# SHRI GURU RAM RAI UNIVERSITY

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]



# **SYLLABUS**

# FOR

# **Bachelor of Science**,

# (Computer Science)

# **Under CBCS PATTERN**

# School of Computer Application &

# **Information Technology**

# (w.e.f. 2021-2022)

# **Bachelor of Science (H) Computer Science**

# **OUTCOME BASED EDUCATION**

# **Programme outcome (POs)**

Programme Outcomes (POs):

It is envisioned that the graduated B.SC (IT) degree holder students , will be able to possess following Attributes and demonstrate related competencies:-

PO1	Computational knowledge	Acquire knowledge of Computing (algrorithm and Coding) & Computing Specialization and Domain Knowledge of proper computing models for defined problems.
PO2	Problem analysis	Identify, formulate and analyze complex computational problems using mathematics, computer science concepts and relevant domains.
PO3	Design/development of solutions	Ability to design efficient solution for complex, real-life problem, system software or Application Software as per needs and specifications of customers.
PO4	Conduct investigations of complex computing problems	Use research-based knowledge and research methods including design of experiments, analysis & interpretation of data & synthesis of information to reach valid conclusions.
PO5	Modern Tool Usage	Ability to demonstrate skills to use modern technologies and tools to analyze and solve the software development problems.
PO6	Professional Ethics	Ability to perform professional practices in an ethical way, keeping in the mind cyber regulations, laws, Intellectual Property Right and norms of professional computing practices.
PO7	Life-Long Learning	Ability to develop confidence and ability for self- education and life-long learning in the broadest context of technological change. Ability to adapt or change the acquired knowledge with change in the technology.
PO8	Project management	Ability to demonstrate knowledge & understanding the

	and finance	Software engineering management principles and apply them as a member & as a leader in a team to manage multidisciplinary projects. Ability to make budget, make estimates of time ,effort ,time and analyze risk and reschedule the projects accordingly.
PO9	Communication Efficacy	Ability to effectively communicate with the technical community and with the society about complex computing activities in both verbal and written form, design documents, letters, make effective presentations.
PO10	Societal and Environmental Concern	Ability to understand the impact of IT solutions in a global and societal context. Ability to apply all concepts of green computing to preserve environment and use IT resources in a effective and optimized way.
PO11	Individual and Team Work	Ability to work multi-disciplinary team both as a member and leader, as per need. To develop the leadership and managerial skills in the student.
PO12	Innovations and entrepreneurship	Ability to apply innovation and promote innovative ideas to a suitable opportunity to create value and wealth for the betterment of the individual and society at large.

#### **Eligibility for admission:**

Any candidate who has passed the Plus Two of the Higher Secondary Board Board of Examinations in any state recognized as equivalent to the Plus Two of the Higher Secondary Board in with not less than 50 %-marks in aggregate with math's as a one subject at 10+2 is eligible for admission, However, SC/ST, OBC and other eligible communities shall be given relaxation as per University rules

Duration of the Programme : 3 Years

School of CA & IT

# STUDY AND EVALUATION SCHEME **Bachelor of Science (Hons) Computer Science**

#### FIRST SEMESTER:

S.No	Course No.	Subject	Eval	luatio	on – S	cheme					Credit
			Period			Sessio	nal		Examin	ation	
			L	Т	P	ТА	СТ	ТОТ	ESE	Sub.	
										Total	
Theory											
1.	BCS-101	Computer Fundamentals and	4	-	-	10	20	30	70	100	4
		Programming in C									
2.	BCS-102	Digital Electronics	3	1	-	10	20	30	70	100	4
3.	BCS-AEC1	English Communication	2	-	-	10	20	30	70	100	2
4.	BCS-GE1	Generic Elective-I	4	1	-	10	20	30	70	100	4
Practic	al										
1.	BCS-P11	Programming in 'C' Lab	-	-	4	30	-	30	70	100	2
2.	BCS-P12	Digital Electronics Lab	-	-	4	30	-	30	70	100	2
Total			14	2	8	100	80	180	420	600	18

#### **SECOND SEMESTER:**

S.No	Course No.	Subject	Eva	luatio	on – S	cheme					Credit
			Peri	od		Sessio	nal		Exami	nation	
			L	Т	Р	TA	СТ	ТОТ	ESE	Sub.	
										Total	
Theory									-		-
1.	BCS-201	Data Structures Using C	3	1	-	10	20	30	70	100	4
2.	BCS-202	Operating System	3	1	-	10	20	30	70	100	4
3.	BCS-AEC2	Environment Studies	2	-	-	10	20	30	70	100	2
4.	BCS-GE2	Generic Elective-II	4	-	-	10	20	30	70	100	4
Practica	al										
1.	BCS-P21	Data Structure Lab	-	-	4	30	-	30	70	100	2
2.	BCS-P22	Unix Lab	-	-	4	30	-	30	70	100	2
Total			14	2	8	100	80	180	420	600	18

