graph Similarity Measures- Supervised Similarity Functions

### **MODULE – IV**

Association Pattern Mining – Introduction- Frequent Pattern Mining Model - Association Rule Generation Framework - Frequent Item set Mining Algorithms- Brute Force Algorithms - Apriori Algorithm - Enumeration-Tree Algorithms - Pattern Summarization

### **MODULE – V**

Cluster Analysis – Introduction - Feature Selection for Clustering - Representative-Based Algorithms - Hierarchical Clustering Algorithms - Cluster Validation Clustering Categorical Data - Outlier Analysis – Introduction - Extreme Value Analysis - Clustering for Outlier Detection - Distance-Based Outlier Detection

**TEXT BOOK:**

1. Charu C. Aggarwal, Data Mining: The Textbook, Springer, 2015.

## DISCIPLINE SPECIFIC ELECTIVE – STREAM I – PAPER III

**Paper Code: CSCA363**

**FOUNDATIONS OF DATA ANALYTICS**

L	T	P	C
3	1	2	4(3+1)

### **OBJECTIVES:**

- To learn to explore data, sample and model them
- To understand R language
- To generate reports

### **MODULE - I**

Introduction to Data Science - Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.

### **MODULE - II**

Modeling Methods - Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-Means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods.

### **MODULE - III**

Introduction to R - Language: Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution.

### **MODULE - IV**

Map Reduce: Introduction – distributed file system – algorithms using map reduce, MatrixVector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS – Executing the Map phase.

### **MODULE - V**

Delivering Results - Documentation and deployment – producing effective presentations– Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters. Case studies.

### **TEXT BOOKS:**

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.
2. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.



3. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.
4. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.

**DISCIPLINE SPECIFIC ELECTIVE**  
**SPECIZATION STREAM II (ARTIFICIAL INTELLIGENCE) – PAPER I**

**Paper Code: CSCA244**

**ARTIFICIAL INTELLIGENCE**

L	T	P	C
3	1	2	4(3+1)

**Pre-requisite:** Knowledge of predicate calculus and programming

**Objectives:**

- To study the concepts of Artificial Intelligence and Methods of solving problems using Artificial Intelligence
- To understand the basic techniques of knowledge representation and their use and components of an intelligent agent
- To be able to implement basic decision making algorithms, including search based and problem solving techniques, and first-order logic.
- To know the basic issues in machine learning

**MODULE - I**

Introduction to AI & Production Systems - Introduction - AI problems, foundation of AI and history of AI intelligent agents -Agents and Environments - the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

**MODULE - II**

Searching Techniques - Searching-Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Greedy best first search- A\* search Game Playing- Adversial search, Games, minimax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, cutting of search.

**MODULE - III**

Representation of Knowledge - Knowledge Representation & Reasons logical Agents, Knowledge – based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in propositional logic, Resolution, Forward & Backward Chaining

**MODULE - IV**

First order logic - Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution - Learning - Learning from observations – forms of learning

**MODULE - V**

An Overview of Prolog - An example program: defining family relations - Extending the example program by rules -A recursive rule definition - How Prolog answers questions -

Declarative and procedural meaning of programs - Syntax and Meaning of Prolog Programs - Lists, Operators, Arithmetic - Using Structures: Example Programs

**TEXT BOOKS:**

1. Rich E, Knight K, “Artificial Intelligence”, 2<sup>nd</sup> edition, TMH, 2005.
2. Stuart Russel, Peter Norvig “AI – A Modern Approach”, 2<sup>nd</sup> edition, Pearson Education, 2007.
3. Ivan Bratka, “PROLOG Programming for Artificial Intelligence”, Addison Wesley, 1986

## DISCIPLINE SPECIFIC ELECTIVE – STREAM II – PAPER II

**Paper Code: CSCA353**

**NEURAL NETWORKS**

L	T	P	C
3	1	2	4(3+1)

**Pre-Requisite:** Knowledge of Artificial Intelligence

**Objectives:**

- To understand the Concept of Artificial Neural Networks
- To study various algorithms and their implementation in real life and in different domains

### **MODULE I**

Introduction - Overview of biological neurons: Structure of biological neurons relevant to Artificial Neural Networks (ANNs).

### **MODULE II**

Learning Process – Supervised, Unsupervised and reinforced - Error Correction Learning, Memory based learning, Hebbian learning rule, The Boltzman machine, Competitive learning, Credit assignment problem, memory, adaptation, statistical nature of learning process.

### **MODULE III**

Single layer Perceptrons: Classification model, Features & Decision regions; training & classification using discrete perception, algorithm, single layer continuous perception networks for linearly separable classifications.

### **MODULE IV**

Multi-layer Feed Forward Networks: linearly non-separable pattern classification, Delta learning rule for multi-perceptron layer, generalized delta learning rule, Error back propagation training, learning factors, Examples.

### **MODULE V**

Single layer feedback Networks: Basic Concepts, Hopfield networks, Training & Examples, associative memories

**TEXT BOOKS:**

1. T.N. Shankar, "Neural Networks", 2008, University Science Press.
2. Kevin L. Priddy & Paul E. Keller, "Artificial Neural Networks", 2005, Internal Society for Optical Engineering
3. B. Yegna Narayana, "Artificial Neural Networks", 2006, PHI

**DISCIPLE SPECIFIC ELECTIVE – STREAM II – PAPER III**

**Paper Code: CSCA364**

**SOFT COMPUTING**

L	T	P	C
3	1	2	4(3+1)

**PRE-REQUISITE:** Knowledge in Neural Networks

**OBJECTIVES:**

- To introduce about incorporating more mathematical approach (beyond conventional logic system) into the artificial intelligence approaches for problem solving such as fuzzy logic, genetic algorithms, etc.

**MODULE I**

INTRODUCTION: Comparison of soft computing methods: neural networks, fuzzy logic, genetic algorithm with conventional artificial intelligence (hard computing).Least - square methods for system identification, recursive least square estimator; LSE for nonlinear models; derivative based optimization: descent methods, Newton's method, conjugate gradient methods; nonlinear least-squares problems: Gauss Newton method, Levenberg-Marquardt method.

**MODULE II**

NEURAL NETWORKS: Different architectures; back-propagation algorithm; hybrid learning rule; supervised learning - perceptrons, back -propagation multilayer perceptrons, radial basis function networks; unsupervised learning –competitive learning network, Kohonen self-organizing networks, the Hopfield network.

**MODULE III**

FUZZY SET THEORY: Basic definition and terminology; basic concepts of fuzzy logic; set theoretic operators; membership functions: formulation and parameterization; fuzzy union, intersection and complement; fuzzy rules and fuzzy reasoning; fuzzy inference systems: Mamdani and Sugeno fuzzy models.

**MODULE IV**

NEURO-FUZZY MODELLING: Adaptive neuro-fuzzy inference systems; neuro-fuzzy controller-feedback control; Back propagation through time and realtime recurrent learning; gradient-free optimization.

**MODULE V**

GENETIC ALGORITHMS: Genetic algorithm, Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross

over, inversion & deletion, mutation operator, Bitwise operator, Applications & advances in GA, Differences & similarities between GA & other traditional method

### **TEXT BOOKS**

1. Rajase, Kharan S. and VijayalakshmiPai S. A., “Neural Networks, Fuzzy Logic & Genetic Algorithms”, Prentice-Hall of India, 2003
2. Kecman Vojislav, “Learning and Soft Computing”, MIT Press, 20013.
3. Konar Amit, “Artificial Intelligence and Soft Computing –Behavioural and Cognitive Modeling of the Human Brain”, Special Indian Edition, CRC Press, 2008
4. Goldberg David E., “Genetic Algorithms”, Pearson Education, 2003.

## DISCIPLINE SPECIFIC ELECTIVE

### SPECIALIZATION STREAM III (INFORMATION SECURITY) – PAPER I

**Paper Code: CSCA245**

L	T	P	C
3	1	2	4(3+1)

#### **PRINCIPLES OF INFORMATION SECURITY**

**Prerequisite:** Basic knowledge of computers

#### **Objectives:**

- To provide an understanding of principal concepts, major issues, technologies and basic approaches in information security.
- Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
- Gain familiarity with prevalent network and distributed system attacks, defenses against them and forensics to investigate the aftermath.

#### **MODULE – I**

Introduction – History of Information Security – defining security – CNSS Security Model – Components of an Information Security – Approaches to Information Security Implementation – System Development Life Cycle - Security Systems Development Life Cycle -Security Professionals and the Organization - Information Security: Is it an Art or a Science?

#### **MODULE – II**

The Need for Security – Introduction - Business Needs First – Threats – Attacks Secure Software Development

#### **MODULE – III**

Legal, Ethical, and Professional Issues in Information Security - Law and Ethics in Information Security - Relevant U.S. Laws - International Laws and Legal Bodies -Ethics and Information Security - Codes of Ethics and Professional Organizations

#### **MODULE – IV**

Risk Management - Introduction - An Overview of Risk Management - Risk Identification - Risk Assessment - Risk Control Strategies - Selecting a Risk Control Strategy - Quantitative Versus Qualitative Risk Control Practices - Risk Management Discussion Points

#### **MODULE – V**

Planning for Security – Introduction - Information Security Planning and Governance - Information Security Policy, Standards, and Practices - Security Education, Training, and Awareness Program- Continuity Strategies - Implementing Information Security - Information



Security Project Management - Technical Aspects of Implementation. - Nontechnical Aspects of Implementation - Information Systems Security Certification and Accreditation

**TEXT BOOK:**

1. Michael E. Whitman & Herbert J. Mattord, "Principles of Information Security", Course Technology, Cengage Learning, 4<sup>th</sup> edition, 2011.

**DISCIPLE SPECIFIC ELECTIVE – STREAM III – PAPER II**

**Paper Code: CSCA354**

L	T	P	C
3	1	2	4(3+1)

**CRYPTOGRAPHY AND NETWORK SECURITY**

**Prerequisite:** Knowledge of mathematics, information security & computer networks.

**Objectives:**

- To learn about network security
- To learn Computer Network Vulnerabilities
- To learn how to deal with Network Security Challenges
- Develop a basic understanding of cryptography, how it has evolved and some key encryption techniques used today.
- Develop an understanding of security policies (such as authentication, integrity and confidentiality)
- To learn about network security threats and countermeasures

**MODULE – I**

Computer Network Fundamentals - Introduction - Computer Network Models- Computer Network Types - Data Communication Media Technology - Network Topology Network Connectivity and Protocol - Network Services - Network Connecting Devices- Network Technologies

**MODULE – II**

Understanding Network Security - Defining Network Security - Security Services - Security Standards - Elements of Security - Security Threats to Computer Networks- Sources of Security Threats - Security Threat Motives - Security Threat Management - Security Threat Correlation

**MODULE – III**

Computer Network Vulnerabilities - Sources of Vulnerabilities- Vulnerability Assessment - Cyber Crimes and Hackers - Cyber Crimes – Hacker - Dealing with the Rising Tide of Cyber Crimes

**MODULE – IV**

Dealing with Network Security Challenges - Access Rights - Access Control Systems – Authorization - Types of Authorization Systems – Authentication - Multiple Factors and Effectiveness of Authentication - Authentication Elements Types of Authentication - Authentication Methods Developing an Authentication Policy

## **MODULE – V**

Cryptography – Definition - Block Ciphers - Symmetric Encryption - Public Key Encryption - Key Management: Generation, Transportation, and Distribution - Public Key Infrastructure (PKI) - Hash Function - Digital Signatures – Firewalls - Types of Firewalls - Configuration and Implementation of a Firewall - Firewall Forensics - Firewall Services and Limitations - Computer Network Security Protocols and Standards - Application Level Security -Security in the Transport Layer Security in the Network Layer

### **TEXT BOOKS:**

1. Kizza& Joseph Migga, “Computer Network Security”, Springer, 2005.
2. William Stallings, “Cryptography & Network Security”, Pearson Education, 4<sup>th</sup> edition, 2010.

## DISCIPLE SPECIFIC ELECTIVE – STREAM III – PAPER III

**Paper Code: CSCA365**

**ETHICAL HACKING**

L	T	P	C
3	1	2	4(3+1)

**Prerequisite:** Knowledge of cryptography & information security

**Objectives:**

- To understand how intruders escalate privileges in a system.
- To understand Intrusion Detection, Policy Creation, Social Engineering, DDoS Attacks, Buffer Overflows and Types of Attacks and Protections.
- To learn Classification and Mechanism of Ethical Hacking.
- To learn the basic principles, instrumentation and applications of Ethical Hacking

### **MODULE I**

Data Theft in Organizations, Elements of Information Security, Authenticity and Non-Repudiation, Security Challenges, Effects of Hacking, Hacker – Types of Hacker, Ethical Hacker, Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking & Computer Attacks – Malicious Software (Malware), Protection Against Malware, Intruder Attacks on Networks and Computers, Addressing Physical Security – Key Loggers and Back Doors

### **MODULE II**

Web Tools for Foot Printing, Conducting Competitive Intelligence, Google Hacking, Scanning, Enumeration, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering – shoulder surfing, Dumpster Diving, Piggybacking.

### **MODULE III**

Physical Security – Attacks and Protection, Steganography – Methods, Attacks and Measures, Cryptography – Methods and Types of Attacks, Wireless Hacking, Windows Hacking, Linux Hacking

### **MODULE IV**

Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking

## **MODULE V**

Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, Buffer Overflow, Denial of Service Attack.

### **TEXT BOOKS:**

1. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series – Elsevier, 2011.
2. Michael T. Simpson, Kent Backman, James E. Corley, "Hands-On Ethical Hacking and Network Defense", Second Edition, CENGAGE Learning, 2010.

**DISCIPLINE SPECIFIC ELECTIVE**

**SPECIALIZATION STREAM IV (WIRELESS COMMUNICATIONS) – PAPER I**

**Paper Code: CSCA246**

L	T	P	C
3	1	2	4(3+1)

**WIRELESS COMMUNICATION TECHNOLOGIES**

**Pre-Requisite:** Data Communication and Networks

**Objectives:**

- To know about the various frequency Spectrum and Signals for wireless communication
- To Know the concept of Infrared, Cordless and WLL
- To understand the concepts wireless communication technologies such as Wireless LAN, WiMAX, Bluetooth and Wi-Fi

**MODULE –I**

Introduction to Protocols and the TCP/IP Suite - The Need for a Protocol Architecture, The TCP/IP Protocol Architecture, The OSI Model, Inter-networking. Wireless Communication Technology- Antennas and Propagation- Antennas, Propagation Modes, Line-of-Sight Transmission, Fading in the Mobile Environment.

**MODULE –II**

Signal Encoding Techniques- Signal Encoding Criteria, Digital Data- Analog Signals, Analog Data-Analog Signals, Analog Data-Digital Signals, The Concept of Spread Spectrum- Frequency Hopping Spread Spectrum, Direct Sequence Spread Spectrum, Code Division Multiple Access, Generation of Spreading Sequences.

**MODULE –III**

Wireless Networking - Satellite Communications- Satellite Parameters and Configurations, Capacity Allocation-Frequency Division, Capacity Allocation-Time Division Cellular Wireless Networks- Principles of Cellular Networks, First-Generation Analog, Second-Generation - TDMA, CDMA, Third-Generation Systems

**MODULE –IV**

Cordless Systems and Wireless Local Loop- Cordless Systems, Wireless Local Loop - Wireless LANs- Wireless LAN Technology – Overview, Infrared LANs, Spread Spectrum LANs, Narrowband Microwave LANs.

## **MODULE –V**

IEEE 802.11 Wireless LAN Standard- IEEE 802 Protocol Architecture, IEEE 802.11 Architecture and Services, IEEE 802.11 Medium Access Control. Introduction to Wi-Fi and Bluetooth Technologies (Only Overview).

### **TEXT BOOKS**

1. William Stallings, “Wireless Communications and Networks” 2<sup>nd</sup> edition, Pearson Prentice Hall, 2005. (Chapters 4, 5, 6, 7, 9, 10,11, 13, 14, 15.1)

### **REFERENCES**

1. Steve Rackley, “Wireless Communication Technology”, Elsevier, 2007
2. C. Siva Ram Murthy and B.S.Manoj, “Adhoc Wireless Networks-Architecture and Protocols”, Pearson Prentice Hall, 2004

## DISCIPLE SPECIFIC ELECTIVE – STREAM IV – PAPER II

**Paper Code: CSCA355**

L	T	P	C
3	1	2	4(3+1)

### **INTRODUCTION TO MOBILE COMMUNICATION**

**Pre-Requisite:** Knowledge in Wireless communication Technologies.

#### **Objectives:**

- To understand the concepts of Telecommunication Systems such as GSM, DECT, TETRA, UMTS and UTRAN.
- To understand the Mobile Network Layer and Transport Layer.

#### **MODULE I**

Introduction – Applications, a short history of wireless communication, a market for mobile communications, Telecommunications systems – GSM- Mobile services, System architecture, Radio interface, protocols, Localization and calling, Handover, Security, New data services, Introduction to DECT, TETRA, UMTS and IMT-2000 & UTRAN.

#### **MODULE II**

Satellite systems – History, Applications, Basics, GEO, LEO, MEO, Routing, Localization, Handover, Examples.

#### **MODULE III**

Broadcast systems – Overview, Cyclical repetition of data, Digital audio broadcasting, Multi-media object transfer protocol, Digital video broadcasting, DVB data broadcasting, DVB for high-speed internet access, Convergence of broadcasting and mobile communications

#### **MODULE IV**

Mobile communications - Radio layer Baseband layer Link manager protocol L2CAP Security SDP Mobile network layer - Mobile IP, Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6, IP micro-mobility support.

#### **MODULE V**

Mobile Transport layer - Traditional TCP- Congestion control, Slow start, Fast retransmit/fast recovery, Implications of mobility, Classical TCP improvements - Indirect TCP , Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction-oriented TCP, TCP over 2.5/3G wireless networks, Performance enhancing proxies



## **TEXT BOOK**

1. Jochen H. Schiller, "Mobile Communications", 2<sup>nd</sup> edition, Addison Wesley, 2003  
(Chapter 1, 4, 5, 6, 8.1, 9)

## DISCIPLE SPECIFIC ELECTIVE – STREAM IV – PAPER II

**Paper Code: CSCA366**

**INTERNET OF THINGS**

L	T	P	C
3	1	2	4(3+1)

**Pre-Requisite:** Knowledge in Wireless and mobile communication Technologies.

**Objectives:**

- Vision and Introduction to IoT.
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

### **MODULE- I**

**M2M to IoT**-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

### **MODULE- II**

**M2M to IoT – A Market Perspective**– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. **M2M to IoT-An Architectural Overview**– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

### **MODULE- III**

**M2M and IoT Technology Fundamentals**- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

### **MODULE- IV**

**IoT Architecture-State of the Art** – Introduction, State of the art, **Architecture Reference Model**- Introduction, Reference Model and architecture, IoT reference Model

### **MODULE- V**

**IoT Reference Architecture**- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Real-World Design Constraints**- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. **Industrial Automation**- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, **Commercial Building**

**Automation-** Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

**TEXT BOOK:**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatias Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1<sup>st</sup> Edition, Academic Press, 2014.

**REFERENCE BOOKS:**

1. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1<sup>st</sup> Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1<sup>st</sup> Edition, Apress Publications, 2013

**DISCIPLINE SPECIFIC ELECTIVE**  
**SPECIALIZATION STREAM V(SOFTWARE ENGINEERING) – PAPER I**

**Paper Code: CSCA247**

L	T	P	C
3	1	2	4(3+1)

**IT PROJECT MANAGEMENT**

**Pre-Requisite:** Knowledge in Software Engineering

**Objectives:**

- To understand the Nature of IT projects
- To design Project plans and write Project proposals.
- To understand the Project Development Life Cycle.

**MODULE –I**

The Nature of Information Technology Projects – Conceptualizing the IT Project - Developing the Project Charter and Baseline Project Plan

**MODULE –II**

The Human Side of Project Management - Defining and Managing Project Scope

**MODULE –III**

The Work Breakdown Structure and Project Estimation - The Project Schedule and Budget - Managing Project Risk

**MODULE –IV**

Project Communication, Tracking and Reporting– IT Project Quality Management

**MODULE –V**

Managing Organizational Change, Resistance and Conflict – Project Implementation, Closure and Evaluation.

**TEXT BOOK**

1. Jack T.Marchewka, “Information Technology and Project Management”, John Wiley & sons P.Ltd,2003.

**DISCIPLINE SPECIFIC ELECTIVE – STREAM V – PAPER II**

**Paper Code: CSCA356**

**SOFTWARE TESTING**

L	T	P	C
3	1	2	4(3+1)

**PRE-REQUISITE:** Knowledge in Software Engineering, Project Management

**Objectives:**

- To understand the Concepts of Software Testing.
- Introducing the students to various Testing Strategies and Testing Tools.

**MODULE I**

Introduction: Software-Testing, Terminology and Methodology, Verification and Validation.

**MODULE II**

Dynamic Testing: Black Box Testing Techniques, White Box Testing Techniques, Static Testing, Validation Activities, Regression Testing.

**MODULE III**

Test Management, Software Metrics, Testing Metrics for Monitoring and Controlling the Testing Process, Efficient Test Suite Management.

**MODULE IV**

Testing Object Oriented Software - Testing Web Based Systems - Debugging.

**MODULE V**

Overview of Testing Tools, Testing an Application using Win Runner, Test Script Language, Architecture and use of Silk Test, Use of LoadRunner and JMeter, Source Code Testing Utilities in Unix/Unix Environment.

**REFERENCES:**

1. Naresh Chauhan, “Software Testing Principles and Practices”, Oxford University Press, 2010.
2. Dr.K.V.K.K.Prasad, Software Testing Tools, Dreamtech press, 2008.
3. William E. Perry, Effective Methods for Software Testing, Third Edition, Wiley & Sons, 2006.
4. Srinivasan Desikan, Gopaldaswamy Ramesh, Software Testing: Principles and Practices, Pearson Education, 2006.

**DISCIPLE SPECIFIC ELECTIVE – STREAM V – PAPER II**

**Paper Code: CSCA367**

L	T	P	C
3	1	2	4(3+1)

**SOFTWARE QUALITY MANAGEMENT**

**Prerequisite:** Knowledge of software engineering

**Objectives**

- To learn quality assurance plans
- To learn how to apply quality assurance tools & techniques
- To learn about standards and certifications
- To learn how to describe procedures and work instructions in software organizations

**MODULE - I**

Introduction - Software Quality Challenge - Software Quality Factors - Components of the Software Quality Assurance System - Pre-Project Software Quality Components - Contract Review - Development and Quality Plans

**MODULE - II**

SQA Components in The Project Life Cycle - Integrating Quality Activities in the Project Life Cycle – Reviews - Software Testing – Strategies - Software Testing –Implementation - Assuring the Quality of Software Maintenance - Assuring The Quality of External Participants' Parts – Case Tools and their effect on Software Quality.

**MODULE - III**

Software Quality Infrastructure Components - Procedures and Work Instructions – Supporting Quality Devices - Staff Training- Instructing and Certification - Preventive and Corrective Actions – Configuration Management - Documentation and Quality Records Controls.

**MODULE - IV**

Software Quality Management Components - Project Progress Control - components of project progress control- Progress control of internal projects and external participants- Implementation of project progress control

**MODULE - V**

Software Quality Metrics - Objectives of quality measurement- Process metrics- Product metrics - Software Quality Costs - Objectives of cost of software quality metrics- classic model of cost of software quality - Maturity Models - Basic Idea in Software Process - Capability Maturity Mode Capability Maturity Model

**TEXT BOOKS:**

1. Daniel Galin, “Software Quality Assurance: From Theory to Implementation” - Pearson Addison-Wesley, 2012.
2. KshirasagarNaik and Priyadarshi Tripathy, “Software Testing and Quality Assurance”, John Wiley, 2008.
3. Allen Gilles, “Software quality: Theory and management”, 2<sup>nd</sup> edition, Cengage Learning, 2003.

**OPEN ELECTIVE -1**  
**SPECIALIZATION STREAM(MANAGEMENT) – PAPER I**

**Paper Code: CSCA248**

L	T	P	C
3	2	0	3

**FUNDAMENTALS OF ACCOUNTANCY**

**Pre-requisites:** Basic knowledge in mathematics

**Objectives:**

- To understand the basic Accountancy.
- To understand concepts of cash maintenance and Cost Accounting.

**MODULE -I**

Accounting – Introduction-Meaning-Accounting and book keeping distinguished-objectives of accounting-Branches of accounting-accounting concepts and conventions-accounting standards in India-systems of Accounting

**MODULE - II**

Double entry system-personal accounts, real accounts, nominal accounts-journal-ledger-preparation of trial balance-rectification of errors.

**MODULE –III**

Subsidiary books including cash book, bank Reconciliation statement

**MODULE –IV**

Preparation of trading account- preparation of profit and loss account and balance sheet- Final accounts with adjustments

**MODULE –V**

Basics of cost Accounting – Basic Concepts- Elements of cost – prime cost – works cost – cost of production – concept of inventory – reorder level – minimum level – maximum level – average level – safety stock

Ratio Analysis – Liquidity ratios – activity ratios – structural ratios – Profitability ratios – dupont analysis

**TEXT BOOKS**

1. S.N. Maheswari, “Advanced Accountancy Vol I”, Vikas Publishing
2. R.L. Gupta, “Advanced accounting”, S. Chand & Co. New Delhi
3. Pillai and Baghawati, “Cost Accounting”
4. Jam and Narang, “Cost Accounting”, Kalyani Publications



5. T.S. Reddy & Murthy, "Financial Accounting"
6. Jain & Narang, "Financial Accounting"
7. M. C. Shukla & T.S.Grewal, "Financial Accounting"

**Note:**

Theory 20 Marks; Problem 80 Marks

## OPEN ELECTIVE - 1 – PAPER II

**Paper Code: CSCA249**

**FINANCIAL MANAGEMENT**

L	T	P	C
3	2	0	3

**Pre-requisite:** Basic knowledge in mathematics and accounts

**Objectives:**

- To understand the Indian financial systems and stock market
- To understand the financial services and financial management.

### **MODULE –I**

Indian Financial System – India Capital market – India Money Market – Their characteristic features – Commercial Banks and reserve bank of India – Their functions – Developmental Financial Institutions – UTI – IDBI – IFCI – ICICI – SIDBI

### **MODULE –II**

Stock exchange – functioning – SEBI – Powers and functions of SEBI – Merchant banking underwriting – stock broking and trading systems - OTCEI

### **MODULE –III**

Management of financial services – Factoring – Forfeiting – Leasing – credit and credit rating – Mergers, restructuring takeovers – venture capital financing – project financing

### **MODULE –IV**

Financial Management – Meaning – Objectives – Importance – Capital Budgeting – Traditional Techniques – discounted cash flow Techniques – NPV Vs IRR cost capital – Leverage – EBIT – EPs analysis

### **MODULE –V**

Working capital management – Operating cycle – Inventory management – EOQ – Cash management – Accounts receivables management

### **TEXT BOOKS**

1. M. Y. Khan and Jain, “Financial Management”, TMH, New Delhi
2. I. M. Pandey, “Financial Management”, Vikas New Delhi
3. S. N. Maheswari, “Financial Management”, Sultan Chand & Sons
4. Prasanna Chandra, “Financial Management, Theory and Practice”, Tata Graw Hill
5. Ramachandran & Srinivasan, “Management Accounting – Theory & practice”

**Note:**

Theory 60 Marks; Problem 40 Marks

## OPEN ELECTIVE - 2 - PAPER I

**Paper Code: CSCA357**

L	T	P	C
3	2	0	3

### **PRINCIPLES OF MANAGEMENT**

#### **OBJECTIVES:**

1. To understand the importance and functions of management
2. To understand the purpose of planning and leadership

#### **MODULE –I**

Meaning, Definition and importance of Management-Functions of a Manager-Management process- Role of a Manager-Social responsibility of Management-Co-Ordination-Meaning and scope requirements of effective co-ordination-problems in co-ordination.

#### **MODULE –II**

Meaning and purpose of planning – steps in planning Process-Limitations-Types of plans, objectives, Strategies, policies, procedures, programmes, management by objectives (MBO) – Decision making- Types of decisions-process of decision making-difficulties in decision making

#### **MODULE –III**

Nature and purpose of organizations-different forms of organizations-merits and demerits – linear and staff concepts- organisational charts- departmentations - bases for departmentation - product, function and territory-span of management

#### **MODULE –IV**

Authority-responsibility-accountability-delegation of authority-principles of delegation-unity of command – centralization and decentralization –advantages and disadvantages

#### **MODULE –V**

Nature and scope of direction-motivation meaning-major theories of motivation – Maslow’s theory - Herberg’s two factor Theory-Leadership Styles-Nature and purpose of controlling

#### **TEXT BOOK**

1. Kathiresan and Radha, “ Business Management”, Bhavani publications, Chennai

## OPEN ELECTIVE - 2 – PAPER II

**Paper Code: CSCA358**

L	T	P	C
3	2	0	3

### **INTRODUCTION TO E-BUSINESS**

#### **OBJECTIVES**

- This course introduces students to various aspects and models for e-business.
- At the end of the course, students should have an understanding of the impacts which e-business is having on society, markets and commerce.
- Students should also become aware of the global nature of e-commerce and how traditional means of doing business will need to change in the electronic age.

#### **MODULE I**

Introduction to e-Business and e-Commerce- Define the e-Commerce and e-Business - Define E-commerce Types of EC transactions - Define e-Business Models - Internet Marketing and e-Tailing - Elements of e-Business Models- Explain the benefits and limitations of e-Commerce.

#### **MODULE II**

E-Marketplaces: Structures, Mechanisms, Economics, and Impacts- Define e-Marketplace and Describe their Functions- Explain e-Marketplace types and their features - Describe the various types of auctions and list their characteristics - Discuss the benefits, limitations and impacts of auctions - E-Commerce in the wireless environment - Competition in the DE and impact on industry

#### **MODULE III**

e-Business Applications, e-Procurement and e-Payment Systems - Integration and e-Business suits - ERP, eSCM, CRM - e-Procurement definition, processes, methods and benefits - e-Payment - Discuss the categories and users of smart cards - Describe payment methods in B2B EC.

#### **MODULE IV**

The Impact of e-Business on Different Fields and Industries - e-Tourism - Employment and Job Market Online - Online Real Estate - Online Publishing and e-Books - Banking and Personal Finance Online - On-Demand Delivery Systems and E-Grocers - Online Delivery of Digital Products, Entertainment, and Media

#### **MODULE V**

e-Learning and Online Education- Define electronic learning-Discuss the benefits and drawbacks of e-Learning.

- The e-Learning Industry- Discuss e-Content development and tools-Describe the major technologies used in e-Learning- Discuss the different approaches for e-Learning delivery-How e-Learning can be evaluated. Future Trends-e-Government- Definition of e-Governments- Implementation-E-Government Services- Challenges and Opportunities- E-Government Benefit.

**TEXT BOOK**

1. Electronic Commerce: A Managerial Perspective, Turban, E. et al., Prentice Hall 2008.

**REFERENCES**

1. Electronic Business and Electronic Commerce Management, 2nd edition, Dave Chaffey, Prentice Hall, 2006
2. e-Learning Tools and Technologies, Horton and Horton, Wiley Publishing.

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA201**

L	T	P	C
0	0	2	2

### **OFFICE AUTOMATION TOOLS**

#### **OBJECTIVES:**

1. To practically learn to use Microsoft word, excel and powerpoint
2. To be able to work as an office assistant

#### **MODULE – I**

MS-WORD: Learning Word Basics – Formatting a Word Document – Working with Longer Document.

#### **MODULE – II**

MS-EXCEL: Creating a Simple Spreadsheet – Editing a Spreadsheet – Working with Functions and Formula – Formatting Worksheets – Completing Your Spreadsheet – Creating Charts

#### **MODULE – III**

MS-POWERPOINT: Creating and Viewing Presentations – Editing a Presentation – Working with Presentation Special Effects

#### **TEXT BOOK:**

1. Microsoft Office XP – fast & easy, DIANE KOERS Publisher: Prentice Hall of India Private Limited, New Delhi, 2001

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA202**

**MULTIMEDIA TOOLS**

L	T	P	C
0	0	2	2

### **OBJECTIVES:**

- Understanding the key principles of animation using FLASH.
- Understanding the concept of timing for animation and its application as a means of communication.
- Ability to creatively manipulate frame time as a means of emphasizing and actualizing action and expressing an idea.

### **MODULE – I**

Flash - Action Scripting Using actions to control a timeline - Using frame labels - Creating button symbols - Creating animated buttons using movie clips – Movie Clip Controls – Browser / network.

### **MODULE - II**

Advanced Animation Methods Creating movies playing within movies (movie clips and .swf) - Controlling multiple timelines (movies) through action scripting - Critique storyboards.

### **MODULE - III**

Streamlining Files for Use on the Web, Publishing Files to the Internet & Pre loaders Pre loaders - Controlling sound with script - Exploring types of output - Work on final project in class - Importing video - Publishing demo (video) reels on web - Publishing and exporting files - Trouble shooting sites.

### **REFERENCE BOOKS**

1. The Illusion of Life: Disney Animation by Frank Thomas, Ollie Johnston (Contributor), Collie Johnston.
2. Adobe Flash CS3
3. The Animator's Survival Kit: A Manual of Methods, Principles, and Formulas for Classical, Computer, Games, Stop Motion, and Internet Animators by Richard Williams

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA203**

**ACCOUNTING TOOLS**

L	T	P	C
0	0	2	2

### **OBJECTIVES:**

1. To learn about basics entries in Tally
2. To work with Tally Accounting Software for maintaining accounts

### **MODULE -I**

Basics of Accounting-Types of accounts-Golden rules of accounting -Accounting Principles - Concepts and conventions -Double entry system of Book keeping-Mode of Accounting-Financial Accounting -Recording Transactions. Fundamentals of Tally - Creation / Setting up of Company in Tally- Accounting masters in Tally -F11: Features - F12 Configurations -Setting up of Account Heads.

### **MODULE II**

Inventory in Tally-Stock Groups–Stock Categories -Godowns / Locations –Units of Measure– Stock Items –Creating Inventory Masters for National Traders. Voucher Entry in Tally- Accounting Vouchers –Inventory Vouchers –Invoicing.

### **MODULE III**

Advanced Accounting in Tally-Billwise details –Cost Centers and Cost Categories –Voucher class and Class Center Class –Multiple Currencies –Bank Reconciliation – Interest Calculations.

### **TEXT BOOK**

1. Tally .ERP 9 in Simple Steps, Kogent Learning Solution



## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA301**

**MOBILE APPLICATION DEVELOPMENT**

L	T	P	C
0	0	2	2

### **OBJECTIVES:**

1. Create a simple application that runs under the Android operating system.
2. Access and work with the Android file system.
3. Create an application that uses multimedia under the Android operating system.
4. Access and work with databases under the Android operating system.

### **MODULE - I**

What is Android, Android Tools, Your First Android Application, Anatomy of Android Application, Workspaces, Editors in Eclipse, Eclipse Perspective, Refactoring - Creating Android Emulator, Creating Snapshot, SD Card Emulation, Sending SMS Messages to the Emulator, Transferring Files into and out of the Emulator, Resetting the Emulator

### **MODULE - II**

Activity, Linking Activity using Intent, Fragments, Calling Build-In Application using Intent, Notifications

Components of a Screen, Display Orientation, Action Bar, listening for User Inter

### **MODULE - III**

Basic Views, Picker Views, List View, Specialized Fragment, Gallery and Image View, Image Switcher, Grid View, Options Menu, Context Menu, Clock View, Web view

### **REFERENCE BOOKS:**

1. Android Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides) By: Bill Philips & Brian Hardy
2. Android Design Patterns: Interaction design solutions for developers by Greg Nudelman
3. Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps By: Ian G. Clifton
4. Android Recipes: A Problem-Solution Approach By: Dave Smith & Jeff Friesen
5. Hello, Android: Introducing Google's Mobile Development Platform (Pragmatic Programmers) By: Ed Burnette

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA302**

**LINUX AND SHELL PROGRAMMING**

L	T	P	C
0	0	2	2

### **OBJECTIVE:**

- It aims to introduce about open source operating system as we can use Linux as Server OS or as standalone OS on our PC, Shell scripting & IPC etc.

### **MODULE - I**

UNIX UTILITIES: Introduction to UNIX file system; vi editor; file handling utilities; security by file permissions; process utilities; disk utilities; networking commands; cp; mv; ln; rm; unlink; mkdir; rmdir; du; df; mount; unmount; find; ps; who; w; finger; arp; ftp; telnet; rlogin; text processing utilities and backup utilities; detailed commands to be covered are cat; tail; head; sort; nl; uniq; grep; egrep; fgrep; cut; paste; join; tee; pg; comm.; cmp; diff; tr; awk; tar; cpio.

### **MODULE - II**

PROBLEM SOLVING APPROACHES IN UNIX: Using single commands; using compound commands; shell scripts; C programs; building own command library of programs; working with the Bourne shell : what is a shell; shell responsibilities; pipes and input redirection; output redirection; shell script examples.

### **MODULE – III**

UNIX FILES: UNIX file structure; directories; files and devices; system calls; library functions; usage of open; creat; read write; close; lseek; stat; fstat; ioctl; umask; dup; dup2; the standard I/O ( fopen; fclose; fflush; fseek; fgetc; getc; getchar; fputc; putc; putchar; fgets; gets); formatted I/O; stream errors; streams and file descriptors; file and directory maintenance (chmod; chown; unlink; link; symlink; mkdir; rmdir; chdir; getcwd).

### **TEXT BOOKS:**

W. R. Stevens, “Unix Network Programming”, Pearson/PHI.

### **REFERENCE BOOKS:**

Sumitabha Dass, “Unix Concepts and Application”, 3<sup>rd</sup> Edition, Tata McGraw Hill.