TA : Teacher Assessment

CT : Class Test ESE : End Semester Examination

SUB TOT.: Subject Total

TOT. : Total

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#### THIRD SEMESTER:

S.No	Course No.	Subject	Eva	luati	on – S	cheme					Credit
			Peri	od		Sessio	nal		Exami	nation	
			L	Т	Р	ТА	СТ	ТОТ	ESE	Sub.	
										Total	
Theory											
1.	BCS-301	Programming in JAVA	4	-	-	10	20	30	70	100	4
2.	BCS-302	Computer Networks	4	-	-	10	20	30	70	100	4
3.	BCS-SEC1	SEC1	4	-	-	10	20	30	70	100	4
4.	BCS-GE3	Generic Elective-III	4	-	-	10	20	30	70	100	4
Practic	al										
1.	BCS-P31	Java Lab	-	-	4	30	-	30	70	100	2
2.	BCS-P32	Networking Lab	-	-	4	30	-	30	70	100	2
Total			16	-	8	100	80	180	420	600	20

#### FOURTH SEMESTER:

		Perio L	od T	Р	Session TA	nal	тот	Exami	nation	
		L	Т	P	ТА	C	TOT	DOD		
						U	101	ESE	Sub.	
						Т			Total	
								_		
CS-401	DBMS	4	-	-	10	20	30	70	100	4
CS-402	Software Engineering	4	-	-	10	20	30	70	100	4
CS-SEC2	SEC2	4	-	-	10	20	30	70	100	4
CS-GE4	Generic Elective-IV	4	-	-	10	20	30	70	100	4
CS-P41	DBMS Lab	-	-	4	30	-	30	70	100	2
CS-P42	SEC2 Lab	-	-	4	30	-	30	70	100	2
		16	-	8	100	80	180	420	600	20
	S-401 S-402 S-SEC2 S-GE4 S-P41 S-P42	S-401DBMSS-402Software EngineeringS-SEC2SEC2S-GE4Generic Elective-IVS-P41DBMS LabS-P42SEC2 Lab	S-401DBMS4S-402Software Engineering4S-SEC2SEC24S-GE4Generic Elective-IV4S-P41DBMS Lab-S-P42SEC2 Lab-16	S-401DBMS4-S-402Software Engineering4-S-SEC2SEC24-S-GE4Generic Elective-IV4-S-P41DBMS LabS-P42SEC2 Lab16	S-401 DBMS 4 - -   S-402 Software Engineering 4 - -   S-SEC2 SEC2 4 - -   S-GE4 Generic Elective-IV 4 - -   S-P41 DBMS Lab - - 4   S-P42 SEC2 Lab - 4	S-401 DBMS 4 - - 10   S-402 Software Engineering 4 - - 10   S-402 Software Engineering 4 - - 10   S-SEC2 SEC2 4 - - 10   S-GE4 Generic Elective-IV 4 - - 10   S-P41 DBMS Lab - - 4 30   S-P42 SEC2 Lab - - 4 30   Ib - 8 100 - - 8 100	S-401 DBMS 4 - - 10 20   S-402 Software Engineering 4 - - 10 20   S-402 Software Engineering 4 - - 10 20   S-SEC2 SEC2 4 - - 10 20   S-GE4 Generic Elective-IV 4 - - 10 20   S-P41 DBMS Lab - - 4 30 -   S-P42 SEC2 Lab - - 4 30 -   Image: S-P42 SEC2 Lab - - 8 100 80	S-401 DBMS 4 - - 10 20 30   S-402 Software Engineering 4 - - 10 20 30   S-402 Software Engineering 4 - - 10 20 30   S-SEC2 SEC2 4 - - 10 20 30   S-GE4 Generic Elective-IV 4 - - 10 20 30   S-P41 DBMS Lab - - 4 30 - 30   S-P42 SEC2 Lab - - 4 30 - 30   IS-P42 SEC2 Lab - - 4 30 - 30	S-401 DBMS 4 - - 10 20 30 70   S-402 Software Engineering 4 - - 10 20 30 70   S-402 Software Engineering 4 - - 10 20 30 70   S-SEC2 SEC2 4 - - 10 20 30 70   S-GE4 Generic Elective-IV 4 - - 10 20 30 70   S-P41 DBMS Lab - - 4 30 - 30 70   S-P42 SEC2 Lab - - 4 30 - 30 70	S-401 DBMS 4 - - 10 20 30 70 100   S-402 Software Engineering 4 - - 10 20 30 70 100   S-402 Software Engineering 4 - - 10 20 30 70 100   S-SEC2 SEC2 4 - - 10 20 30 70 100   S-GE4 Generic Elective-IV 4 - - 10 20 30 70 100   S-P41 DBMS Lab - - 4 30 - 30 70 100   S-P42 SEC2 Lab - - 4 30 - 30 70 100   Image: S-P42 SEC2 Lab - - 4 30 - 30 70 100   Image: S-P42 SEC2 Lab - - 4 30 - 30 70 100   Image: S-P42 SEC2 Lab - - 4 30 -<