**PONDICHERY UNIVERSITY  
(A CENTRAL UNIVERSITY)**

**Kalapet, Puducherry.**



**Bachelor of Computer Applications(B.C.A)  
(Choice Based Credit System)**

**Regulations & Syllabus**

**2019 - 2020 onwards**

# **Pondicherry University**

## **Bachelor of Computer Applications (B.C.A)**

### **REGULATIONS**

(Effective from the academic year 2019-2020)

#### **1. Aim of the Course**

The BCA course aims to impart the students with fundamental and hands on knowledge of computers, applications of computer science and modern computer science applications.

#### **2. Eligibility of Admission**

Candidates for admission to BCA shall be required to have passed 10 + 2 system of Examination or equivalent with Mathematics / Business Mathematics / Computer Science/ Computer Applications as one of the subjects of study.

#### **3. Lateral Entry Admission**

Candidates who have passed Diploma in Computer Science / Information Technology/ Computer Technology / Computer Application in I Class (10+3 years of study) are eligible to apply for the lateral entry to the 2<sup>nd</sup> year of the course subject to availability of seats, but limited to 10% of the sanctioned intake.

#### **4. Duration of the course**

The course shall be of three years' duration spread over six consecutive semesters. The maximum duration to acquire prescribed number of credits in order to complete the Programme of Study shall be twelve consecutive semesters (six years).

#### **5. Medium**

The medium of instruction shall be English.

## 6. Course Structure

Category	Course Name	Number of Papers	Credits Per Paper	Total Credits
MIL	Modern Indian Languages	2	3	6
ENG	English	2	3	6
AECC	Ability Enhancement Compulsory Course	2	2	4
SEC	Skill Enhancement Course	4	2	8
GE	Generic Elective Course	2	3	6
DSC	Discipline Specific Core Course	Theory - 12 Practical - 9 Project -1	Theory - 3 Practical - 2 6	12x3=36 9 x 2=18 1 x 6 =6 Total = <b>60</b>
DSE	Discipline Specific Elective Course	6	4	6 x 4 =24
OE	Open Elective Course	2	3	2 x 3 =6
			<b>Total</b>	<b>120</b>

### MIL, ENG, AECC

The crediting of MIL, ENG and AECC courses is as per Pondicherry University UG CBCS regulations.

### DSC and DSE

At least 60% (72 credits) of the total minimum credit requirement must be earned by the student from DSC and DSE courses as follows in order to obtain the degree - 60 credits from Discipline Specific Core and 12 credits from Discipline Specific Elective courses.

### SEC

Out of the 4 Skill Enhancement Courses, one course viz. - Online Course / In-Plant Training (2 weeks) / One month Internship / mini project is mandatory. The Online Course to be studied, the organization to be chosen for In-Plant Training or One month internship is to be validated or approved by a panel of members comprising of the Department Faculty, before a student pursues the same. For the remaining 3 SEC courses, any of the 2 credit Skill Enhancement Courses specified in the curriculum (BCA) could be credited or

substituted with Skill Enhancement Courses in the curriculum of other UG computer science courses or Skill Enhancement Courses of other UG Non-Computer Science Disciplines of study that constitute to skill development or an assortment of these without any overlap of courses.

### **GE**

Any 2 of the 3 credit Generic Elective Courses specified in the curriculum (BCA) could be credited to constitute the 6 credits or substituted with Generic Elective courses in the curriculum of other UG Computer Science Disciplines of study or UG Courses of Non-Computer Science Disciplines of study that add proficiency to the students - with the advice of the Faculty Advisor, or an assortment of these without any overlap of courses.

### **DSE**

The six 4 credit papers to be credited under DSE can be credited from Discipline Specific Elective specialization stream courses as follows:

- a. Three of the 4 credit courses can be credited from one specialization streams, thus completing 2 specialization streams. (or)
- b. All six 4 credit papers can be credited from any specialization stream across the different specialization stream courses specified in the curriculum without any overlap of courses credited in above. (or)
- c. Another specialization stream courses or across the different specialization stream courses in the curriculum of other UG Computer Science Disciplines of study without any overlap of courses credited in above.

### **OE**

Any 2 of the 3 credit Open Elective Courses specified in the curriculum (BCA) could be credited to constitute the 6 credits or substituted with Open elective courses in the curriculum of other UG Computer Science disciplines of study or substituted with UG Courses of Non- Computer Science Disciplines of study that add proficiency to the students - with the advice of the Faculty Advisor or an assortment of these without any overlap of courses.

## **1. Faculty to Students Ratio**

The Faculty to Student Ratio in all the practical / laboratory classes shall be maintained at 1:25.

## **2. Pattern of Examination**

- a. The End-Semester examination and internal assessments for MIL, ENG, AECC, DSC, GE and OE courses are as per Pondicherry University UG CBCS regulations.
- b. All SEC courses (except Online Course / In-Plant Training (2 weeks) / One month Internship) to be treated as a practical / laboratory course and the End-Semester examination to be conducted as per Pondicherry University UG CBCS regulations.
- c. The internal assessments for all practical / laboratory courses (for DSC, SEC courses) shall be as follows – 15 marks from two internal practical / laboratory assessment tests and 5 marks based on practical / laboratory course based mini application development.
- d. The internal assessment for DSE courses shall be conducted as follows - 12 marks from two internal assessment tests and 8 marks based only on two internal practical / laboratory assessment tests.
- e. The marks for attendance (5 marks) applies to all courses and the awarding of attendance marks is as per Pondicherry University UG CBCS regulations.
- f. The Project work is to be evaluated as follows:
  - i. The internal assessment (25 marks) is awarded as follows:
    - a. 10 marks is awarded based on two internal project reviews conducted in periodic intervals by a panel comprising of members of the Department during the tenure of the project.
    - b. The student's project guide awards 10 marks for the project work and 5 marks for attendance (attendance marks as specified in the Pondicherry University UG CBCS regulations).
  - ii. The End Semester Examination assessment (75 marks) is evaluated under two aspects viz – i)Project Work – (50 marks) ii)Project Report and Viva- Voce (25marks)

## **Passing Minimum**

Passing Eligibility and classification for the award of the Degree is as per Pondicherry University UG CBCS regulations.

## **Lateral Entry**

The Lateral Entry students have to complete 81 credits from the DSC, DSE, GE, SE, OE courses as per curriculum (III<sup>rd</sup> to VI<sup>th</sup> semesters). In addition, they should complete the two AECC courses (4 credits) for the award of the degree. One MIL (3 credits) and one ENG (3 credit) courses also need to be completed, if it is not studied in the last three years of the course eligible for lateral entry admission.

Other aspects of CBCS not covered in this document by default conforms to the Pondicherry University UG CBCS regulations.

## **Programme Outcomes**

BCA programme has been designed to prepare graduates for attaining the following specific outcomes:

P01 – It provides an ability to apply knowledge of Mathematics, Computers and Management in practice. It enhances not only comprehensive understanding of the theory but its application.

P02 - The program prepares the young professionals in wide range of areas such as Algorithms, Programming, Networking, Software Engineering, Business Intelligence, Information Security, Web Designing, Big Data and IOT.

P03 - In order to enhance programming skills of the young IT professionals, the program has introduced the ability to identify a business problem, isolate its key components, analyze and assess the salient issues, set appropriate criteria for decision making, and draw appropriate conclusions and implications for proposed solutions.

P04 – The program equips to demonstrate the capabilities required to apply cross-functional business knowledge and technologies in solving real-world business problems and to demonstrate use of appropriate techniques to effectively manage business challenges.

P05 - The programs teaches to effectively communicate business issues, management concepts, plans and decisions both in oral and written form using appropriate supportive technologies. Blend analytical, logical and managerial skills with the technical aspects to resolve real world issues.

P06 - Become employable in various IT companies as programmer, system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

P07 - To work in public sector undertakings and Government organisations.



# PONDICHERY UNIVERSITY

## Bachelor of Computer Applications (BCA)

### PROPOSED STRUCTURE OF THE COURSE UNDER CBCS 2019 - 2020

Category	No. of Papers	Credits Per Paper	Total Credits
MIL	2	3	6
ENG	2	3	6
AECC	2	2	4
SEC	4	2	8
GE	2	3	6
DSC	Theory- 12	Theory- 3	12x3=36 9 x 2=18 1 x 6 =6 Total =60
	Practical – 9	Practical – 2	
	Project -1	6	
DSE	6	4	6 x 4 =24
OE	2	3	2 x 3 =6
		<b>Total</b>	<b>120</b>

- MIL - Modern Indian Languages  
- Tamil, Hindi, Sanskrit, etc
- ENG - English
- AECC - Ability Enhancement Courses  
- Public Administration and Environmental Studies
- SEC - Skill Enhancement Courses
- GE - Generic Elective
- DSC - Discipline Specific Core
- DSE - Discipline Specific Elective
- OE - Open Elective

**FIRST SEMESTER**

S.No	COURSE	SUBJECT CODE	PAPER	CREDITS		HOURS		
				Theory	Prac	L	T	P
1	MIL	LTAM/LHI/ LARA/LMAL/ LFRE 111	Language-I	3	-	3	2	0
2	ENG	ENGL112	English-I	3	-	3	2	0
3	DSC -1	CSCA113	Introduction to Problem Solving using C	3		3	2	
4	DSC -2	CSCA114	Digital Electronics	3		3	2	
5	AECC - 1	PADM115	Public Administration	2		2	0	0
6	DSC -1 (lab)	CSCA116	Programming in C Lab		2*			4
7	DSC -2 (lab)	CSCA117	Digital Lab		2*			4
			<b>TOTAL</b>	<b>18</b>		<b>30</b>		

**SECOND SEMESTER**

S.No	COURSE	SUBJECT CODE	PAPER	CREDITS		HOURS		
				Theory	Prac	L	T	P
1	MIL	LTAM/LHIN/ LARA/ MAL/ LFRE 121	Language-II	3		3	2	0
2	ENG	ENGL122	English-II	3		3	2	0
3	DSC - 3	CSCA123	Python Programming	3		3	0	
4	DSC - 4	CSCA124	Data Structures and Algorithms	3		3	1	
5	GE -1 (1 out of 2)	CSCA125	Mathematics for Business	3		3	0	0
		CSCA126	Discrete Mathematics					
6	AECC - 2	ENVS127	EVS	2		2		
7	DSC - 3 (lab)	CSCA128	Python Lab		2*			4
8	DSC - 4 (lab)	CSCA129	Data Structures and Algorithms Lab		2*			4
			<b>TOTAL</b>	<b>21</b>		<b>30</b>		

### THIRD SEMESTER

S.No	COURSE	SUBJECT CODE	PAPER	CREDITS		HOURS		
				Theory	Prac	L	T	P
1	DSC – 5	CSCA231	Object Oriented Programming using Java	3		3	1	
2	DSC – 6	CSCA232	Computer Networks	3		3	0	
3	DSC – 7	CSCA233	Software Engineering	3		3	1	
4	DSC – 8	CSCA234	Operating Systems	3		3	1	
5	GE – 1 (1 out of 2)	CSCA235	Applied Statistics	3		3	0	
		CSCA236	Operations Research					
6	SEC – 1		Select one SEC from SEC list		2*		1	3
7	DSC-5 (lab)	CSCA237	Java Lab		2*			4
8	DSC-6 (lab)	CSCA238	Computer Networks Lab		2*			4
			<b>TOTAL</b>	<b>21</b>		<b>30</b>		

### FOURTH SEMESTER

S.No	COURSE	SUBJECT CODE	PAPER	CREDITS		HOURS		
				Theory	Prac	L	T	P
1	DSC – 9	CSCA241	Programming with Visual Basic	3		3	1	
2	DSC – 10	CSCA242	Database Management System	3		3	0	
3	OE – 1		Select one OE from OE List	3		3	0	0
4 5	Select DSE – 1 DSE – 2 Out of 5	CSCA243	Data Warehousing	3	1	3	1	2
		CSCA244	Artificial Intelligence					
		CSCA245	Information Security					
		CSCA246	Data Communication Technologies					
		CSCA247	IT Project Management					
6	SEC - 2		Select one SEC from SEC List		2*		1	3
7	DSC-9 (lab)	CSCA248	VB and DBMS Lab		2*			4
			<b>TOTAL</b>	<b>21</b>		<b>30</b>		

## FIFTH SEMESTER

S.No	COURSE	SUBJECT CODE	PAPER	CREDITS		HOURS		
				Theory	Prac	L	T	P
1	DSC - 11	CSCA351	Web Technology	3		3	0	
2 3	Select DSE – 3 DSE – 4 Out of 5	CSCA352	Data Mining	3	1	3	1	2
		CSCA353	Machine Learning Techniques					
		CSCA354	Network Security					
		CSCA355	Introduction to Wireless Communication					
		CSCA356	Software Testing					
4	OE – 2		Select one OE from OE List	3		3	0	0
5	SEC - 3 (Compulsory)		Accounting Tools		2*		1	3
6	SEC – 4 (Compulsory)		Online Certification Course / Mini Project (Viva Compulsory) / 2 weeks Internship / 1month In-Plant Training <i>Any one from the above list</i>		2*		1	3
7	DSC-11 (lab)	CSCA357	Web Technology Lab		2*			4
<b>TOTAL</b>				<b>20</b>		<b>30</b>		

## SIXTH SEMESTER

S.No	COURSE	SUBJECT CODE	PAPER	CREDITS		HOURS		
				Theory	Prac	L	T	P
1	DSC – 12	CSCA361	Visual Programming with C#	3		3	0	
2	DSC - 13	CSCA362	PROJECT		6*		1	10
3 4	Select DSE - 5 DSE – 6 Out of 5	CSCA363	Foundations of Data Analytics	3	1	3	1	2
		CSCA364	Introduction to Robotics					
		CSCA365	Ethical Hacking					
		CSCA366	Internet of Things					
		CSCA367	Software Quality Management					
5	DSC-12 (lab)	CSCA368	Visual Programming Lab		2*			4
<b>TOTAL</b>				<b>19</b>		<b>30</b>		

**\*University Practical Exam/ Viva Should be conducted.**

<b>DISCIPLINE SPECIFIC CORE – PRACTICALS – Compulsory</b>		
<b>Course Code</b>	<b>Paper Name</b>	<b>Credits</b>
CSCA116	Programming in C Lab	2
CSCA117	Digital Lab	2
CSCA127	Python programming Lab	2
CSCA128	Data Structures and Algorithms Lab	2
CSCA237	Object Oriented Programming using Java Lab	2
CSCA238	Computer Networks Lab	2
CSCA247	VB and DBMS Lab	2
CSCA357	Web Technology Lab	2
CSCA362	PROJECT	6
CSCA365	Visual Programming Lab	2

<b>DISCIPLINE SPECIFIC CORE – THEORY – Compulsory</b>		
<b>Course Code</b>	<b>Paper Name</b>	<b>Credits</b>
CSCA113	Introduction to problem solving using C	3
CSCA114	Digital Electronics	3
CSCA123	Python Programming	3
CSCA124	Data Structures and Algorithms	3
CSCA231	Object Oriented Programming using JAVA	3
CSCA232	Computer Networks	3
CSCA233	Software Engineering	3
CSCA234	Operating Systems	3
CSCA241	Programming with Visual Basic.NET	3
CSCA242	Database Management Systems	3
CSCA351	Web Technology	3
CSCA361	Visual Programming using C#.NET	3

<b>DISCIPLINE SPECIFIC ELECTIVE – POOL</b>			
<b>Course Code</b>	<b>Paper Name</b>	<b>Credits</b>	
		<b>Theory</b>	<b>Practical</b>
<b>Stream – I (Business Intelligence)</b>			
	Data Warehousing	3	1
	Data Mining	3	1
	Foundations of Data Analytics	3	1
<b>Stream – II (Artificial Intelligence)</b>			
	Artificial Intelligence	3	1
	Machine Learning Techniques	3	1
	Introduction to Robotics	3	1
<b>Stream – III (Information Security)</b>			
	Information Security	3	1
	Network Security	3	1
	Ethical Hacking	3	1
<b>Stream – IV (Wireless Communication)</b>			
	Data Communication Technologies	3	1
	Introduction to Wireless Communication	3	1
	Internet of Things	3	1
<b>Stream – V (Software Engineering)</b>			
	IT Project Management	3	1
	Software Testing	3	1
	Software Quality Management	3	1

<b>OPEN ELECTIVE - OE - LIST</b>		
CSCA701	Business Communication	3
CSCA702	IT Enabled Services	3
CSCA703	Total Quality Management	3
CSCA704	Introduction to E-Business	3
CSCA705	Fundamentals of Accountancy	3
CSCA706	Principles of Management	3

<b>OPEN ELECTIVE – OE – FOR OTHER DEPARTMENTS</b>		
CSCA171	Basics of Computers and Office Automation	3
CSCA172	Fundamentals of Information Technology	3
CSCA173	Fundamentals of C Language	3
CSCA174	Web Designing	3

<b>GENERAL ELECTIVE – OE - LIST</b>		
<b>Course Code</b>	<b>Paper Name</b>	<b>Credits</b>
CSCA125	Mathematics for Business	3
CSCA126	Discrete Mathematics	3
CSCA235	Applied Statistics	3
CSCA236	Operations Research	3

<b>SKILL ENHANCEMENT COURSES – LIST</b>		
<b>Course Code</b>	<b>Name of the course</b>	<b>Credits</b>
CSCA801	DeskTop Publishing Tools	2
CSCA802	Office Automation tools	2
CSCA803	Multimedia Tools	2
CSCA804	Programming with PHP	2
CSCA805	Mobile Application Development	2
CSCA806	Online Certification Course/	
CSCA807	Mini Project – Viva (Compulsory)/	
CSCA808	2 weeks Internship/	
CSCA809	1 month In-Plant Training	
CSCA810	Programming with C++	2
CSCA811	Accounting Tools (Compulsory)	2

## DISCIPLINE SPECIFIC CORE - 1

**Paper Code: CSCA113**

L	T	P	C
3	2	0	3

### **INTRODUCTION TO PROBLEM SOLVING USING C**

**Prerequisite:** Basic knowledge of Computers.

#### **Objectives:**

- To learn the concepts of “ C ” Programming
- To develop software programs using “C” language

#### **Outcomes:**

- In-depth understanding of various concepts of C language.
- Skill to write program code in C to solve real world problems and to debug a program

#### **MODULE – I**

Introduction to Computers– Introduction to Programming - How to develop a program, Algorithms, Flow-charts, Types of Programming Languages -- Debugging, Types of errors - Techniques of Problem Solving – Problem solving aspects – Top- Down aspects –Structured programming concepts.

#### **MODULE – II**

Character Set, Structure of a ‘C’ Program, Data Types, Operations, Expressions, Assignment Statement, Conditional Statements, Looping Statements, Nested Looping Statements, Multi Branching Statement (Switch), Break and Continue, Differences between Break and Continue, Unconditional Branching (Go to Statement)

#### **MODULE – III**

Functions: Defining and accessing: Passing arguments, Function prototypes, Function calls- Categories of functions- Nesting of functions- Recursion. Use of library functions, Scope , Visibility and Lifetime of variables.

#### **MODULE – IV**

Arrays: Declaration and Initialization of one and two dimensional arrays – Multidimensional array – dynamic arrays - Character arrays and strings. Structure: Defining and processing. Structure initialization Operations on individual members Arrays of structure, Arrays within Structure, Structure and Functions- Passing to a function, Union.

#### **MODULE – V**

Pointers: Declarations and initialization of pointer variables ,Accessing pointer variables, Passing to a function. Operations on pointers, pointer and arrays. Array of pointers, Pointer to Functions. Data Files: Open, close, create, process unformatted data files.

#### **TEXT BOOK**

1. E. E.Balagurusamy, Programming in ANSI C , 8<sup>th</sup> Edition Tata McGraw Hill, 2019
2. P. K. Sinha & Priti Sinha, “Computer Fundamentals”, BPB Publications, 2007.
3. Byron S. Gottfried, Programming with C , Schaum’s Outline Series, TMH, 4<sup>th</sup> Edition 2018.



**Paper Code: CSCA116**

L	T	P	C
0	0	4	2

**PROGRAMMING IN C LAB**

**LIST OF EXERCISES**

1. Simple C programs
2. Program to illustrate control statements
3. Program to illustrate FOR loop
4. Program to illustrate SWITCH & WHILE statements
5. Program to illustrate functions
6. Program to illustrate user-defined functions
7. Program to illustrate arrays
8. Program to illustrate usage of pointers
9. Program to illustrate character handling libraries.
10. Program to illustrate string manipulation
11. Program to illustrate creation of files.
12. Program to illustrate creation, reading & accessing files

## DISCIPLINE SPECIFIC CORE - 2

**Paper Code: CSCA114**

L	T	P	C
3	2	0	3

### **DIGITAL ELECTRONICS**

**Prerequisite:** Basic knowledge about computers

**Objectives:**

- To learn the fundamentals of digital logic.
- To learn combinational and sequential logic.

**Outcomes:**

- Skill to use the methods of systematic reduction of Boolean expression using K- Map. Ability to interpret logic gates and its operations.
- Familiarization with combinational and sequential logic circuits in electronics.

#### **MODULE -I**

Number systems & Conversions – Arithmetic of number systems – binary codes – BCD – The excess – 3code – Gray code – ASCII – EBCDIC - Introduction to Logic Circuits – logic functions & gates – Inversion – truth tables – logic gates – truth table of basics gates – timing diagrams of NOT, AND & OR gates.

#### **MODULE -II**

Boolean Algebra – Basic Theorems and properties – Boolean Functions – Canonical and Standard Forms – Karnaugh Map Simplification –Two, Three, Four and Five Variables –NAND and NOR Implementation – Don't Care Conditions.

#### **MODULE -III**

Combinational Logic Circuits – Code Converter- Multiplexer – Demultiplexer – Magnitude Comparator-Adder: Half Adder, Full Adder – Subtractor : Half Subtractor, Full Subtractor – Encoder – Decoder.

#### **MODULE -IV**

Sequential Logic Circuits - SR flip flop – D flip flop – JK flip flop – T flip flop – flip flop triggering – Shift registers – data movements in digital systems – counters – classification of counters.

#### **MODULE –V**

Register transfer logic Inter register transfer Arithmetic, Logic and shift micro operations Conditional control statements fixed point binary data overflow Arithmetic shifts Instruction codes Design of simple computer.

**Text Books:**

1. Morris Mano M, “Digital Logic and Computer Design”, Pearson Education, 4th edition, 2014.
2. S.S. Bhatti & Ragul Malhotra, ”A Textbook of Digital Electronics”, I.K. International publishing, New Delhi, 2013

**Paper Code: CSCA117**

L	T	P	C
0	0	4	2

**DIGITAL LAB**

**LIST OF EXERCISES**

1. Study of Logic Gates
2. Design of Adder and Subtractor
3. Design and Implementation of Code Convertors
4. Design of 4-Bit Adder and Subtractor
5. Design and Implementation of Magnitude Comparator
6. 16 Bit Odd/Even Parity Checker and Generator
7. Design and Implementation of Multiplexer and Demultiplexer
8. Design and Implementation of Encoder and Decoder
9. Simulation of Logic Gates
10. Simulation of Adder and Subtractor

## DISCIPLINE SPECIFIC CORE - 3

**Paper Code: CSCA123**

L	T	P	C
3	0	0	3

### **PYTHON PROGRAMMING**

**Prerequisite:** Knowledge of any programming language

**Objectives:**

- To learn basic python concept.
- To develop simple Python programs and code reusing with functions

**Outcomes:**

- Skill to write codes in Python to solve mathematical or real world problems.
- Ability to isolate and fix common errors in Python programs.

#### **MODULE 1**

Introduction to Python - The IDLE Python Development Environment - The Python Standard Library - Literals - Numeric Literals - String Literals - Control Characters - String Formatting - Implicit and Explicit Line Joining Variables and Identifiers - Variable Assignment and Keyboard Input- Identifier-Keywords and Other Predefined Identifiers in Python – Operators - Various Operators - Relational Operators-Membership Operators – Boolean Operators - Expression and Data Types -Operator Precedence and Boolean Expressions - Operator Associativity - Mixed-Type Expression

#### **MODULE 2**

Control Structure -Selection Control- If Statement - Indentation in Python - Multi-Way Selection - Iterative Control - While Statement - Input Error Checking - Infinite loops - Definite vs. Indefinite Loops

#### **MODULE 3**

List Structures - Common List Operations - List Traversal - Lists (Sequences) in Python- Python List Type - Tuples- Sequences- Nested Lists Iterating Over Lists (Sequences) in Python - For Loops - The Built-in range Function - Iterating Over List Elements vs. List Index Values-While Loops and Lists (Sequences) - Dictionaries and sets

#### **MODULE 4**

Defining Functions - Calling Value-Returning Functions - Calling Non-Value-Returning Functions - Parameter Passing - Keyword Arguments in Python Default Arguments in Python - Variable Scope - Recursive functions - Exception Handling -The Propagation of Raised Exceptions - Catching and Handling Exceptions -Exception Handling and User Input

#### **MODULE 5**

String Processing - String Traversal - String-Applicable Sequence Operations -String Methods - Using Text Files - Opening Text Files - Reading Text Files - Writing Text Files

#### **TEXT BOOK**

1, Charles Dierbach, Introduction to Computer Science using Python , Wiley First Edition (2015), ISBN-10: 81265560132015

#### **REFERENCE BOOKS**

- 1, Zed A.Shaw, Learn Python the Hard Way Paperback, Pearson Education, Third Edition edition (2017), ISBN-10: 9332582106
2. Paul Barry, Head First Python, O' Reilly Publishers, First Edition, 2010, ISBN:1449382673.

**Paper Code : CSCA128**

L	T	P	C
0	0	4	2

**PYTHON PROGRAMMING LAB**

### **LIST OF EXERCISES**

1. Create simple programs using arithmetic Boolean and logical operators
2. Develop program using control flow tools like IF.
3. Develop program using LOOP control structures
4. Data structures
  - use list as stack
  - use list as queue
  - tuple, sequence
5. Write a program to read and write files, create and delete directories
6. Write a program with exception handling
7. Write a program using string handling and regular expressions

## DISCIPLINE SPECIFIC CORE - 4

**Paper Code: CSCA124**

L	T	P	C
3	1	0	3

### **DATA STRUCTURES AND ALGORITHMS**

**Pre-requisite:** Knowledge of any programming language

**Objectives:**

- To acquaint students with data structures used for programming and manipulation of data.
- To make students to understand the basics of algorithms.

**Outcomes:**

- Skill to analyze data and to determine appropriate data structure. Knowledge of various data structures and their implementations.
- Ability to implement algorithms to perform various operations on data structures.

#### **MODULE-I**

Introduction to Data Structure: Types of Data Structures - Linear & Non Linear Data Structures. Linear Data Structure - Arrays: Representation of arrays, Applications of arrays - Searching: Linear search and Binary Search. Stacks: Representation, Operations on stack, Implementation of stack using array, Application – Evaluation of Expression.

#### **MODULE-II**

Queues: Representation, Operations on Queues, Implementation of queues using array. List representations: implementing the list operations, Doubly linked list representation. Polynomial-representations.

#### **MODULE-III**

Non Linear Data Structures: Trees: Basic terminology, Binary tree, Representation, Traversal, Binary search tree.

#### **MODULE-IV**

Graph: Definition and Terminology – Representation, Traversal – Depth First and Breadth First traversal techniques.

#### **MODULE-V**

Introduction to Algorithms: Algorithm Design Techniques – Iterative techniques: Bubble Sort, Insertion Sort, Divide and Conquer : Merge Sort, Quick Sort

#### **TEXT BOOKS**

1. Ellis Horowitz, Sartaj Sahni and Anderson, “Fundamentals of Data Structure in C”, University Press, 2<sup>nd</sup> edition,2008.
2. T.H.Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein. “ Introduction to Algorithms, PHI, 3rd edition.2010.

**Paper Code: CSCA129**

L	T	P	C
0	0	4	2

**DATA STRUCTURES & ALGORITHMS LAB**

**LIST OF EXERCISES**

1. Linear Search
2. Binary Search
3. Implementation of Stack (Array Representation)
4. Implementation of Evaluation of Expression
5. Implementation of Queue (Array Representation)
6. Implementation of Singly Linked List
7. Implementation of tree traversal
8. Implementation of Graph traversal
9. Implementation of Bubble sort
10. Implementation of Insertion sort
11. Implementation of Quick sort
12. Implementation of Merge sort

## DISCIPLINE SPECIFIC CORE - 5

**Paper Code: CSCA231**

L	T	P	C
3	1	0	3

### **OBJECT ORIENTED PROGRAMMING USING JAVA**

**Prerequisite:** Basic knowledge of programming

**Objectives:**

- To learn the basic concepts of OOP
- To develop Java programs, Swing and Applets

**Outcomes:**

- Skill to write Java application programs using OOP principles and proper program structuring.
- Ability to create packages and interfaces. Ability to implement error handling techniques using exception handling.

#### **MODULE - I**

Concepts of OOP: Introduction OOP, Procedural Vs Object Oriented Programming, Principles of OOP, Benefits and applications of OOPS

#### **MODULE – II**

Introduction to java applications – Introduction to classes, objects, methods & Strings - Control statements – Arrays - constructor – function overloading & overriding - Inheritance - Polymorphism – Interface – package - exception handling

#### **MODULE – III**

GUI components –Overview of Swing components –Displaying Text and Images in a Window - Text Fields , Introduction to Event Handling- GUI Event Types and Listener Interfaces - layout manager, Swings Vs AWT

#### **MODULE – IV**

Files, Streams & I/O – Introduction – Files & Streams – Sequential Access Text Files

#### **MODULE – V**

Introduction to Multithreading , thread life cycle, thread priorities. Introduction – Applets & Java Web Start – applet life-cycle, HTML tags, a simple applet program

**Text Books:**

Paul Deital & Harvey Deital, "Java: How to Program", Pearson Education, 10th edition, 2015.



**Paper Code: CSCA237**

**OBJECT ORIENTED PROGRAMMING USING JAVA LAB**

**LIST OF EXERCISES**

L	T	P	C
0	0	4	2

1. Program to illustrate class and objects.
2. Program to illustrate control structures ( if-then, while, switch ).
3. Program to illustrate arrays (creation, initialization and processing).
4. Program to illustrate Constructor and its overloading.
5. Program to illustrate Inheritance and Packages.
6. Program to illustrate Interface and static methods.
7. Program to illustrate Exception Handling Technique with IO streams
8. Program to illustrate File handling technique.
9. Program to illustrate Swing Application
10. Program to illustrate applets using HTML

## DISCIPLINE SPECIFIC CORE - 6

**Paper Code: CSCA232**

L	T	P	C
3	0	0	3

### **COMPUTER NETWORKS**

**Pre-requisite:** Basic Knowledge of Computers

**Objectives:**

- To educate the functions of various OSI layers

**Outcomes:**

- Knowledge of OSI Layers in Computer Network.
- Ability to identify transmission media, types and topologies of network. Familiarization with the techniques of error detection and congestion control

#### **MODULE –I**

Introduction –Uses of Networks, Network hardware, Network Software, Network Reference Models, Example Networks.

#### **MODULE –II**

Physical Layer: Transmission Media: Guided, Wireless and Communication satellites – Multiplexing and Switching.

#### **MODULE –III**

Data Link Layer: data link Layer Design issues, Error Detection and correction, Simplex Stop-and-wait protocol, Sliding window protocols

#### **MODULE –IV**

Network Layer –Design issues, Routing Algorithms: Optimality Principle, Shortest path algorithm, flooding, link state routing, Hierarchical routing, Broadcast, Multicast. Congestion Control Algorithms.

#### **MODULE –V**

Transport Layer – Elements of Transport Protocols, Internet Transport protocols: UDP, TCP  
Application Layer – Domain Name System –Electronic Mail

#### **TEXT-BOOK**

1. Computer Networks A.S Tanenbaum, David J. Wetherall, Prentice Hall,5<sup>th</sup> edition, 2011  
(Chapters 1.1 – 1.5, 2.1-2.6, 3.1-3.4, 5.1 – 5.3, 6.1 -6.5, 7.1,7.2)

#### **REFERENCES**

1. Behouzan A. Forouzan, “Data Communication & Networking “, McGraw-Hill, 4<sup>th</sup> Edition
2. Data and Computer communications Seventh edition William Stallings PHI

**Paper Code: CSCA238**

**NETWORKS LAB**

L	T	P	C
0	0	4	2

**LIST OF EXERCISES:**

Implementation using JAVA or PYTHON

1. Text Message Sending and Receiving
2. File Transmission
3. Basic Chat Applications
4. Simple Mailing Application
5. Client Server Applications

## **DISCIPLINE SPECIFIC CORE – 7**

**Paper Code: CSCA233**

L	T	P	C
3	1	0	3

### **SOFTWARE ENGINEERING**

**Pre-requisite:** Basic knowledge of programming

**Objectives:**

- To gain knowledge about software development life cycle models, software design, implementation, and testing of software.
- To gain overall knowledge of how software is developed

**Outcomes:**

- Understanding of various methods or models for developing a software product.
- Ability to analyze existing system to gather requirements for proposed system. Skill to design and code a software.

#### **MODULE -I**

Introduction to Software Engineering – evolving role of software – defining software engineering – changing nature of software – software myths – terminologies – role of software development – software life cycle models – build & fix model – waterfall model – incremental model – evolutionary model – unified model – selection of a life cycle model.

#### **MODULE -II**

Software Cost Estimation: Software cost factors - Software Cost Estimation Techniques -Staffing-level Estimation -Estimating Software Maintenance Costs -The Software Requirements specification - Formal Specification Techniques - Languages and Processors for Requirements Specification.

#### **MODULE -III**

Software Design: Fundamental Design Concepts - Modules and Modularization Criteria -Design Notations –Design Techniques -Detailed Design Considerations -Real-Time and Distributed System Design -Test Plans -Milestones, walkthroughs, and Inspections.

#### **MODULE -IV**

Implementation issues: Structures Coding Techniques -Coding Style -Standards and Guidelines – Documentation guidelines -Type Checking -Scoping Rules –Concurrency Mechanisms.

#### **MODULE -V**

Software testing – strategic approach to software testing – terminologies – functional testing – structural testing – levels of testing – validation testing – the art of debugging – testing tools

#### **TEXT BOOK**

1. R. Fairley, “Software Engineering Concepts”, Tata McGraw Hill Edition -1997.
2. Roger S. Pressman, “Software Engineering: A Practitioner’s Approach”, McGraw Hill, 7<sup>th</sup> edition, 2010. (Module 1 & Module 5)

## DISCIPLE SPECIFIC CORE - 8

**Paper Code: CSCA234**

### **OPERATING SYSTEMS**

L	T	P	C
3	1	0	3

**Pre-requisite:** Knowledge of computers & computer organization

**Objectives:**

- To learn OS management functions.
- To learn Memory management, Processor management, Device Management and I/O Management

**Outcomes:**

- Understand how memory is utilized. Understand CPU scheduling algorithms to manage tasks.
- Knowledge of methods to prevention and recover from a system deadlock. Manages I/O devices.

#### **MODULE –I**

Operating Systems – Introduction – Basic Concepts and terminology – As OS Resource Manager – OS process view point – OS hierarchical and extended machine view – Memory management: Single contiguous memory allocation – Introduction to multiprogramming – Partitioned memory management.

#### **MODULE –II**

Memory management: Relocatable partitioned memory management – Paged memory management – Demand paged memory management – Segmented memory management – Segmented and Demand – Paged memory management – Swapping and Overlays.

#### **MODULE –III**

Processor management – State model – Job scheduling - Process scheduling – Multi Process system – Process Synchronization.

#### **MODULE –IV**

Device Management: Techniques for Device Management – Device Characteristics – Channels and Control Unit – Device Allocation – I/O Controller, Scheduler, Device Handler- Virtual Devices

#### **MODULE –V**

Information Management : A simple file system- General Model of a File System – Symbolic File System – Basic File System – Access Control Verification – Logical file system – Physical file system – Allocation strategy module.

#### **TEXT BOOK**

1. Stuart E. Madnick and John Donovan “Operating System”, TMH, Reprint 2008. (Chapter 1,3,4,5,6)

## DISCIPLINE SPECIFIC CORE – 9

**Paper Code: CSCA241**

L	T	P	C
3	1	0	3

### **PROGRAMMING WITH VISUAL BASIC**

**Pre-requisite:** Knowledge of any programming language

**Objectives:**

- To introduce students Event Driven Programming.
- To help the students to find solution to real life problems using Visual Basic.NET
- Students will learn about connecting and accessing databases.

**Outcomes:**

- Understand Forms, module, components, menu editor and its concepts. Usage of controls such as text box, buttons, checkbox etc and control them through codes.
- Ability to develop simple project with database using data source.

#### **MODULE I**

Introduction to .net framework -Visual Programming, VB.net- Features, IDE- Menu System, Toolbars, Code Designer, Solution Explorer, Object Browser, Toolbox, Class View Window, Properties Window, Server Explorer, Task List, Output Window, Command Window.

#### **MODULE II**

Data Types, Keywords, Declaring Variables and Constants, Operators, Conditional Statements- Looping Statement. Arrays- Static and Dynamic . Functions and Procedures- Built-In Functions- Mathematical and String Functions .Object Oriented Programming- Creating Classes, Objects, Properties, Methods, Events, Constructors and destructors, Exception Handling.

#### **MODULE III**

Properties, Events and Methods of Form, Label, TextBox, ListBox, Combo Box, RadioButton, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box, HScrollbar, VScrollbar, Group Box, ToolTip, Timer.

#### **MODULE IV**

Menus and toolbars- Menu Strip, Tool Strip, Status Strip, Built-In Dialog Boxes –Open File Dialogs, Save File Dialogs, Font Dialogs, Color Dialogs, Print Dialogs, InputBox, Msg Box, Interfacing With End user- Creating MDI Parent and Child.

#### **MODULE V**

Introduction to ADO.NET: ADO.Net Object Model, Data Provider, DataSet, Connecting to database, Reading data into a data cell: the dataset class, finding tables, rows, column values, column definition, adding, deleting and updating rows, writing updates back to data source.