TA : Teacher Assessment CT : Class Test

ESE : End Semester Examination

SUB TOT.: Subject Total

TOT. : Total

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#### **FIFTH SEMESTER:**

S.No	Course No.	Subject	Eva	luati	on – S	cheme					Credit
			Peri	od		Sessio	nal		Examir	nation	
			$\mathbf{L}$	Т	Р	ТА	СТ	ТОТ	ESE	Sub.	
										Total	
Theor	y										
1.	BCS-501	Web Technology	4	-	-	10	20	30	70	100	4
2.	BCS-502	. Net Programming	4	-	-	10	20	30	70	100	4
3.	BCS-DSE1	DSE1	4	-	-	10	20	30	70	100	4
4.	BCS-DSE2	DSE2	4	-	-	10	20	30	70	100	4
Practic	cal										
1.	BCS-P51	Web Technology Lab	-	-	4	30	-	30	70	100	2
2.	BCS-P52	C#.Net Lab	-	-	4	30	-	30	70	100	2
Total			16	-	8	100	80	180	420	600	20

#### SIXTH SEMESTER:

S.No	Course No.	Subject	Eval	Evaluation – Scheme								
			Peri	Period			Sessional			ination		
					-							
			L	Т	Р	ТА	СТ	тот	ESE	Sub.		
										Total		
Theory	7				1	1	1					
1.	BCS-601	Computer Graphics	4	-	-	10	20	30	70	100	4	
2.	BCS-DSE3	DSE3	4	1	-	10	20	30	70	100	4	
3.	BCS-DSE4	DSE4	4	1	-	10	20	30	70	100	4	
Practic	al											
2.	BCS-P61	DSE3 Lab	-	-	4	30	-	30	70	100	2	
3.	BCS-P62	Project	-	-	4	30	-	30	70	100	2	
	BCS-SM	Seminar	-	-	4	100	-	100	-	100	2	
Total			12	2	12	190	60	250	350	600	18	

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SUB TOT.: Subject Total

TOT. : Total

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#### **Generic Electives (Other Discipline) GE1 to GE5**

- 1. Statistics
- 2. Operations Research
- 3. Economics
- 4. Organizational Behavior
- 5. Consumer Affairs

#### **Skill Enhancement Courses**

#### SEC1 (Choose One)

SEC1.1	Computer Organization
SEC1.2	Introduction to Logic
SEC1.3	Multimedia Systems
SEC1.4	System Analyis & Design

SEC1.5 Blockchain Technology

#### SEC2(Choose One)

<b>SEC2.1</b>	Object	Oriented	Programming
using C++	F		
<b>SEC2.2</b>	Program	ming in Pyt	hon
<b>SEC2.3</b>	R Progra	mming	
<b>SEC2.4</b>	PERL/ C	CGI	
SEC2.5	Java S	<mark>cript</mark>	

#### **Discipline Specific Elective Papers**

#### DSE 1 (Choose One)

- **DSE1.1** Theory of Computation
- **DSE1.2** Microprocessor Systems
- **DSE1.3** Analysis and Design of Algorithms
- **DSE1.4** Graph Theory
- **DSE1.5** Ethical Hacking

#### DSE 2 (Choose One)

- **DSE2.1** Cryptography and Network Security
- **DSE2.2** Cloud Computing
- **DSE2.3** Mobile Computing
- **DSE2.4** Data warehousing and Data mining
- DSE2.5 Foundation for Data Science

#### DSE 3 (Choose One)

DSE3.1Advanced JavaDSE3.2ASP.NETDSE3.3Android ProgrammingDSE3.4NoSQL

#### DSE 4 (Choose One)

- **DSE4.1** Design of Compilers
- **DSE4.2** Advanced DBMS
- **DSE4.3** Advanced Computer Networks
- **DSE4.4** Artificial Intelligence
- DSE4.5 Internet of Things
- DSE4.6 Machine Learning

#### FIRST SEMESTER

Course code	: BCS-101				
<b>Course Name</b>	: Computer Fundamental & Programm	ning	in '	C'	
Semester /Year	: I				
		L	Τ	Р	С
		4	0	4	4

L - Lecture T – Tutorial P – Practical C – Credit

#### **Course Objectives: The objectives of this course are**

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Unit I Generation of Computer, Hardware Components, Primary Memory-RAM, ROM, Secondary

Storage Devices; Input Devices, Output Devices, CPU- Arithmetic Logic Unit, Control Unit, Registers, Cache Memory. System software, Application Software, Elementary commands of DOS.

Unit II [8 hrs] Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programms. Debugging Techniques,

Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor

Unit III

Operators: Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, precedence and order of evaluation. Control Statements: if-else, switch, break, continue, the comma operator, go to statement. Loops: for, while, do-while

Unit IV

[8 hrs]

[8 hrs]

[8 hrs]

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Functions: built-in and user-defined, function declaration, definition and function call, parameter passing: call by value, call by reference, recursive functions, multifile programs.