**Text Books:**

1. Steven Holzner, Visual Basic .Net programming black book, Dreamtech Press , 2005
2. Jeffery R. Shapiro, Visual Basic .NET The Complete Reference, Tata McGraw Hills, 2002

**ReferenceBooks:**

1. Anne Bohem, Murach’s Beginning Visual basic .Net, Mike Murach & associates, 2002

## DISCIPLINE SPECIFIC CORE – 10

**Paper Code: CSCA242**

L	T	P	C
3	0	0	3

### **DATABASE MANAGEMENT SYSTEMS**

**Prerequisite:** Knowledge of data structures and file-handling

**Objectives:**

- To learn the fundamental concepts of Database management systems.
- To learn SQL commands to manage data and PL/SQL.

**Outcomes:**

- Understand data modeling and database development process. Construct and normalize conceptual data models.
- Implement a relational database into a database management system. Become proficient in using database query language.

#### **MODULE I**

Introduction to Database System- Objectives- Entities and Attributes – Data Models

#### **MODULE II**

Database Management Systems – Tree Structures – Plex Structures – Data Description Languages, Relational Databases – First, Second and Third Normal Form – Canonical Data structures - Varieties of data independences.

#### **MODULE III**

Basic SQL reports and commands – Datatypes and notations – String functions – Data functions – Unions – Joins – DDL – DML – DDL.

#### **MODULE IV**

PL/SQL: Approach and Advantages –PL/SQL Blocks -Variables-Manipulating Data – Triggers – Procedures, functions and packages - Exception handling

#### **MODULE V**

Locking Techniques – Time stamp ordering – Validation techniques - Granularity of data items – Recovery Concepts - log based Recovery – Database Security issues – Access Control – Statistical Database Security.

#### **TEXT BOOK**

1. James Martin, “Computer Database Organization”, 2<sup>nd</sup> edition- PHI, 2001

#### **REFERENCES**

1. Kevin Loney, George Koch , Oracle 9i The Complete Reference 2002 McGraw Hill
2. Henry F. Korth Abraham Silberschatz , Sudarsan “Database System Concepts “, Sixth Edition McGraw Hill International Edition

**Paper Code: CSCA247**

**VB AND DBMS LAB**

L	T	P	C
0	0	4	2

**LIST OF EXERCISES:**

1. Building simple applications.
2. Working with controls.
3. Application with multiple forms.
4. Application with dialogs
5. Application with Menus
6. Develop any TWO case studies listed below:
  - i) Students marksheet processing
  - ii) Electricity bill processing
  - iii) Bank Transaction
  - iv) Payroll processing
  - v) Gas booking and delivery
  - vi) Library information system.



## **DISCIPLINE SPECIFIC CORE - 11**

**Paper Code: CSCA351**

**WEB TECHNOLOGY**

L	T	P	C
3	0	0	3

**Pre-requisite:** Knowledge of Operating system, computer network, DBMS, and Java language.

**Objectives:**

- To gain knowledge in HTML and DHTML
- To design interactive web pages using Style sheets, Java-script and ASP.

**Outcomes:**

- Understand the various steps in designing Creative and dynamic website.
- Ability to write HTML, JavaScript, CSS and ASP.

### **MODULE – I**

Introduction to Internet – The World Wide Web – Web Browsers, Web Servers, Uniform Resource locators, Multipurpose Internet mail extensions. HTTP Request Message - HTTP Response Message.

### **MODULE – II**

Introduction to HTML – Elementary tags in HTML – List in HTML – Displaying Text in Lists – Using Ordered List – Using Unordered Lists- HTML Description Lists - Nested HTML Lists, Control List – combining List Types – Graphics and Image Formats – Graphics and HTML document- image and hyperlink anchors – Image maps – Tables – Frames – Forms.

### **MODULE – III**

Introduction to DHTML – Introduction to style sheets – Setting the default style sheet language – Inline style information – External Style sheets – Cascading Style sheets.

### **MODULE – IV**

Introduction to Java script - script tag, interactive data, DOM, A simple document, Add a form, Add a text input element, Add a button element, properties, methods and event handlers. Scripts and HTML.

### **MODULE – V**

Introduction to ASP – Database Management with ASP: Database access with ADO, working with ADO's Connection object, Using Command objects, Working with ADO's Recordset Object.

### **TEXT BOOKS**

1. Robert W. Sebesta, "Programming the World Wide Web", Addison Wesley, 2011 (Chapter 1 only)
2. Elisabeth Freeman and Eric Freeman, "Head First HTML with CSS & XHTML (Head First)", O'Reilly, 2005
3. A.Russell Jones, "Active Server Pages 3", BPB Publications, 2000
4. Danny Goodman, "JavaScript Bible", 7<sup>th</sup> edition, Wiley Publishing Inc, 2010, (Chapters 6,7 only)

**Paper Code: CSCA357**

**WEB TECHNOLOGYLAB**

L	T	P	C
0	0	4	2

**LIST OF EXERCISES**

1. Usage of Simple HTML commands, Graphics and image formats and hyperlinks
2. Usage of Tables, Frames, Forms, Background Graphics and Color
3. Simple application using HTML
4. Simple application using DHTML and Cascading style sheet
5. Simple application using Java script
6. Simple application using ASP

## DISCIPLINE SPECIFIC CORE – 12

**Paper Code: CSCA361**

L	T	P	C
3	0	0	3

### **VISUAL PROGRAMMING USING C#**

**Pre-Requisite:** Knowledge of any object oriented programming language

**Objectives:**

- Understand the foundations of CLR execution.
- Familiarize the object oriented aspects of C#.
- Design and develop applications on .NET

**Outcomes:**

- Understand programming in C# and able to write code for real life problems.
- Ability to connect to a database and create small projects.

#### **MODULE I**

Introduction to .Net Framework: an Overview - Framework Components - The Common Language Runtime (CLR) - .NET Base Class Library - Common Language Specification (CLS) - Common Type System (CTS) – Metadata and Assemblies - .NET Namespaces - MSIL - JIT Compilers.

#### **MODULE II**

Overview of C#: Program structure, Literals, Variables, Constants, Data Types, Operators, Statements and Expressions, Branching, Looping and loop control statements, Arrays, Strings manipulation, Boxing and Unboxing, Preprocessors, Namespaces

#### **MODULE III**

Object Oriented Programming in C# - Class, Objects, Encapsulation, Constructors and its types, Inheritance, Polymorphism. Interface, Abstract class, Operator overloading, Properties, Indexers, Delegates, Collections.

#### **MODULE IV:**

Errors and exception handling, File IO, Multithreading. Windows Forms and various controls, menu creation, SDI and MDI applications, Common Dialog Boxes. Events and event handling.

#### **MODULE V**

Introduction to ADO.NET - ADO.NET Architecture - Connection Object - Command Object - Dataset - Data Reader Object - Data Adapter Object – Data Table – Datagridview and Data Binding. Connecting to a database, and OLE DB data source, Adding, updating, deleting and viewing records in database.

#### **TEXT BOOKS:**

1. Herbert Schildt, The Complete Reference: C# 4.0, Tata McGraw Hill, 2012.
2. Christian Nagel et al. Professional C# 2012 with .NET 4.5, Wiley India, 2012.

#### **REFERENCE BOOKS:**

1. Andrew Troelsen , Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010
2. Ian Griffiths, Matthew Adams, Jesse Liberty, Programming C# 4.0, Sixth Edition, O'Reilly, 2010.

**Paper Code: CSCA368**

**VISUAL PROGRAMMING LAB**

L	T	P	C
0	0	4	2

**LIST OF EXERCISES**

1. Implement Classes and Objects, Inheritance & Polymorphism
2. Implement Interfaces, Operator Overloading, Delegates and Events
3. Implement Exception Handling & Multi-Threading
4. Create Console application & Window Applications.
5. Create programs using SDI & MDI
6. Create program using Database Controls
7. Develop any TWO case studies listed below:
  - I. Inventory Control
  - II. Retail Shop Management
  - III. Employee Information System
  - IV. Personal Assistant Program
  - V. Students Information System

## DISCIPLINE SPECIFIC CORE - 13

**Paper Code: CSCA362**

L	T	P	C
0	1	10	6

### **PROJECT**

#### **Objective**

The objective of the project is to motivate them to work in emerging/latest technologies, help the students to develop ability, to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories.

#### **Outcome**

The course outcome is the ability of the student to apply Software Development Cycle to develop a software module. The student will be able to use the techniques, skills and modern software engineering tools necessary for software development. Develop a software product along with its complete documentation.

The project is of 2 hours/week for one (semester VI) semester duration and a student is expected to do planning, analyzing, designing, coding, and implementing the project. The initiation of project should be with the project proposal. The synopsis approval will be given by the project guides.

The project proposal should include the following:

- Title
- Objectives
- Input and output
- Details of modules and process logic
- Limitations of the project
- Tools/platforms, Languages to be used
- Scope of future application

The project work should be either an individual one or a group of not more than three members and submit a project report at the end of the semester. The students shall defend their dissertation in front of experts during viva-voce examinations.

## **GENERAL ELECTIVE - PAPER I**

**Paper Code: CSCA125**

L	T	P	C
3	0	0	3

**MATHEMATICS FOR BUSINESS**

### **Objectives:**

- To enable students to learn and apply mathematics skills to a business setting.

### **Outcomes:**

- Ability to understand mathematics for business and real life setting
- Student will be able to write competitive exams

### **MODULE - I**

Ratio, Proportion and Percentage, Ratio- Definition, Continued Ratio, Inverse Ratio, Proportion, Continued Proportion, Direct Proportion, Inverse Proportion, Variation, Inverse Variation, Joint Variation, Percentage- Meaning and Computations of Percentages.

### **MODULE - II**

Profit and Loss-Terms and Formulae, Trade discount, Cash discount, Problems involving cost price, Selling Price, Trade discount and Cash Discount. Introduction to Commission and brokerage, Problems on Commission and brokerage.

### **MODULE - III**

Interest -Simple Interest, Compound interest (reducing balance & Flat Interest rate of interest), Equated Monthly Installments(EMI), Problems

### **MODULE - IV**

Matrices and Determinants (upto order 3 only)-Multivariable data, Definition of a Matrix, Types of Matrices, Algebra of Matrices, Determinants, Ad joint of a Matrix, Inverse of a Matrix via ad joint Matrix.

### **MODULE - V**

Linear Equations: Homogeneous System of Linear equations, Condition for Uniqueness for the homogeneous system, Solution of Non-homogeneous System of Linear equations (not more than three variables). Condition for existence and uniqueness of solution, Solution using inverse of the coefficient matrix.

### **TEXT BOOK**

1. Parshuram Ahire & Dr. Jayant Tatke, "Business Mathematics", Vision Publications, 2017

### **REFERENCE BOOKS:**

1. Business Mathematics by Dr. Amarnath Dikshit & Dr. Jinendra Kumar Jain.
2. Business Mathematics by V. K. Kapoor - Sultan chand & sons, Delhi

## **GENERAL ELECTIVE – PAPER II**

**Paper Code: CSCA235**

L	T	P	C
3	0	0	3

### **APPLIED STATISTICS**

#### **Objectives:**

- To learn the basics of statistics concepts
- To learn solving correlation and regression problems

#### **Outcomes:**

- Ability to understand and represent data
- Ability to analyze and interpret data.

#### **MODULE - I**

Diagrammatic and Graphic Presentation: General Rules for Constructing Diagrams, Types of Diagrams, One Dimensional or Bar Diagrams, Types of Bar Diagrams, Two-Dimensional Diagrams, Limitations of Pie Diagrams.

#### **MODULE - II**

Measures of Central Value: Arithmetic Mean: Calculation of Simple Arithmetic Mean-Individual Observations, Calculation of Arithmetic Mean-Discrete Series, Calculation of Arithmetic Mean-Continuous Series, Merits and Limitations of Arithmetic Mean.

Median: Calculation of Median-Individual Observations, Computation of Median-Discrete Series, Calculation of Median-Continuous Series, Merits and Limitations of Median

Mode :Calculation of Mode-Individual Observations, Calculation of Mode-Discrete Series, Calculation of Mode-Continuous Series, Merits and Limitations of Mode.

#### **MODULE - III**

Measures of Dispersion: Significance of Measuring Variation, Properties of a Good Measure of Variation, The Interquartile Range or the Quartile Deviation, Merits and Limitations, The Mean Deviation, Calculation of Mean Deviation, Calculation of Mean Deviation-Continuous Series, Merits and Limitations, The Standard Deviation, Difference Between Mean Deviation and Standard Deviation, Calculation of Standard Deviation, Merits and Limitations.

#### **MODULE - IV**

Correlation Analysis: Types of Correlation, Scatter Diagram Method, Merits and Limitations of the Method, Karl Pearson's Coefficient of Correlation, Direct Method of Finding Out Correlation Coefficient, Origin is made and Problems, Rank Correlation Coefficient, Merits and Limitations of the Rank Method.

#### **MODULE - V**

Regression Analysis: Uses of Regression Analysis, Difference Between Correlation and Regression Analysis, Regression Lines, Regression Equations, Regression Equation of Y on X, Regression Equation of X on Y and Problems

#### **TEXT BOOK**

S.P.GUPTA, "Statistical Methods", Sultan Chand & Sons, Educational Publishers, New Delhi, 2016

#### **REFERENCE BOOK:**

P.R.Vittal, "Mathematical Statistics", Margham Publications, 2016

## **GENERAL ELECTIVE - PAPER III**

**Paper Code: CSCA126**

L	T	P	C
3	0	0	3

### **DISCRETE MATHEMATICS**

#### **Objectives:**

- Ability model data sets as mathematical functions and solve.
- Ability to understand and model the discrete structures such as graphs and trees.

#### **Outcomes:**

- Acquire knowledge regarding the use of Discrete Mathematics in Computer Science.
- Acquire knowledge regarding relevant topics such as set Theory, basic logic, graphs and trees.

#### **MODULE –I**

Matrices – definition – special types of matrices – operations – symmetric matrices – skew symmetric matrices – Hermitian and skew Hermitian matrices – Inverse – Orthogonal matrices – Solutions of Simultaneous equations – Rank of a matrix – Eigen values and eigenvectors – Cayley Hamilton Theorem.

#### **MODULE –II**

Mathematical Logic – Connectives – Statement Forms – Paranthesis – Truth Table – Tautology and Contradiction/Logical Implications and equivalences – Disjunctive and Conjunctive normal forms.

#### **MODULE –III**

Sets – Relation – functions – Poset – Hasse Diagram – Lattice and its Properties Boolean Algebra – Properties – Karnaugh Map (Two, Three and Four Variables Only).

#### **MODULE –IV**

Graph Theory: Introduction – application of graphs – Finite and Infinite Graphs – Incidence and Degree – Isolated Vertex, Pendant Vertex and Null Graph. Paths and Circuits – Connected Graph, Disconnected Graphs and components – Euler Graphs – Operations on Graphs – Hamiltonian Paths and Circuits

#### **MODULE –V**

Trees and Fundamentals Circuits: Trees – Some properties of Trees – Pendant Vertices in a Tree, Distance and Centers in a Tree – Rooted and Binary Trees – On Counting Trees – Spanning Trees – Fundamental Circuits

#### **TEXT BOOKS**

1. Manicavachagom Pillay and others,” Algebra”,11th Revised edition. Vol II., S.V. Publications, (Module –1)
2. NarsinghDeo, “Graph Theory with applications to Engineering and ComputerScience”, PHI, 1997. (Module –4, 5)
3. Trembly&Manohar, “Discrete Mathematics for Computer Science”, TMH, 1997(Modules– 2, 3).



## GENERAL ELECTIVE –PAPER IV

**Paper Code: CSCA236**

L	T	P	C
3	0	0	3

### **OPERATIONS RESEARCH**

#### **Objectives:**

1. Ability to analyze the given data set using mathematical models.
2. Ability to represent the dataset and solve using techniques such as linear programming, Game theory, PERT and CPM.

#### **Outcomes:**

- Acquire knowledge to use OR methods for computation.
- Derive solutions for business problem using methods in OR.

#### **MODULE –I**

Introduction to Operations Research - Principal components of decision problems - phases of OR study.

#### **MODULE –II**

Linear Programming - graphical solution - simplex method including artificial variable technique - duality.

#### **MODULE –III**

Transportation and assignment models - Sequencing

#### **MODULE –IV**

Game theory - optimal solution of two-person zero-sum games - mixed strategies - graphical solution of (2 X n) and (m X 2) games - solution of (m X n) games by linear programming.

#### **MODULE – V**

PERT and CPM - network diagrams - determination of the floats and critical path - probability considerations in project scheduling.

#### **TEXT BOOKS**

1. Treatment as in Hamdy A.Taha “Operations Research - An introduction (III edition)”, chapters 1, 2, 3 (omit 3.4), 4 (omit 4.4, 4.5), 5 (omit 5.4), 11 (omit all sections except 11.4 only), 12 (omit 12.3,12.5).
2. R.L. Ackoff and M.W.Sasieni "Fundamentals of O.R.". (For Sequencing)

## DISCIPLINE SPECIFIC ELECTIVE

### SPECIALIZATION STREAM I (BUSINESS INTELLIGENCE) – PAPER I

**Paper Code: CSCA243**

L	T	P	C
3	1	2	4(3+1)

#### **DATA WAREHOUSING**

**Pre-requisite:** Knowledge of database management system.

#### **Objectives:**

- To learn the fundamentals of data warehouses
- To study the architecture, design, hardware and planning of a data warehouse.

#### **Outcomes:**

- Acquire knowledge in the fundamental concepts, benefits and problem areas associated with data warehousing. Understand the various architectures and main components of a data warehouse.
- Ability to design a data warehouse, and be able to address issues that arise when implementing a data warehouse.

#### **MODULE I**

Introduction: Data Warehouse-History, Difference between Database and Data Warehouse – Differences between OLTP Systems and Data Warehouse– working of Data warehouse –General stages of Data Warehouse– Need for Data warehouse – Advantages & Disadvantages– Steps to Implement Data Warehouse –Applications– Types.

#### **MODULE II**

Data Warehouse Architecture: Concepts and Components: Data warehouse Characteristics– Data Warehouse Architectures– Data warehouse Components: Data Warehouse DB, ETL, Metadata, Query Tools – ETL: Need, ETL Process: Extraction, Transformation, Loading, ETL Tools, ETL vs ELT. Data mart: need for data mart, its types, steps to implementing data mart, Advantages & Disadvantages.

#### **MODULE III**

Design aspects: Data Modeling –Need for Data Model - Types of Data Models: Conceptual Model, Logical Data Model, Model Advantages, OLAP: OLAP, Characteristics, Basic analytical operations of OLAP, Steps in the OLAP Creation Process, Advantages & Disadvantages.

#### **MODULE IV**

Hardware and operational design: server hardware, network hardware, Client hardware – Physical layout: parallel technology, Disk technology, Database layout, File systems – Security – introduction to Service level Agreement.

#### **MODULE V**

Planning and Development: Capacity planning – Estimating the load – Tuning the data warehouse – Assessing performance –Tuning the data load and queries – Testing data warehouse – Development of test plan – Testing the data base and operational environment.

#### **TEXT BOOKS:**

1. Sam Anahory & Dennis Murray, “Data Warehousing in the real world”, Pearson Education, 2008
2. Prabhu C.S.R, “Data Warehousing: Concepts, Techniques, Products and Applications”, PHI Learning, 3rd edition, 2009.