Unit V

[8 hrs]

Arrays: Linear arrays, multidimensional arrays, Passing arrays to functions, Arrays and strings. Structure and Union: Definition and differences, self-referential structure. And address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers.

File: File Handling in C, streams in 'c', command line arguments in 'c', formatted I/O functions.

#### TEXT BOOKS:

- 1. Raja Raman V: Fundamentals of Computers
- 2. Sanders D.H: Computers Today
- 3. Gottfried, "Programming in C, Schaum's Series Tata McGraw Hill

## Course outcomes (COs):

CO1	Understand basic data types variables etc.
CO2	Understanding a functional hierarchical code organization
CO3	Ability to define and manage data structures based on problem subject domain
CO4	Illustrate the use of pointers with call by value and call by reference
CO5	Ability to work with textual information, characters and strings
CO6	Ability to preserve the information/data generated after the program is run

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1	1	1							
CO2	2	3										
CO3	2	2	3									
CO4					2							
CO5	2								2			
CO6	3		2		2							
Avg.	1.5	0.8	1	0.2	0.8				0.3			

Course code	: BCS-P11				
Course Name	: 'C' Programming Lab				
Semester /Year	: I				
		L	Τ	P	С
		0	0	4	2

 $L \ \ - Lecture \ T - Tutorial \ P - Practical \ C - Credit$ 

#### Course Objectives: The objectives of this course are

- 1. Demonstrate an understanding of algorithms in the problem-solving process.
- 2. Identify the necessary properties of good problem-solving techniques
- 3. Develop program using Arrays, Pointer and Functions
- 4. Develop user defined structures.

#### **Course Contents**

- 1. Program based on loops
- 2. Program based on conditions
- 3. Program based on arrays
- 4. Program based on functions
- 5. Program based on Pointers
- 6. Program based on file handling

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Understand basic data types, identifier etc.
CO2	Understand working of different loops
CO3	Design program based on iteration and conditions
CO4	Illustrate the use of pointers with call by value and call by reference
C05	Ability to work with textual information, characters and strings
CO6	Design program based on structure and union.

#### **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									
CO2	2											
CO3	3		2	1								
CO4	2				2							
CO5		2	1									
CO6	2		1		1							
Avg.	2.0	0.66	1.0	0.16	0.5							

Course code	: BCS-102				
Course Name	: Digital Electronics				
Semester /Year	: I				
		L	T	P	С
		3	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

#### **<u>Course Objectives</u>:** The objectives of this course are

- 1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- 2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- 3. To implement simple logical operations using combinational logic circuits.
- 4. To design combinational logic circuits, sequential logic circuits.

#### **Course Contents**

#### UNIT 1

Number Systems: Binary, Decimal, Octal, Hexadecimal, Conversion from One Number System to another, Character Codes (BCD), Excess-3, Gray Code, ASCII, 1's Complement Representation, 2's Complement Representation Logic Gates: AND, OR, NOT, XOR, XNOR, NAND and NOR as Universal Gates Logic Families: Transistor-Transistor Logic (TTL), Emitter-Coupled Logic (ECL), MOSFET Logic, TTL Gates [10 Hours]

#### UNIT 2

Boolean Algebra: Boolean postulates and laws, De Morgan's Theorem, Principle of Duality, Boolean expression, Boolean function, Minimization of Boolean expressions, Sum of Products (SOP), Product of Sums (POS), Minterm-Maxterm, Canonical forms, Karnaugh map Simplification-Don't care conditions. [10 Hours]

#### UNIT 3

Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Serial Adder/Subtractor, Parallel Adder/ Subtractor, BCD Adder/Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer [10 Hours]

#### UNIT 4

Sequential Circuits: Latch, Flip Flops- SR, JK, Data, Toggle, Counters- Synchronous and Asynchronous, Registers- Serial-in-Parallel-out, Parallel-in-Serial-Out, Parallel-in-Parallel-out, Applications of Flip Flops [10 Hours]

#### TEXT BOOKS:

1. M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education(Singapore) Pvt. Ltd., New Delhi, 2003

2. John .M Yarbrough, Digital Logic Applications and Design, Thomson- Vikas publishing house, New Delhi,2002

3. Zaky&Hamacher, "Computer Organization: McGraw Hill

4. B. Ram, "Computer Fundamental Architecture & Organization" New Age

5. Tannenbaum, "Structured Computer Organization" PHI.

#### **Course outcomes** (COs):

CO1	Examine and perform numeric information in different forms.
CO2	Understand machine level representation of data and perform operations on
	it.
CO3	Manipulate simple Boolean expressions using the theorems and postulates
	of Boolean algebra and to minimize combinational functions.
CO4	Design and analyze small combinational circuits and to use standard
	combinational functions to build larger more complex circuits.
CO5	Design and analyze small sequential circuits and to use standard
	sequential functions to build larger more complex circuits.
CO6	Design SR and JK flip flop