## DISCIPLINE SPECIFIC ELECTIVE – STREAM I – PAPER II

**Paper Code: CSCA352**

L	T	P	C
3	1	2	4(3+1)

### **DATA MINING**

**Prerequisite:** Knowledge of Data Warehouse.

#### **Objectives:**

- To understand the concepts of Data Mining.
- To learn about Classification, prediction and cluster analysis techniques.

#### **Outcomes:**

- Acquire knowledge to compare and contrast OLAP and data mining as techniques for extracting knowledge from a data warehouse.
- Implement data mining techniques like clustering, association rule and decision tree etc on the real data set.

#### **MODULE I**

Introduction to Data Mining: Definition of data mining - Stages of the Data Mining Process – Basic data types – Major building blocks – Scope of Data Mining – Data Mining working – Data Mining Architecture – Data Mining implementation process – Data Mining Techniques – Advantages & Disadvantages.

#### **MODULE II**

Data: Types of Data, Data quality, Data preprocessing- Measures of similarity and dissimilarity – Exploring data: summary statistics, visualization, OLAP and multi-dimensional data analysis.

#### **MODULE III**

Data preprocessing: Data preprocessing introduction, Data cleaning - Data integration - Data reduction – Data transformation and data Discretization.

#### **MODULE IV**

Classification: Problem definition - General approach - Decision tree induction - Rule based classifiers – nearest neighbor - Bayesian classifiers - Pattern Mining – Introduction- pattern mining in multilevel, multi-dimensional space - Frequent Pattern Mining Model.

#### **MODULE V**

Cluster analysis basic concepts and methods: Introduction – requirements for cluster analysis – Overview of clustering methods. Data mining Applications – Data Mining Tools

#### **TEXTBOOKS:**

1. Data Mining: Concepts and Techniques by Jiawei Han and Micheline Kamber, Elsevier, 2012.
2. Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach and Vipin Kumar, 2005.

## **DISCIPLINE SPECIFIC ELECTIVE – STREAM I – PAPER III**

**Paper Code: CSCA363**

**FOUNDATIONS OF DATA ANALYTICS**

L	T	P	C
3	1	2	4(3+1)

**Pre-requisite:** Knowledge of Data Mining.

**Objectives:**

- To learn to explore data, sample and model them
- To gain knowledge about Big Data and analyse them.

**Outcomes:**

- Understand need for big data and its associated methodologies
- Understand the various techniques to analyze and learn from data

**MODULE - I**

Introduction to Data Science: Definition of Data Science, Need for Data Science, components of data science - Data science process – Introduction to NoSQL.

**MODULE II**

Business Intelligence Systems Application and Development: BIG DATA Overview: Types, Characteristics, Architecture, BI vs Data Science - Data Analytics Life Cycle - Big Data Analytics: Methodology - Technologies – Advantages.

**MODULE III**

Big data Management - Operational Databases: importance of RDBMS in Big Data Environment, Non-Relational databases, key value pair database, document database, columnar database, graph database, spatial database

**MODULE - IV**

MapReduce Fundamentals: Tracing the Origins of MapReduce, Understanding the map Function, Adding the reduce Function, Putting map and reduce Together, Optimizing MapReduce Tasks.

**MODULE V**

Introduction to Machine Learning for Data Analysis: Introduction: Need, Types of ML learning algorithms: Supervised and Semi-supervised, Unsupervised, reinforcement.

**TEXT BOOKS:**

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, manning publications, 2016 (Chapter 1 to 3 for Module I & Module V)
2. “Data Science and Big Data Analytics”, EMC Education Service, Wiley. (Chapter 1 & Chapter 2 for module II)
3. Alan Nugent, Dr. Fern Halper, Marzia Kaufman, “Big Data for Dummies”, by Judith Hurwitz, , Wiley pub, 2013. (Chapter 7 & 8 for module III and IV)
4. Rudolph Russell, “Machine Learning Step-by-Step Guide To Implement Machine Learning algorithms with Python”, 2018. (Chapter I for module V)

## DISCIPLINE SPECIFIC ELECTIVE

### SPECIZATION STREAM II (ARTIFICIAL INTELLIGENCE) – PAPER I

**Paper Code: CSCA244**

L	T	P	C
3	1	2	4(3+1)

#### **ARTIFICIAL INTELLIGENCE**

**Pre-requisite:** Basic knowledge of algorithms.

#### **Objectives:**

- To study the concepts of Artificial Intelligence and Methods of solving problems using Artificial Intelligence

#### **Outcomes:**

- Understand concepts of artificial intelligence and underlying characteristics
- Learn various techniques of knowledge representation

#### **MODULE-I**

Introduction to Artificial Intelligence- definition - underlying Assumption - A.I Techniques - Space search - production system - control strategies - Heuristic search - problem characteristics - production system characteristics.

#### **MODULE-II**

Heuristic search techniques - Generate and test - Hill Climbing – best first search - problem reduction - Knowledge Representation issues: Representation and mapping - Approaches to Knowledge Representation - Issues in Knowledge Representation - Frame problem.

#### **MODULE-III**

Representing simple facts in logic - representing instance and Isa relationship- computable functions and predicates - resolution – frames - strong slot and filler structure Conceptual Dependency – scripts- advanced problem solving system.

#### **MODULE-IV**

Game playing - minimax search procedure - adding alpha beta cuts offs - additional refinements.

#### **MODULE-V**

Planning – An example Domain: the blocks world – components of planning system- goal-stack planning - Expert Systems: Definition of Expert Systems – Role of Expert Systems Knowledge Acquisition- example expert systems: MYCIN.

#### **TEXT BOOK:**

1. Artificial Intelligence - Elaine Rich, Kevin Knight, Shivasankar B.Nair –Third edition- McGraw Hill- 2017

#### **REFERENCE BOOK:**

1. Stuart Russel, Peter Norvig “AI – A Modern Approach”, 2<sup>nd</sup> edition, Pearson Education, 2007

## **DISCIPLINE SPECIFIC ELECTIVE – STREAM II – PAPER II**

**Paper Code: CSCA353**

### **MACHINE LEARNING TECHNIQUES**

L	T	P	C
3	1	2	4(3+1)

**Pre-requisite:** Knowledge of Artificial Intelligence.

**Objectives:**

- To understand Machine Learning Language and implementation algorithms.

**Outcomes:**

- Acquire knowledge about various types of machine learning algorithms
- Acquire knowledge to choose and evaluate various models and applications

#### **MODULE I**

Machine Learning Introduction: Definition –Uses of Machine learning - Languages of Machine Learning – Machine Learning life cycle - Defining the process – Data Processing.

#### **MODULE II**

Machine Learning algorithm types: Supervised & Semi-supervised, Unsupervised, Reinforcement - Process & Techniques: feature learning, sparse dictionary learning, anomaly detection, decision trees, association rules.

#### **MODULE III**

Modeling Methods: Steps in machine learning model development and deployment - Machine learning terminology for model building and validation. Machine learning model overview - Train, validation, and test data.

#### **MODULE IV**

Choosing and evaluating models: Mapping problems to machine learning - Modeling Methods: Classifying with Nearest Neighbors, Naive Bayes, Support vector, Regression, Logistic Regression, Tree based regression, K-Means Clustering , A priori algorithm, Frequent path.

#### **MODULE V**

Applications of Machine learning: Characteristics of machine language that drive digital business - Providing value to organizations using machine learning – Benefits of Machine learning in IT – Business strengths and challenges of Machine learning

**TEXT BOOKS:**

1. Jason Bell, “Machine Learning Hands-On for Developers and Technical Professionals”, Wiley publications, 2015 (Chapters 1 & 2 for Module I)
2. Rudolph Russell, “Machine Learning Step-by-Step Guide To Implement Machine Learning Algorithms with Python”, 2018 (Chapter I for Module II)
3. Pratap Dangeti, “Statistics for Machine Learning Build supervised, unsupervised, and reinforcement learning models using both Python and R”, 2017, Birmingham. (Chapter 1 for Module III)
4. Kim H. Pries Robert Dunnigan, “Big Data Analytics A Practical Guide for Managers”, , CRC Press, 2015 (chapter 5 for Module IV)
5. Carlton E. Sapp, “Preparing and architecting for machine learning”, Gartner Technical professional advice, 2017 (for module V)

## **DISCIPLINE SPECIFIC ELECTIVE – STREAM II – PAPER III**

**Paper Code: CSCA364**

L	T	P	C
3	1	2	4(3+1)

### **INTRODUCTION TO ROBOTICS**

**Prerequisites:** Knowledge in Artificial Intelligence.

**Objectives:**

- To learn about Robotic Automation Process.

**Outcomes**

- Acquire knowledge about Automated systems, their need, functioning and pros and cons
- Understand what is robot technology and how it is programmed

**MODULE I**

Introduction to Programmable Automation - The Manufacturing Process - Automation - Benefits of Automation - Automation Strategies.

**MODULE II**

Introduction to Computer Numerical Control (CNC) - Introduction to CNC Technology – CNC System Components - The Ten Steps of CNC Programming -Advantages and Disadvantages of CNC Technology.

**MODULE III**

Introduction to Robotics Technology - Industrial Robotics - Robot Hardware - Robot Applications - Robot Safety - Robot Selection Considerations.

**MODULE IV**

Robot Programming - Robot Programming Concepts - Programming Methods - Robot Programming Languages - Robot Program Development, Organization, and Structure - Robot Simulation.

**MODULE V**

Introduction to Programmable Logic Controllers (PLCs): Programmable Logic Control Overview - PLC Hardware Components - PLC Applications - Sensors and Actuators.

**TEXT BOOKS**

1. Daniel E. Kandrav, “Programmable Automation Technologies An Introduction to CNC, Robotics and PLCs”, P.E., Industrial Press Inc., New York. 2010 (chapters 1,3,4,6,7,8)
2. Mike Wilson, “Implementation of ROBOT SYSTEMS An introduction to robotics, automation, and successful systems integration in manufacturing”, BH, Elsevier.
3. John J. Craig, “Introduction to Robotics Mechanics and Control”, Third Edition, Prentice hall, Pearson Education International.

## DISCIPLINE SPECIFIC ELECTIVE

### SPECIALIZATION STREAM III (INFORMATION SECURITY) – PAPER I

**Paper Code: CSCA245**

L	T	P	C
3	1	2	4(3+1)

#### **INFORMATION SECURITY**

**Prerequisite:** Basic knowledge of computers

#### **Objectives:**

- To provide an understanding of principal concepts, major issues, technologies and basic approaches in information security.

#### **Outcomes:**

- Understand the history and the need for information security.
- Acquire knowledge about legal and ethical aspects of information security and risk control strategies.

#### **MODULE – I**

Introduction – History of Information Security – defining security – CNSS Security Model – Components of an Information Security – Approaches to Information Security Implementation – System Development Life Cycle.

#### **MODULE – II**

The Need for Security – Introduction - Business Needs First – Threats – Attacks - Secure Software Development

#### **MODULE – III**

Legal, Ethical, and Professional Issues in Information Security - Law and Ethics in Information Security - Relevant U.S. Laws - International Laws and Legal Bodies.

#### **MODULE – IV**

Ethics and Information Security - Codes of Ethics and Professional Organizations - Risk Management - Introduction - An Overview of Risk Management – Risk Identification - Risk Assessment.

#### **MODULE – V**

Risk Control Strategies - Selecting a Risk Control Strategy - Quantitative Versus Qualitative Risk Control Practices - Risk Management Discussion Points

#### **TEXT BOOK:**

1. Michael E. Whitman & Herbert J. Mattord, “Principles of Information Security”, Course Technology, Cengage Learning, 4<sup>th</sup>edition, 2011. (Chapters 1,2,3,4,5)



## DISCIPLINE SPECIFIC ELECTIVE – STREAM III – PAPER II

**Paper Code: CSCA354**

**NETWORK SECURITY**

L	T	P	C
3	1	2	4(3+1)

**Prerequisite:** Knowledge of & computer networks.

**Objectives:**

- To learn Computer Network Vulnerabilities
- To learn how to deal with Network Security Challenges and counter measures

**Outcomes:**

- familiarization with the benefits and issues regarding Network Security
- Ability to understand the threat and deal with vulnerabilities

**MODULE – I**

Computer Network Fundamentals - Introduction - Computer Network Models- Computer Network Types - Data Communication Media Technology - Network Topology -Network Connectivity and Protocol - Network Services.

**MODULE – II**

Understanding Network Security - Defining Network Security - Security Services - Security Standards - Elements of Security - Security Threats to Computer Networks- Sources of Security Threats - Security Threat Motives - Security Threat Management - Security Threat Correlation

**MODULE – III**

Security threats to Computer Networks: Sources of security threats, Threat motives, Security threat management. Computer Network Vulnerabilities - Sources of Vulnerabilities- Vulnerability Assessment.

**MODULE – IV**

Dealing with Network Security Challenges - Access Rights - Access Control Systems – Authorization - Types of Authorization Systems – Authorization principles, Authorisation granularity.

**MODULE – V**

Authentication - Multiple Factors and Effectiveness of Authentication - Authentication Elements Types of Authentication - Authentication Methods Developing an Authentication Policy. Introduction to firewalls - Types of Firewalls.

**TEXT BOOK**

1. Kizza& Joseph Migga, “Computer Network Security”, Springer,2005. (Chapter 1,2,3,4,8,9)

**REFERENCES**

1. William Stallings, “Cryptography & Network Security”, Pearson Education, 4<sup>th</sup> edition, 2010.

## **DISCIPLINE SPECIFIC ELECTIVE – STREAM III – PAPER III**

**Paper Code: CSCA365**

L	T	P	C
3	1	2	4(3+1)

**ETHICAL HACKING**

**Pre-requisite:** Knowledge of Networks

**Objectives:**

- Understanding need for Ethical Hacking
- Understanding the procedure for hacking and malware attacks

**Outcomes:**

- Acquire knowledge of ethical hacking, need and procedure.
- Understand various malwares and hacking methodologies.

**MODULE I**

Introduction to Ethical Hacking : Defining hacker, Ethical Hacking, Understanding the Need to Hack Your Own Systems, Understanding the Dangers Your Systems Face, Nontechnical attacks Network-infrastructure attacks, Operating system attacks, Application and other specialized attacks, Obeying the Ethical hacking Commandments, Working ethically Respecting privacy Not crashing your systems, The Ethical hacking Process: Formulating your plan, Selecting tools Executing the plan, Evaluating results.

**MODULE II**

Cracking the Hacker Mindset: Determining who you're up against, who hacks, why hackers hack. Planning and Performing Attacks, Maintaining Anonymity, Developing Your Ethical Hacking Plan, Getting Your Plan Approved, Establishing Your Goals, Determining What Systems to Hack, Creating Testing Standards: Timing, Specific tests, Blind versus knowledge assessments, Location, Reacting to major exploits that you find, Silly assumptions, Selecting Tools.

**MODULE III**

Hacking Methodology : Setting the Stage, Seeing What Others See, Gathering public information, Mapping the network, Scanning Systems, Hosts, Modems and open ports, Determining What's Running on Open Ports, Assessing Vulnerabilities, Penetrating the System

**MODULE IV**

Putting Ethical Hacking in Motion: Social Engineering, Why Hackers Use Social Engineering, Understanding the Implications, Performing Social-Engineering Attacks: Fishing for information, Building trust, exploiting the relationship. Social-Engineering Countermeasures: Policies, awareness.

**MODULE V**

Implications of Malware Attacks, Types of Malware: Trojan horses, Viruses, Worms, Rootkits, Spyware, Built-in programming interfaces, Logic bombs Security tools, How Malware Propagates: Automation, E-mail, Hacker backdoors, Testing: Vulnerable malware ports, Manual assessment, Antivirus software testing, Network scanning, Behavioral-analysis tools, Malware Countermeasures: General system administration, E-mails, Files.

**TEXT BOOK**

1. Kevin Beaver, "Hacking for Dummies", Wiley Publishing Inc, 2004  
(Chapters 1,2,3,4,5,14)

## DISCIPLE SPECIFIC ELECTIVE

### SPECIALIZATION STREAM IV (WIRELESS COMMUNICATIONS)-PAPER I

**Paper Code: CSCA246**

L	T	P	C
3	1	2	4(3+1)

**DATA COMMUNICATION TECHNOLOGIES**

**Pre-Requisite:** Knowledge of Networks

**Objectives:**

- To know about Data communication model, data transmission concepts, media, encoding techniques
- To understand the concepts Multiplexing and ATM

**Outcomes:**

- Understand the various communication models, concepts and terminologies.
- Analog and Digital signaling and coding techniques

#### **MODULE –I**

Data Communication: A Communications Model, Data Communications, Networks, The Internet Protocol Architecture, TCP/IP, and Internet-Based Applications, The Need for a Protocol Architecture, The TCP/IP Protocol Architecture, The OSI Model, Standardization within a Protocol Architecture.

#### **MODULE –II**

Data Transmission-Concepts and Terminology-Analog and Digital Data Transmission - Transmission Impairments - Channel Capacity-Decibels and Signal Strength -Transmission Media : Guided Transmission Media - Wireless Transmission - Wireless Propagation -Line-of-Sight Transmission.

#### **MODULE –III**

Signal Encoding Techniques - Digital Data, Digital Signals - Digital Data, Analog Signals - Analog Data, Digital Signals - Analog Data, Analog Signals -Digital Data Communication Techniques : Asynchronous and Synchronous Transmission

#### **MODULE –IV**

Multiplexing - Frequency-Division Multiplexing - Synchronous Time-Division Multiplexing - Statistical Time Division Multiplexing - Asymmetric Digital Subscriber Line- Spread Spectrum - The Concept of Spread Spectrum - Frequency Hopping Spread Spectrum - Direct Sequence Spread Spectrum - Code-Division Multiple Access.

#### **MODULE –V**

Circuit Switching and Packet Switching - Switched Communications Networks - Circuit Switching Networks - Circuit Switching Concepts - Packet-Switching Principles.

#### **TEXT BOOKS**

1. William Stallings, “Data and Computer Communications” 8<sup>th</sup> edition, Pearson, 2007. (Chapters 1-10)

## DISCIPLINE SPECIFIC ELECTIVE – STREAM IV – PAPER II

**Paper Code: CSCA355**

L	T	P	C
3	1	2	4(3+1)

### **INTRODUCTION TO WIRELESS COMMUNICATIONS**

**Pre-Requisite:** Knowledge of Computer Networks.

**Objectives:**

- To understand the concepts wireless communication Technology
- To understand the concepts of wireless, cordless, Wi-Fi, Bluetooth.

**Outcomes:**

- Acquire knowledge about the various wireless communication technologies.
- Understand the working of state of the art technologies such as mobile and WLANs

#### **MODULE –I**

Wireless Communication Technology- Antennas and Propagation- Antennas, Propagation Modes, Line-of-Sight Transmission, Fading in the Mobile Environment. Signal Encoding Techniques- Signal Encoding Criteria, Digital Data- Analog Signals, Analog Data-Analog Signals, Analog Data-Digital Signals.

#### **MODULE –II**

Wireless Networking - Satellite Communications- Satellite Parameters and Configurations, Capacity Allocation-Frequency Division, Capacity Allocation-Time Division Cellular Wireless Networks- Principles of Cellular Networks, First-Generation Analog, Second-Generation - TDMA, CDMA, Third-Generation Systems

#### **MODULE –III**

Cordless Systems and Wireless Local Loop- Cordless Systems, Wireless Local Loop –WiMax and IEEE 802.16 broadband wireless access standards

#### **MODULE –IV**

Mobile IP : Introduction, operation of Mobile IP, Mobile IP terminologies, Wireless Access Protocols: Introduction, Architecture overview, Wireless application environment

#### **MODULE –V**

Wireless LAN technology: wireless LAN- application, requirements, Technology: Infrared, spread spectrum, Narrowband microwave (radio), Introduction Bluetooth Technologies (Only Overview).

#### **TEXT BOOKS**

1. William Stallings, “Wireless Communications and Networks” 2<sup>nd</sup> edition, Pearson Prentice Hall, 2005. (Chapters 5, 6, 7, 9, 10,11,12, 13, 15.1)

## DISCIPLINE SPECIFIC ELECTIVE – STREAM IV – PAPER III

**Paper Code: CSCA366**

L	T	P	C
3	1	2	4(3+1)

**INTERNET OF THINGS**

**Pre-Requisite:** Knowledge in Wireless and mobile communication Technologies.

**Objectives:**

- Vision and Introduction to IoT.
- Understand IoT Market perspective and state of the art – IoT Architecture.

**Outcomes:**

- Understand the machine to machine communication technology in both technical and market perspective
- Acquire knowledge about how they are applied to various business scenarios

**MODULE- I**

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, Differing Characteristics: Comparison between M2M and IoT.

**MODULE- II**

M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

**MODULE- III**

An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, Standards.

**MODULE- IV**

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management: Introduction, Managing M2M Data, Considerations.

**MODULE- V**

Business processes in IoT : Introduction, IoT Integration with enterprise system, Distributed business process in IoT - Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management,

**TEXT BOOK**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1<sup>st</sup> Edition, Academic Press, 2014. Chapters(1,2,3,4,5)

**DISCIPLINE SPECIFIC ELECTIVE**

**SPECIALIZATION STREAM V(SOFTWARE ENGINEERING) – PAPER I**

**Paper Code: CSCA247**

L	T	P	C
3	1	2	4(3+1)

**IT PROJECT MANAGEMENT**

**Pre-Requisite:** Knowledge in Software Engineering

**Objectives:**

- To understand the Nature of IT projects
- To design Project plans and write Project proposals and understand the Project Development Life Cycle.

**Outcomes:**

- Acquire knowledge of the Project management process and need for such a management strategy
- Understand how to be a stakeholder in a project and know the responsibilities

**MODULE –I**

The Nature of Information Technology Projects – Conceptualizing the IT Project - Developing the Project Charter and Baseline Project Plan

**MODULE –II**

The Human Side of Project Management - Defining and Managing Project Scope

**MODULE –III**

The Work Breakdown Structure and Project Estimation - The Project Schedule and Budget - Managing Project Risk

**MODULE –IV**

Project Communication, Tracking and Reporting– IT Project Quality Management

**MODULE –V**

Managing Organizational Change, Resistance and Conflict – Project Implementation, Closure and Evaluation.

**TEXT BOOK**

1. Jack T.Marchewka, “Information Technology and Project Management”, John Wiley & sons P.Ltd, 2003.Chapter(1-12).

## DISCIPLINE SPECIFIC ELECTIVE – STREAM V – PAPER II

**Paper Code: CSCA356**

L	T	P	C
3	1	2	4(3+1)

**SOFTWARE TESTING**

**PRE-REQUISITE:** Knowledge in Software Engineering.

**Objectives:**

- To understand the Concepts of Software Testing.
- Introducing about various Testing Tools.

**Outcomes:**

- Understand the problems of defects and need of Testing
- Acquire knowledge about various testing strategies that are used in the industries to test their products

**MODULE – I**

Objectives of Testing - The Psychology of Testing – Economics of Testing – Software Testing Principles– Testing as a phase of SDLC- Software testing life cycle.

**MODULE – II**

Developing a test case: Testing Strategies – White Box Testing Techniques: Statement Coverage – Branch Coverage - Condition Coverage – Multiple Condition Coverage – Data flow Coverage- loop coverage. Black Box Testing Techniques: Boundary Value Analysis – Decision tables - Equivalence Partitioning - State based or graph based testing.

**MODULE- III**

Levels of Testing: Unit Testing – Integration Testing: Top down integration and bottom up integration – System Testing: overview – functional Vs Non-functional testing – Functional testing: Design Verification, Business vertical testing, deployment testing and Beta Testing. Non-functional Testing: Scalability testing, reliability testing, stress testing and inter-operability testing - Acceptance testing.

**MODULE - IV**

Regression Testing: Types- smoke test – criteria for selecting the test case – classifying test case – selecting test case – resetting the test case for regression testing – concluding the results – best practices.

**MODULE - V**

Software Test Automation: Approaches to Automation: partial automation, full automation- Choosing the right tool - Challenges in software test automation.

**Text Books**

1. Glenford J. Myers, Correy Sandler et. el, “The Art of Software Testing”, John Wiley & Sons, 2011. (Chapter 1 for module 1)
2. Srinivasan Desikan, Gopaldaswamy Ramesh, “Software Testing Principles and Practices”, Pearson Education, 2008. (Chapters 3,4,5,6,8,16.8,16.10 for modules 2, 3,4,5)

## DISCIPLINE SPECIFIC ELECTIVE – STREAM V – PAPER II

**Paper Code: CSCA367**

L	T	P	C
3	1	2	4(3+1)

### **SOFTWARE QUALITY MANAGEMENT**

**Prerequisite:** Knowledge of software engineering

#### **Objectives**

- To learn how to apply quality assurance tools & techniques
- To learn about standards and certifications

#### **Outcomes:**

- Able to understand the importance of quality and standards
- Understand various models of dealing with software quality

#### **MODULE - I**

Introduction, Environment, Characteristics, tasks and Goals, Software Quality Challenge - Software Quality requirements, factors: McCall's factor model, - Components of the Software Quality Assurance System : SQA Architecture, Pre-Project Components –Software PLC components.

#### **MODULE - II**

Integrating Quality Activities in the Project Life Cycle – Reviews - Assuring the Quality of Software Maintenance components - Case Tools and their effect on Software Quality.

#### **MODULE - III**

Software Quality Infrastructure Components - Procedures and Work Instructions – Staff Training and Certification - Software Configuration Management - Documentation Control.

#### **MODULE - IV**

Software Quality Management Components - Project Progress Control - components of project progress control- Progress control of internal projects and external participants- Implementation of project progress control

#### **MODULE - V**

Software Quality Metrics - Objectives of quality measurement- Classification - Product metrics – Implementation – limitation; scope of quality management standards: ISO 9000 family, CMM and CMMI.

#### **REFERENCES**

1. Daniel Galin, “Software Quality Assurance: From Theory to Implementation” - Pearson Addison-Wesley,2012.
2. Kshirasagar Naik and Priyadarshi Tripathy, “Software Testing and Quality Assurance”, John Wiley,2008.
3. Allen Gilles, “Software quality: Theory and management”, 2<sup>nd</sup>edition, CengageLearning, 2003.



## OPEN ELECTIVES

### OPEN ELECTIVE - PAPER I

**Paper Code: CSCA701**

L	T	P	C
3	0	0	3

**BUSINESS COMMUNICATION**

**Pre-requisite:** Basic knowledge in English.

**Objectives:**

- To understand and learn to communicate effectively
- Learn to write business reports and letters

**Outcomes:**

- Understand the importance of communication and able to communicate business deals verbally and non-verbally
- Acquire knowledge to write efficient business reports and equip to appear for interviews

**MODULE I**

The fact and meaning of communication: the need for communication, the communication process, interpersonal communication, business communication, characteristics of business communication, many meaning of communication; direct communication, non-direct of written communication, non-method of communication, non-verbal communication, visual communication, audio-visual communication, Tele-communication.

**MODULE II**

Objectives of communication process, types of communication-internal and external communication, formal and informal channels, the grapevine, internal communication networks, downward communication, upward communication, horizontal communication, barriers to communication and how to handle them.

**MODULE III**

Public relations advertising- concepts and types, interviews: types and techniques, meetings, committees, conference and communication problems.

**MODULE IV**

Business reports, memoranda and representation, business correspondence: theory principles of business correspondence, parts of a letter, forms / formats of letters.

**MODULE V**

Business correspondence in practice- applications, reference, testimonials, appointments, confirmation, promotion, termination, resignation enquiries and replies, orders and acknowledgements, circulars, public speaking, precise writing.

**TEXT BOOK**

1. Rajendra Pal & J.S. Korlahalli, “Essentials of Business Communications”, Sultan Chand& Sons, 2009
2. M.K. Sehgal, Vandana Khetarpal, “ Business Communication”, Excel books, 2008

## OPEN ELECTIVE – PAPER II

**Paper Code: CSCA702**

L	T	P	C
3	0	0	3

### **IT ENABLED SERVICES**

**Prerequisite:** Knowledge of Information Technology

**Objective:**

- To understand importance of IT enabled services.
- To develop the ability to integrate various resources for optimization in the industry as well as for strategic utilization of IT enabled services and functions.

**Outcomes:**

- Understand the various IT business openings and strategies
- Acquire knowledge about various business models such as outsourcing

#### **MODULE - I**

Business Strategy: Challenges and Opportunities For IT - Business Strategy: Challenges and Opportunities in the Globalized, Interconnected, Convergent World, Establish Principles before Practice. IT Strategy- Application Strategy, Technology Strategy for IT, IT Management Strategy: Developing IT Strategy for Competitive Advantage, Stages of IT Strategy Development and Implementation, Challenges of IT and Business Strategy Alignment, Inhibitors of Business and IT Strategy Alignment, Three-D Framework for Business and IT Strategy Alignment.

#### **MODULE – II**

Strategic IT Planning - Business Implications for IT Strategic and Planning, Strategic IT Planning Motivations, SITP Process: Prevalent Planning Approaches, Difficulties in Developing and Executing SITP, Best Practices for Achieving Good SITP, SITP Approaches- Prevalent Researches.

#### **MODULE - III**

Enterprise IT Architecture – Challenges of EITA, Defining EITA, Need for EITA Study, Contents of a Typical Enterprise IT Architecture, Standard for Enterprise IT Architecture.

#### **MODULE - IV**

IT Application strategy: Introduction, Need, COTS, COTS package selection life cycle, COTS implementation strategy, Post implementation support and management.

#### **MODULE – V**

IT sourcing strategy: Introduction, Imperatives for outsourcing, motivation and need to outsource, Outsourcing and associated risk, IT management layers and considerations for outsourcing, strategic vs generic sourcing, Business process outsourcing, process to Succeed Outsourcing, contract management and governance.

**TEXT BOOK:**

1. Sanjiva Shankar Dubey, “ IT strategy and Management”, PHI, fifth edition, 2016 (Chapters 1,2,4,5,6,10)

## OPEN ELECTIVE – PAPER III

**Paper Code: CSCA703**

### **TOTAL QUALITY MANAGEMENT**

L	T	P	C
3	0	0	3

**Prerequisite:** Knowledge of Software Engineering and Software Quality Assurance.

#### **Objectives:**

- To learn how to understand the customer's perception and to satisfy the customer
- To understand process capability and Reliability concepts

#### **Outcome:**

- Understand the importance of quality from the customer perspective and translate to requirements
- Understand the significance of statistical tool in Quality

#### **MODULE I**

Quality – vision, mission and policy statements. Customer Focus – customer perception of quality, Translating needs into requirements, customer retention, Dimensions of product and service quality, Cost of quality.

#### **MODULE II**

Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio. Concepts of Quality circle, Japanese 5S principles and 8D methodology.

#### **MODULE III**

Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed. Process capability – meaning, significance and measurement – Six sigma - concepts of process capability. Reliability concepts – definitions, reliability in series and parallel, and product life characteristics curve. Total productive maintenance (TMP), Terotechnology. Business process Improvement (BPI) – principles, applications, reengineering process, benefits and limitations.

#### **MODULE IV**

Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven Tools (old & new). Bench marking and POKA YOKE.

#### **MODULE V**

Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements. Quality Audits. TQM culture, Leadership – quality council, employee involvement, motivation, empowerment, recognition and reward - TQM framework, benefits, awareness and obstacles.

#### **TEXT BOOKS**

1. Dale H.Besterfield, Carol Besterfield – Michna, Glen H. Besterfield, Mary Besterfield – Sacre, Hermant – Urdhwareshe, Rashmi Urdhwareshe, Total Quality Management, Revised Third edition, Pearson Education, 2011
2. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition 2002.

## OPEN ELECTIVE – PAPER IV

**Paper Code: CSCA704**

L	T	P	C
3	0	0	3

### **INTRODUCTION TO E-BUSINESS**

**Pre-requisite:** Basic knowledge of Information Technology

**Objectives:**

- This course introduces students to various aspects and models fore-business.
- At the end of the course, students should have an understanding of the impacts which e-business is having on society, markets and commerce.

**Outcomes:**

- Understand the various E-Business solutions available today such as E-Commerce and its mechanisms
- Acquire knowledge from e-governance to e-learning

#### **MODULE I**

Introduction E-Commerce (EC)- Definition and concept, EC Framework, Classification based on transaction, application, History–Digital Revolution, Business Environment, EC Business models: Structure, typical EC business models, Benefits and Limitation of EC.

#### **MODULE II**

EC mechanisms – E-Marketplaces: Components, Types, Mechanisms, Merchant Solutions, Auctions, Bartering and negotiating online, EC applications: Internet marketing and B2C electronic retailing: E-Tailing business models.

#### **MODULE III**

Online Travel and Tourism - Employment and Job Market Online - Online Real Estate - Online Publishing and e-Books Banking and Personal Finance Online - On-Demand Delivery Systems and E-Grocers - Online Delivery of products, Digital items, Entertainment and Gaming, B2B E-Commerce: Concepts, Characteristics, and Models

#### **MODULE IV**

From E-Government to E-Learning, Collaborative Commerce and C2C Commerce: E -Government- Definition and scope –G2C, G2B, G2G, Efficiency and effectiveness, Implementation of E-Government Services. E-Learning, E-Training and E-books: Definition- Benefits and drawbacks - Distance learning and Online Universities, Online corporate training, E-Books.

#### **MODULE V**

E-Commerce security, fraud issue and protection: Basic security issues, Technical malware attack methods: Virus to DoS, Nontechnical attack methods: Phishing to spam.

#### **TEXT BOOK**

1. Electronic Commerce: A Managerial Perspective, Turban, E. et al., Prentice Hall 2008. Chapters(1.1,1.2,1.3,1.7,1.8,2.1,2.2,2.5,3.2,3.1-3.7, 4.1, 5.1,5.2,10.1-10.4)

## OPEN ELECTIVE – PAPER V

**Paper Code: CSCA705**

L	T	P	C
3	0	0	3

### **FUNDAMENTALS OF ACCOUNTANCY**

**Pre-requisites:** Basic knowledge in mathematics

**Objectives:**

- To understand the basic Accountancy.
- To understand concepts of cash maintenance and Cost Accounting.

**Outcomes:**

- Acquire knowledge about basic account for maintaining record in a company
- Understand to manage profit and loss and trading accounts so that the student can maintain an account register

**MODULE -I**

Accounting – Introduction-Meaning-Accounting and book keeping distinguished-objectives of accounting-Branches of accounting-accounting concepts and conventions-accounting standards in India-systems of Accounting

**MODULE - II**

Double entry system-personal accounts, real accounts, nominal accounts-journal-ledger- preparation of trial balance-rectification of errors.

**MODULE –III**

Subsidiary books including cash book, bank Reconciliation statement

**MODULE –IV**

Preparation of trading account- preparation of profit and loss account and balance sheet- Final accounts with adjustments

**MODULE –V**

Basics of cost Accounting – Basic Concepts- Elements of cost – prime cost – works cost – cost of production – concept of inventory – reorder level – minimum level – maximum level – average level – safety stock.

**TEXT BOOKS**

1. S.N. Maheswari, “Advanced Accountancy Vol I”, Vikas Publishing, 2009
2. R.L. Gupta, “Advanced accounting”, S. Chand & Co. New Delhi, 2010
3. Pillai and Baghawati, “Cost Accounting”, 2010
4. Jam and Narang, “Cost Accounting”, Kalyani Publications

## OPEN ELECTIVE – PAPER VI

**Paper Code: CSCA706**

L	T	P	C
3	0	0	3

### **PRINCIPLES OF MANAGEMENT**

**Pre-requisites:** No specific pre-requisite

#### **Objectives:**

- To understand the importance and functions of management
- To understand the purpose of planning and leadership

#### **Outcomes:**

- Understand the need for management and learn the nuances of management.
- Acquire knowledge about various form of organizations, their structure and scope

#### **MODULE –I**

Meaning, Definition and importance of Management-Functions of a Manager-Management process- Role of a Manager-Social responsibility of Management-Co-Ordination-Meaning and scope requirements of effective co-ordination-problems in co-ordination.

#### **MODULE –II**

Meaning and purpose of planning – steps in planning Process-Limitations-Types of plans, objectives, Strategies, policies, procedures, programmes, management by objectives (MBO) – Decision making- Types of decisions-process of decision making-difficulties in decision making

#### **MODULE –III**

Nature and purpose of organizations-different forms of organizations-merits and demerits – linear and staff concepts- organisational charts- departmentations - bases for departmentation - product, function and territory-span of management

#### **MODULE –IV**

Authority-responsibility-accountability-delegation of authority-principles of delegation-unity of command – centralization and decentralization –advantages and disadvantages

#### **MODULE –V**

Nature and scope of direction-motivation meaning-major theories of motivation – Maslow’s theory - Herberg’s two factor Theory-Leadership Styles-Nature and purpose of controlling

#### **TEXT BOOK**

- 1.Kathiresan and Radha, “ Business Management”, Bhavani publications, Chennai,2004

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA801**  
**DESKTOP PUBLISHING TOOLS**

L	T	P	C
0	1	3	2

**Prerequisites:** Basic knowledge of computers

**Objectives:**

- To practically learn to design using DTP tools

**Outcomes:**

- Student will be able to work with editing tools such as Adobe PageMaker, coreldraw and Photoshop

**MODULE – I**

Adobe PageMaker: Creating and opening publications, using tool box, working with palettes, text and graphics, saving and closing publication, ruler guides, creating columns, creating styles. Adding Graphics to your Document, Adding lines, Shapes, changing Shape Line and fill, Creating Drop-Shadow, Boxes, Text wrap, Changing page maker Options: Adjusting Margins, Setting and Adjusting Columns, Setting Unequal Width Columns, Creating headers and Footers, Creating Graphics in page maker, Rotating Text, Skewing and Mirroring objects with Control Palette. Importing Graphics into page maker: Placing, Sizing, aligning Graphics, Cropping Graphics. Introduction to Using layers.