#### **CO-PO Mapping**

0010	1 - app											
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	2		1					
CO2	2	1	2	2	2		1					
CO3	3	2	2	2	1		1					
CO4	2	1	1	3	1		1					
CO5	2	1	1	3	1		1					
CO6	2	2	1	3	1	1	1	1				
Avg.	2.33	1.33	1.33	2.33	1.33	0.16	1.0	0.16				

Course code	: BCS-P12				
Course Name	: Digital Electronics Lab				
Semester /Year	: II				
		L	T	P	С
		0	0	4	2

 $L \ \ - Lecture \ T - Tutorial \ P - Practical \ C - Credit$ 

#### **Course Objectives:** The objectives of this course are

- To know the concepts of Combinational circuits.
- To understand the concepts of flipflops, registers and counters

#### **Course Contents**

- 1. Implement different logic gates
- 2. Implement counters
- 3. Implement various circuit operations

#### **Course outcomes** (COs):

CO1	Learn the basics of gates
CO2	Construct basic combinational circuits and verify their functionalities
CO3	Apply the design procedures to design basic sequential circuits
CO4	Construct half adder and full adder
CO5	Design flip flop
CO6	Understand adder subtractor

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2			2	2	2						
CO2		2		2	2	2						
CO3			2									
CO4	2											
CO5	1	2	1		1							
CO6	2	1	2	2	2							
Avg.	1.16	0.83	0.83	1.0	1.16	0.66						

Course code	:	BCS-AEC1				
Course Name	:	English Communication				
Semester /Year	:	II				
			L	Τ	P	С
			2	0	0	2

L - Lecture T - Tutorial P - Practical C - Credit

#### **<u>Course Objectives</u>:** The objectives of this course are

- Students will heighten their awareness of correct usage of English grammar in writing and speaking
- Students will improve their speaking ability in English both in terms of fluency and comprehensibility
- Students will give oral presentations and receive feedback on their performance

#### UNIT 1 Elementary English

Grammar: Parts of Speech, Tenses, Short responses, Active and Passive Voice Vocabulary: Idioms and Phrases, Antonyms, Synonyms, One word substitution Writing skills: Formal and Informal Letters

#### **UNIT 2 Employability skills**

Communication: Types, Objectives, Formal and Informal Communication, Barriers to communication, Selection of appropriate communication medium, Verbal and Non- verbal Communication

Soft Skills: Public Speaking, Presentation Skills, Speech, Debates, Emotion Management

#### UNIT 3 Career Skills

Interviews, CV Preparation, Group discussion, Personality Development

#### TEXT BOOKS:

- 1. Fluency in English Part II, Oxford University Press, 2006.
- 2. Business English, Pearson, 2008.
- 3. Language, Literature and Creativity, Orient Blackswan, 2013.
- 4. Bussiness Communication: Rajender Paul

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Students will attain and enhance competence in the four modes of literacy: writing, speaking, reading and listening
CO2	Students will develop their ability as critical readers and writers
CO3	Develop vocabulary and improve the accuracy in grammar.
CO4	Produce words with right pronunciation
CO5	Demonstrate positive group communication exchanges
CO6	Plan effective communications

#### **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	1	2										
CO3	2	2	1		2							
CO4	1			2			2					
CO5	1								3			
CO6	2	2	2	1	1		1		3			
Avg.	1.5	1.0	0.5	0.5	0.5	0	0.5	0	1.0	0	0	0

Course code	: BCS-201				
Course Name	: Data Structure using 'C'				
Semester /Year	: II				
		L	Τ	P	С
		3	1	0	4

 $L \ \ - Lecture \ T - Tutorial \ P - Practical \ C - Credit$ 

#### **<u>Course Objectives</u>:** The objectives of this course are

- 1. Familiarization of fundamentals of data and file structures and their operations like, insertion, deletion, searching and sorting
- 2. Understanding and implementation of data structures like arrays, linked lists, stacks, queues, trees, graphs and files
- 3. Identification of a suitable data structure to model data used in real world applications

#### **Course Contents**

Unit-1( No. of Hours: 10)

**Introduction**: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off.

#### Arrays

Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation)

**Stacks:** Array Representation and Implementation of stack, Operations and Stacks: Push and POP, Array Representation of Stack, Linked Representation of stack, Operations Associated with Stacks, Application of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

**Unit-II**(No. of Hours: 10)

#### Queues

Array and Linked representation of Queue, De-queue, Priority Queues

#### Linked Lists

Representation and implementation of Singly linked lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List of Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

#### Recursion

Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)

**Unit-III**(No. of Hours: 7)

#### Trees

Basic terminology, Binary Tree, Binary tree representation algebraic Expressions, Complete Binary Tree, Extended Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary tree, Huffman algorithm.Binary Search (BST), Insertion and Deletion in BST.

**Unit-IV**(No. of Hours: 7)

#### Searching and Sorting

Sorting, Searching and Hashing: Selection sort, Insertion Sort, Bubble sorting, Quick Sort, Merge Sort Sequential and Binary searching, comparison and analysis of sorting and searching techniques.

**Unit-V**(No. of Hours: 7)

#### Hashing

Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function

#### **REFERENCE BOOKS:**

- 1. Horowitz and Sahani, "Fundamentals of data Structures" Galgotia
- 2. R. Kruse etal, "Data Structures and Program Design in C" Person Education
- 3. A.M. Tenenbaumetal, "Data Structures and Program Design in C" Person Education
- 4. Lipschutz, "Data Structure", TMH
- 5. K Loudon, "Mastering Algorithms With C", Shroff Publishers and Distributors

#### Course outcomes (COs):

CO1	Recall different type of data structures.						
CO2	Explain the fundamentals of an Abstract DataType (ADT).						
CO3	Apply linear and nonlinear data structures tosolve real time problems						
CO4	Appraise and determine the correct datastructure for any given real-world problem.						
CO5	Create programs based on various data structure for ex. sorting ,searching etc.						
CO6	Create innovative solutions for real world						

#### **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	3	2	2	2	1	1				
CO2	2	1		1		1	2					
CO3	1	1	3	2	3	1	2	1		1		
CO4	2	1		1		2	2			2	1	
CO5	2		2	2	1	1	2	1		2	2	
CO6	2	2	2	2			1	1	1	1		
Avg.	1.66	1.33	1.66	1.66	1.0	1.16	1.66	0.66	0.16	1.0	0.5	

Course code	: BCS-P21				
Course Name	: Data Structure using 'C' Lab				
Semester /Year	: II				
		L	Τ	P	С
		0	0	4	2

L - Lecture T – Tutorial P – Practical C – Credit

#### **<u>Course Objectives</u>:** The objectives of this course are

- 1. To implement recursive functions.
- 2. To arrange data using different sorting techniques.
- 3. To implement stack, queue, linked list, tree data structures.
- 4. Implementing various data structures using a programming language.
- 5. Implementing different operations on data structures

#### **Course Contents**

- 1. Implement program on 1D and 2D arrays
- 2. Implement program on bubble sort, insertion sort, quick sort, merge sort etc.
- 3. Implement program on stack using arrays and linked list
- 4. Implement program on queue using arrays and linked list.
- 5. Implement program on binary search tree.

# **Course outcomes** (COs):

CO1	Illustrate basic data structures- arraysand linked lists.
CO2	Build stacks and queues using arrays and linked lists.
CO3	Discover sparse matrix, polynomialarithmetic, searching and sorting techniques and their applications.
<b>CO4</b>	Appraise binary search tree to perform efficient search operations
CO5	Design AVL Tree.
CO6	Develop an application making extensiveuse of binary files.

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1		1		1					
CO2	2	2	1		1		1					
CO3	2	1	2		2		1					
CO4	3	1	1	1		1	1					
CO5	2	1		1		2	1		2	1	2	
CO6	2	2	1	1			1	1	1	1		
Avg.	2.33	1.33	1.0	0.5	0.66	0.5	1.0	0.16	0.5	0.33	0.33	

Course code	: BCS-202				
Course Name	: Operating System				
Semester /Year	: II				
		L	Τ	Р	С
		3	1	0	4

#### L - Lecture T – Tutorial P – Practical C – Credit

#### **<u>Course Objectives:</u>** The objectives of this course are

- To understand main components of OS and their functions.
- To study process management and scheduling.
- To understand concept of memory management.
- To understand the concept of Disk Organization.

#### **Course Content**

#### UNIT 1

Introduction: Operating System- Definition, Types of OS- Simple batch system, Time sharing systems, Real time systems, Multiprocessor systems, Distributed systems, System components - OS Services, System Calls.

#### UNIT 2

Process concepts: PCB, Process Scheduling, Operations on Processes, Co-operating process, IPC, Threads- Overview, Benefits, User & Kernel Threads.

CPU Scheduling:, Scheduling criteria , Preemptive & Non-preemptive scheduling, Scheduling algorithms

#### UNIT 3

Process Synchronization: Background, Critical Section problem, Critical Regions, Synchronization hardware, Semaphores, Classic Problems of Synchronization Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

#### UNIT 4

Memory Management: Logical vs. Physical address space, Swapping, Contiguous memory allocation, Non-Contiguous memory allocation- Paging, Segmentation, Segmentation with paging. Virtual Memory: Background, Demand paging - Performance, Page replacement, Page replacement algorithms (FCFS, LRU), Allocation of frames, Thrashing.

#### UNIT 5

File Systems: File concept, access methods, Allocation methods-contiguous, linked and index allocation, Directory System – single level, tree structured, acyclic graph and general graph directory, File protection.