**MODULE – II**

CorelDRAW: Introduction-Creating A New File - Title Bar-Menu Bar - Work Area - Property Bar - Colour Palette – Toolbox - Status Bar - Drawing Figures: Drawing Toolbox – Selecting, Resizing, Moving an Object - Changing the Shape - Combining Two Objects –Skewing - Welding the Objects – Blending. Media Tool-Rotating an Object – Grouping - Fill Tool Fly Out – Filling - Spray Mode. Text tool - Entering Artistic Text - Entering Paragraph Text-Converting Text-Formatting Text-Changing the Font Size-Arranging Objects-Ordering The Objects-Changing the Font-Bullets-Decorating the Text-Webdings. Image : Bitmap Images-Vector Image-Resizing-Rotating-Skewing-Moving-Cropping-Importing.

**MODULE – III**

Adobe Photoshop: Image Modifications, Color Modifications, Basic Tools, Selection Tools, Drawing and Coloring Tools, Advanced Tools, Text Tools, Tools Presets, Brush Presets Color and Shapes, Making Selections with Different Tools, Modifying an Existing Selection, Saving and Loading Selections, Working with Layers Layer Options, Layer Effects, Mask Types Modifying Masks, Filters and Effects, Additional Filters

**Text Book**

1. “Adobe Pagemaker: A classroom in a book”, Adobe, 2002
2. Gary David Bouton, “CorelDRAW: The official guide”, 12<sup>th</sup> edition, 2017
3. Andrew Faulkner, “Adobe Photoshop cc: classroom in a book”, Adobe, 2018

**List of Practical**

1. Create a simple document using text and shapes in PageMaker
2. Create a simple document using graphics and layering in PageMaker
3. Create a simple document using Objects and Shapes in CorelDRAW
4. Create a simple document using Text and images in CorelDRAW
5. Modifying an existing Image with modifications in colours and shapes using Photoshop
6. Layering, Masking and Filtering effects in image using Photoshop

## **SKILL ENHANCEMENT COURSES**

**Paper Code: CSCA802**

L	T	P	C
0	1	3	2

### **OFFICE AUTOMATION TOOLS**

**Pre-requisite:** Basic use of computers.

#### **Objectives:**

- To practically learn to use Microsoft word, excel and power point

#### **Outcomes:**

- Students will be able to draft official and personal letters using various functions of MSWord.
- Understand, manipulate, represent data with MSExcel using formula and graphs
- Acquire knowledge to prepare presentation for presenting their data through PowerPoint

#### **MODULE – I**

MS-WORD - Working with MS Word - Creating a New Document – Working with Font, Page setup, Paragraph and Page background - Text Editing using various features – Margins, Inserting Page Numbers, Pictures, Files, Word Art, Symbols – Header and footer, Page border, working with Columns, Tabs & Indents - Creation & Working with Tables -Margins & Space management in Document - Mail Merge

#### **MODULE – II**

MS-EXCEL: Working with MS Excel - concepts of Workbook & Worksheets - Working with Data & Ranges - Different Views of Worksheets - Using different features with Data and Text - Use of Formulas, Calculations & Functions - Cell Formatting including Borders & Shading; Working with Different Chart Types - Printing of Workbook.

#### **MODULE – III**

MS-POWERPOINT: Creating and Viewing Presentations – Editing a Presentation – Working with Presentation, slide transitions and Special Effects

#### **TEXT BOOKS:**

1. Dinesh Maidasani , Straight to the Point – MS Office 2010, Laxmi Publications, 2010.
2. Sherry Kinkoph Gunter, Master Visually Microsoft Office 2010, WILEY, 2010.

#### **LIST OF LAB EXERCISES:**

1. To create a personal letter using MS-WORD
2. To create company letter head using MS-WORD
3. To create a memo using MS-WORD
4. To create a greeting card using MS-WORD
5. To create a cover page of a project report.
6. To create letter using mail merge.
7. To create a spreadsheet for mark statement of students.
8. To create various graphs with respect to students' academic details.
9. To create a slide show regarding our college and department.



## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA803**

**MULTIMEDIA TOOLS**

L	T	P	C
0	1	3	2

**Prerequisite:** Familiarity with computers

**Objectives:**

- Understanding the key principles of animation and its applications.

**Outcomes:**

- Acquire knowledge of how to create animation using Flash.
- Acquire knowledge of how to create story board, work with files create movies and publish

**MODULE – I**

Flash - Action Scripting Using actions to control a timeline - Using frame labels - Creating button symbols - Creating animated buttons using movie clips – Movie Clip Controls – Browser / network.

**MODULE - II**

Advanced Animation Methods Creating movies playing within movies (movie clips and .swf) - Controlling multiple timelines (movies) through action scripting - Critique storyboards.

**MODULE - III**

Streamlining Files for Use on the Web, Publishing Files to the Internet & Pre-loaders- Controlling sound with script - Exploring types of output - Work on final project in class - Importing video - Publishing demo (video) reels on web - Publishing and exporting files.

**REFERENCE BOOKS**

1. E. A. Vander Veer and Chris Grover, “Flash CS3”, O’reilly, 2007
2. Richard Williams, “The Animator's Survival Kit”, 2009

**LIST OF PRACTICALS**

1. Creating Company Title
2. Create new Clip art Company Logo
3. Animated Buttons and Menus
4. Text Graphics
5. Morphing
6. Shape and Motion Tween
7. Creating an animated Web site
8. Working with Audio and video

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA804**

L	T	P	C
0	1	3	2

### **PHP PROGRAMMING**

**Prerequisite:** Knowledge of web Technology and DataBase programming.

#### **Objectives:**

- To learn the fundamentals of PHP language
- To learn how to use PHP language to create websites

#### **Outcomes:**

- Understand how to write code using PHP
- Acquire knowledge about web techniques

#### **MODULE – I**

Introduction to PHP – brief history – installing PHP – Language basics – Lexical structure – data types – variables – expressions and Operators – flow-control statements – including code – embedding PHP in web pages

#### **MODULE – II**

Functions – Strings – Arrays - Multidimensional Arrays- Extracting Multiple Values - Slicing an Array - Checking Whether an Element Exists - Traversing Arrays – Sorting - Objects – Terminology - Creating an Object - Accessing Properties and Methods - Declaring a Class – Introspection

#### **MODULE – III**

Web Techniques - HTTP Basics - Server Information - Processing Forms - Setting Response Headers - Maintaining State - Databases - Using PHP to Access a Database - Relational Databases

#### **TEXT BOOK:**

Kevin Tatroe, Peter MacIntyre, and Rasmus Lerdorf, “Programming PHP”, O’Reilly, 3<sup>rd</sup> edition, 2013.

#### **PHP Lab – List of Exercises**

1. Create a PHP page using functions for comparing three integers and print the Largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. Write a Program to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? ( A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
7. Write a Program to sort an array.
8. Write a PHP script that removes the whitespaces from a string.  
Sample string : 'The quick " " brown fox'  
Expected Output : Thequick""brownfox
9. Write a PHP script that finds out the sum of first n odd numbers.
10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA805**

L	T	P	C
0	1	3	2

### **MOBILE APPLICATION DEVELOPMENT**

**Prerequisite :** Basic Understanding of Programming Concepts.

#### **Objectives:**

- To introduce students to the Mobile application development ecosystem.
- To impart mobile application development skills.

#### **Outcomes:**

- Understand the anatomy of Android app and develop small application
- Understand to use multimedia handling in android application

#### **MODULE I**

Introduction to Mobile Apps - Mobility Panorama - Various Mobile Platforms - Different Approaches to Mobile Development - Comparison of Various Mobile app development platforms - Overview of Android App Development Scenario - Mobile App development challenges.

#### **MODULE II:**

Android App Development - Setting up the development environment - Building the Hello World Android App - Anatomy of Android Apps - Logical Components. Android Activities - UI Resources and Elements - Activity interaction - Fragments - Services - App Data Persistence.

**Module III:** Multimedia Handling in Android Apps : Audio, Video and Images, Capture and Storage - Graphics and Animation - Location Services - Sensor handling in Android apps - App markets and publishing apps.

#### **Text Book:**

- *Composing Mobile Apps : Learn, Explore and Apply using Android*, by Anubhav Pradhan and Anil V Deshpande, Wiley Publications, 2014, ISBN: 978-81-265-4660-2.

#### **Web Resources:**

- <https://developer.android.com/training/basics/firstapp/index.html>
- <https://developers.google.com/training/android/#for-new-programmers>

#### **Lab Exercises:**

- Design and develop a mobile app to compute Body Mass Index.
- Design and Develop a mobile app for an event registration form.
- Design and develop a mobile app for storage and retrieval of data.
- Design and develop a mobile app with multimedia components.
- Design and develop a mobile app to utilize various sensors.
- Design and develop a mobile app to utilize location services.

**SKILL ENHANCEMENT COURSES**

L	T	P	C
0	1	3	2

**Paper Code: CSCA806: ONLINE CERTIFICATION COURSE (Min 30 Hrs)**

**Paper Code: CSCA807: MINI PROJECT**

**Paper Code: CSCA808: 2 WEEKS INTERNSHIP**

**Paper Code: CSCA809: I MONTH IN-PLANT TRAINING**

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA810**

L	T	P	C
0	1	3	2

### **PROGRAMMING IN C++**

**Prerequisite:** Knowledge of C programming

**Objectives:**

- To learn the basics of C++ programming languages.
- To learn concepts of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.

**Outcomes:**

- Understand and Apply object oriented programming concepts in problem solving through C++.

#### **MODULE - I**

C++ Basics - Objects and Classes: Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion

#### **MODULE - II**

Inheritance: Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class- Polymorphism.

#### **MODULE - III**

Pointers in C++, Pointers and Objects, this pointer, virtual and pure virtual functions, implementing polymorphism

**Text Books:**

1. E Balagurusamy , Object Oriented Programming with C++, 5<sup>th</sup> edition, Tata McGraw, 2011.
2. Deitel and Deitel , “C++: How to Program”, 9<sup>th</sup> Edition, Pearson, 2013.

#### **C++ LAB – LIST OF EXERCISES**

1. Program to illustrate class and objects
2. Program to illustrate inline member function
3. Program to illustrate static data and member functions
4. Program to illustrate constructors.
5. Program to illustrate friend functions
6. Program to illustrate operator overloading (Unary and Binary)
7. Program to illustrate function overloading.
8. Program to illustrate inheritance
9. Program to illustrate pointer to objects
10. Program to illustrate virtual functions.

## SKILL ENHANCEMENT COURSES

**Paper Code: CSCA811**

L	T	P	C
0	1	3	2

### **ACCOUNTING TOOLS**

**Pre-requisite:** No specific pre-requisite.

**Objectives:**

- To learn about basics entries in Tally
- To work with Tally Accounting Software for maintaining accounts

**Outcomes:**

- Student will be able to computerize the accounts maintained in the ledger
- Acquire knowledge about how to use the package for accounts application for a company

#### **MODULE -I**

Basics of Accounting-Types of accounts-Golden rules of accounting -Accounting Principles - Concepts and conventions -Double entry system of Book keeping-Mode of Accounting- Financial Accounting - Recording Transactions. Fundamentals of Tally - Creation / Setting up of Company in Tally- Accounting masters in Tally -F11: Features - F12 Configurations -Setting up of Account Heads.

#### **MODULE II**

Inventory in Tally-Stock Groups–Stock Categories -Godowns / Locations –Units of Measure– Stock Items –Creating Inventory Masters for National Traders. Voucher Entry in Tally- Accounting Vouchers –Inventory Vouchers –Invoicing.

#### **MODULE III**

Advanced Accounting in Tally-Billwise details –Cost Centers and Cost Categories –Voucher class and Class Center Class –Multiple Currencies –Bank Reconciliation – Interest Calculations.

#### **TEXT BOOK**

1. Tally ERP 9 in Simple Steps, Kogent Learning Solution, Printman India, 2010

## OPEN ELECTIVE FOR OTHER DEPARTMENTS – PAPER IV

L	T	P	C
3	0	0	3

**Paper Code: CSCA171**

### **BASICS OF COMPUTERS & OFFICE AUTOMATION**

**Pre-requisite:** No specific pre-requisite.

**Objectives:**

- To understand how to use software packages viz MS-Word, Excel and Powerpoint for day-to-day activities.

**Outcomes:**

- Non computer science will be able to understand the basics of computers and understand the office automation tools such as word, excel and powerpoint

#### **MODULE – I**

DOS: Internal & External commands; Wildcard Character; file name; Creating/Editing file; batch file - MS Windows: Windows Basic - Introduction to Windows- Using My Computer; Using Windows Explorer - Printing- Introduction to Accessories and Control Panel

#### **MODULE – II**

Word processing - Introduction to MS Word - Working with MS Word - Creating a New Document-Different Page Views and layouts - Working with Styles, Text Attributes; Paragraph and Page Formatting - Text Editing using various features - Advanced Features of MS-Word – bookmarks - Spell Check and Thesaurus; Find & Replace; Headers & Footers ; Inserting – Page Numbers, Pictures, Files, Auto texts, Symbols -Working with Columns, Tabs & Indents;- Creation & Working with Tables -Margins & Space management in Document - Mail Merge.

#### **MODULE – III**

MS Excel - Introduction and area of use -Working with MS Excel - concepts of Workbook & Worksheets - Working with Data & Ranges - Different Views of Worksheets - Column Freezing, Labels, Hiding, Splitting etc.;-Using different features with Data and Text - Use of Formulas, Calculations & Functions-Cell Formatting including Borders & Shading; Working with Different Chart Types - Printing of Workbook & Worksheets with various options.

#### **MODULE -IV**

MS PowerPoint - Introduction & area of use- Working with MS PowerPoint- Creating a New Presentation-Working with Presentation; Using Wizards- Slides & it's different views; Inserting, Deleting and Copying of Slides

#### **MODULE – V**

Working with Notes, Handouts, Columns & Lists- Adding Graphics, Sounds and Movies to a Slide-Working with PowerPoint Objects; Designing & Presentation of a Slide Show.

**Text Books:**

1. Rob Tidrow, Master Visually Windows 7, John Wiley, 2010.
2. Dinesh Maidasani , Straight to the Point – MS Office 2010, Laxmi Publications, 2010.
3. Sherry Kinkoph Gunter, Master Visually Microsoft Office 2010, WILEY, 2010.
4. Faithe Wempen, Computing Fundamentals: Introduction to Computers, WILEY, 2014.

## OPEN ELECTIVE FOE OTHER DEPARTMENTS – PAPER I

**Paper Code: CSCA172**

L	T	P	C
3	0	0	3

### **FUNDAMENTALS OF INFORMATION TECHNOLOGY**

**Pre-requisite:** No specific pre-requisite.

**Objective:**

- To acquire the basic knowledge about computers

**Outcomes:**

- Understand the concepts and various components of computers. Acquire knowledge about internet and other applications

**MODULE - I**

Introduction to Computers - Generation of Computers - Classification of Digital Computer - Anatomy of Digital Computer.

**MODULE - II**

CPU and Memory - Secondary Storage Devices - Input Devices - Output Devices.

**MODULE - III**

Introduction to Computer Software - Programming Language – Operating Systems - Introduction to Database Management System.

**MODULE - IV**

Computer Networks - WWW and Internet - Email - Web Design

**MODULE - V**

Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.

**TEXT BOOKS:**

1. Fundamentals of Information Technology, Alexis Leon and Mathews Leon, Vikas Publishing House Pvt. Ltd., 2009.
2. Faithe Wempen, Computing Fundamentals: Introduction to Computers, WILEY, 2014.



## OPEN ELECTIVE FOR OTHER DEPARTMENTS – PAPER II

**Paper Code: CSCA173**

L	T	P	C
3	0	0	3

### **FUNDAMENTALS OF ‘C’ LANGUAGE**

**Pre-requisite:** No specific pre-requisite.

**Objective:**

- To learn how to solve common types of computing problems.
- To learn about various programming constructs of C

**Outcomes:**

- Analyze a given problem and develop an algorithm to solve the problem
- Use the 'C' language constructs in the right way. Design, develop and test programs written in 'C'

#### **MODULE- I**

Introduction to Programming - How to develop a program, Algorithms, Flow-charts, Types of Programming Languages, Compiler and Linker, Testing and Debugging a program, Documentation. Constants, Variables & Data Types - Character set, C Tokens, Identifiers and Keywords, Constants, Variables, Data types - Operators & Expressions - Managing Input & output operations

#### **MODULE - II**

Decision Making – Branching & Looping - Arrays - One dimensional array: Array Manipulation, Different operations on one dimensional arrays, two dimensional array, operations on two dimensional arrays, multi-dimensional array- Handling of Character Strings.

#### **MODULE - III**

Functions - Top down approach of problem solving, standard library functions, passing values between functions, scope rules of functions, calling convention, return type of functions, call by value and call by reference, recursive functions

#### **MODULE – IV**

Storage Classes - Scope and extent, Storage Classes in a single source file: auto, extern and static, register.

#### **MODULE - V**

Structures and Unions - Defining a structure, Declaring Structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operation on individual members, arrays of structures, arrays within structures, structures and functions, union, size of structure,

#### **TEXT BOOKS:**

1. E. Balagurusamy, “Programming with ANSI-C”, Fourth Edition, Tata McGraw Hill, 2008,
2. Hanly J R & Koffman E.B, “Problem Solving and Programming design in C”, Pearson Education, 2009.

## OPEN ELECTIVE FOR OTHER DEPARTMENTS – PAPER III

**Paper Code: CSCA174**

L	T	P	C
3	0	0	3

### **WEB DESIGNING**

**Pre-requisite:**

- Knowledge of computers.

**Objectives:**

- To acquire the fundamental knowledge about internet & WWW.
- To learn how to develop static and dynamic web pages / websites for any organization.

**Outcomes:**

- Understand the scenario of web page development
- Ability to develop web pages using HTML and Cascading Style Sheets.

#### **MODULE - I**

Internet and the World Wide Web - Internet - Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web- World Wide Web and its evolution, uniform resource locator (URL), browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. search engine, web saver – apache, IIS, proxy server, HTTP protocol

#### **MODULE – II**

HTML5 – Introduction - formatting text by using tags, using lists and backgrounds, creating hyperlinks and anchors - Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets.

#### **MODULE – III**

Page layout and navigation - Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts.

#### **MODULE – IV**

Tables, Forms and Media - Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment

#### **MODULE – V**

Creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page.

**TEXT BOOK:**

1. Faithe Wempen, “HTML5 Step by Step”, Microsoft Press, 2011.

**B.C.A DEGREE EXAMINATION**  
**Semester**  
**Subject Name**

**Time: Three hours**

**Maximum: 75 marks**

**SECTION - A (10 X 2 = 20 marks)**

Answer **ALL** the questions

Totally 10 questions. 2 questions from 1 unit

**SECTION - B (5 X 5 = 25 marks)**

Answer **ALL** the questions, choosing either (a) or (b).

11. a)

(OR)

b)

12. a)

(OR)

b)

13. a)

(OR)

b)

14. a)

(OR)

b)

15. a)

(OR)

b)

Each question (a & b) from one Unit [Equal distribution for all 5 units]

**SECTION - C (3 X 10 = 30 marks)**

Answer any **THREE** questions.

16.

17.

18.

19.

20.

One question from one Unit