Disk Management: Secondary storage structure: Disk structures, Disk Scheduling, Disk reliability.

#### TEXT BOOKS:

- 1. Abraham Silberschatz, Peter Baer Galvin & Greg Gagne, "Operating System Concepts", Sixth Edition, John Wiley & Sons, Inc.
- 2. MilankovicM "Operating System concepts and Design", 2nd edition, Tata Mcgraw hill.
- 3. Deitel H.M. "An Introduction to Operating Sysems", 2nd edition, Pearson Education.

# **Course outcomes** (COs):

CO1	Describe important computer system resources and the role of operating system
CO2	Understand the process management policies and scheduling of processes by CPU.
CO3	Evaluate the requirement for process synchronization.
CO4	Understand deadlock situation and its conditions
CO5	Understand disk Scheduling
CO6	Design files concept

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	1	1	1	1	2				
CO2	1	1	1	2	2	1	2	1			1	
CO3	1	2	3	1	2	1	3	1			1	
CO4	1	1	2	2	2	2	3	1			1	
CO5	1	2	2	2	2	2	2	1			1	
CO6	1	1	2	2	2	1	1	1	1			
Avg.	1.0	1.5	1.83	1.66	1.83	1.33	2.0	1.16	0.16	0	0.66	

Course code	: BCS-P22				
Course Name	: Unix Lab				
Semester /Year	: II				
		L	Т	Р	С
		0	0	4	2

L - Lecture T - Tutorial P - Practical C - Credit

#### Course Objectives: The objectives of this course are

This course introduces basic understanding of UNIX OS, UNIX commands and File system and to

familiarize students with the Linux environment.

To make student learn fundamentals of shell

scripting and shell programming. Emphases are on making student familiar with UNIX environment and issues related to it

#### **Course Contents**

- 1. Introduction to unix operating system comparison with windows.
- 2. Working with Vi editor creating text files.
- 3. Working with unix basic commands.
- 4. Working with shell programming
- 5. Working with system calls.

#### **Course outcomes** (COs):

CO1	Understand unix command
CO2	Understand system administration command
CO3	Ability to understand the operating system .
CO4	Ability to write system level programs
CO5	Ability to develop shell scripts
CO6	Ability to develop awk scripts

### **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		3		3			3	2	3	2	
CO2	3		3		2			3	2	3		
CO3	2	2			3				3			
CO4	2	2	1	2	1	1	1					
CO5	2	1	1	1	1	1						
CO <sub>6</sub>	2	1	1	2	2	1	2					
Avg.	2.16	1.0	1.5	0.83	2.0	0.5	0.5	1.0	1.16	1.0	0.33	

Course code	: BCS-AEC2				
Course Name	: Environment Studies				
Semester /Year	: II/I				
		L	Τ	Р	С
		2	0	0	2

#### L - Lecture T – Tutorial P – Practical C – Credit

#### **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

.To enable students to learn about the environment

- . to develop an appreciation for diversity at various levels
- . To emphasize inculcation of values and skills related to protection of environment
- . To understand link between human and natural system.
- . To know about programs working at Global level for environment.

#### **Course Contents**

#### **UNIT 1: Introduction to environmental studies and Ecosystems**

Definition of environment Multidisciplinary nature of environmental studies;, Scope and importance; Concept of sustainability and sustainable development.

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession.

#### **UNIT 2: Natural Resources**

Natural resources and their type Land resources and land use change; Land degradation, soil erosion and desertification, Deforestation: Causes and impacts due to mining, dam building on environmentWater : Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state)., Energy resources : Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

#### **UNIT 3: Environmental Pollution and Environmental Laws**

Environmental pollution: types, causes, effects and controls; Nuclear hazards and human health risks, Solid waste management: Control measures of urban and industrial waste, Pollution case studies.

Climate change, global warming, greenhouse effect ozone layer depletion, acid rain and impacts on human communities and agriculture

Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD)

#### UNIT 4: Biodiversity and Conservation&Human Communities and the Environment

Definition of biodiversity Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Human population growth: Impacts on environment, human health and welfare, Resettlement and rehabilitation of project affected persons;Disaster management: floods, earthquake, cyclones and landslides, Environmental movements:Chipko, Silent valley, Bishnois of Rajasthan., Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.Case studies (e.g., CNG vehicles in Delhi).

#### Unit 5 : Field work,

Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc., Visit to a local polluted site-Urban/Rural/Industrial/Agricultural., Study of common plants, insects, birds and basic principles of identification., Study of simple ecosystems-pond, river, Delhi Ridge, etc.

#### TEXT BOOKS:

- 1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
- 2. Gadgil, M., &Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
- 3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.

#### **Course outcomes** (COs):

CO1	To demonstrate a general understanding of multidisciplinary nature of environmental science
CO2	To create awareness among people about protection of wildlife and other natural resources
CO3	To gain the knowledge about the different control technologies and awareness programs regarding environment protection
CO4	To identify, formulate and solve environmental problems by utilizing the concept of environmental studies

CO5	To analyse, synthesize and evaluate a range of field data from different locations
CO6	Understand importance of eco-system.

# CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	2											
CO3												
CO4												
CO5												
CO6	2											
Avg.	1.16											

Course code	: BCS-301				
Course Name	: Programming in Java				
Semester /Year	: III				
		L	Τ	Р	С
		4	0	0	4

#### L - Lecture T - Tutorial P - Practical C - Credit

#### Course Objectives: The objectives of this course are

- To learn why Java is useful for the design of desktop and web applications.
- To learn how to implement object-oriented designs with Java.
- To identify Java language components and how they work together in applications.
- To design and program stand-alone Java applications

#### **Course Content**

#### UNIT 1

Java Programming: Introduction, Operator, Data types, Variables, Methods and Classes, Multi threaded programming,

#### UNIT 2

Java Inheritance, Single inheritance, multiple inheritance, multilevel inheritance, interfaces in java, abstract class in java.

#### UNIT 3

Exception handling in java try, catch and finally block throw and throws exception in java, checked and unchecked exception in java.

#### UNIT 4

Java Applet, Applet life cycle, Applet I/O, Java files I/O, java files streams

#### TEXT BOOKS:

- 1. Naughton, Schidt, "The Complete Reference JAVA2", TMH
- 2. Balagurusamy E, "Programming in JAVA, TMH
- 3. Dustin R. Calway, "Inside Serviets" Addison Wesley
- 4. Mark Wutica, "Java Enterprise Edition" QUE

5. Steven Hoizner, "Java2 Black book" Dreamtech

# **Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	Understand the concept of Object Oriented Programming
CO2	The implementation will demonstrate the use of a variety of basic control structures including selection and repetition, classes and objects.
CO3	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
CO4	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes
CO5	Knowledge about primitive and reference data types file-based I/O
CO6	Design event driven GUI and web related applications like Applets which mimic the real word scenarios.

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1		2	1	1	2	1	1	1	1
CO2	2	2	2	1	1	2	2	1	1	1	1	1
CO3	2	2	2	1	1	2	2	2	2	2	2	2
CO4	3	2	2	1	1	2	2	2	1	2	2	2
CO5	3	2	2	1	1	2	2	2	1	2	2	2
CO6	3	3	3	2	2	3	3	3	2	3	3	3
Avg.	2.66	2.0	2.0	1.0	1.33	2.0	2.0	2.0	1.33	1.83	1.83	1.83

Course code	: BCS-P31				
Course Name	: Core Java Lab				
Semester /Year	: III				
		L	Τ	P	С
		0	0	4	2

#### $L \ \ \text{-Lecture} \ T-Tutorial \ P-Practical \ C-Credit$

#### **<u>Course Objectives</u>:** The objectives of this course are

- To teach the students basics of JAVA programs and its execution.
- To teach the students the differences between C++ and Java programming.
- To make the students learn concepts like packages and interfaces.
- To make the students understand threads.
- To make the students understand the usage util package.
- To teach the student, to develop java programs using inheritance and interfaces.
- To understand exceptional handling, command line arguments and file handling

#### **Course Contents**

- 1. Program based on classes and objects
- 2. Program based on arrays 1D and 2D
- 3. Program based on Inheritance
- 4. Program based on interfaces.

#### **Course outcomes** (COs):

CO1	Implement java program using loops and condition
CO2	Implement java program using classes and object
CO3	Develop GUI program using AWT and Swing
CO4	Implement different files streams

CO5	Implement Event and Listener.
CO6	Plan java Servlets

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	2	-	-	-
CO2	3	-	-	-	-	-	-	-	1	-	-	-
CO3				2								
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5					2							
CO6	2	2	1	2	1	2						
Avg.	1.33	0.33	0.16	0.66	0.5	0.33	0	0	0.5	0	0	0
Course code	: BCS-302											
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Course Name	: Computer Network											
Semester /Year	: III / II											
		L	Т	P	С							
		4	0	0	4							

# **<u>Course Objectives</u>:** The objectives of this course are

- To understand the concepts of communicating channel in order to deal with the different transmission media.
- To learn different about the different approaches of networking through switching modes and different multiplexing techniques.
- To learn the importance of IEEE standard to raise good results and modes to apply various protocols internally and externally in specified time domain. To deal with the problems arises due to channel allocation and ultimately to detect collisions so as to avoid them on priority basis.
- To learn different models o transfer data through physical communicating medium with the help of routing algorithms. To analyze the features of different algorithms to find a short way to approach to the destination.
- To understand significance of various layers in OSI as well as TCP/IP models to bring a data in segment form and to synchronize the interaction of source and destination using respective layers.
- To draw elementary knowledge regarding different known systems that provide various characteristics, when number of protocols are applied to secure the data.

# **Course Content**

# UNIT 1

Overview of Networking: Introduction;Need of Networking; Elements of Network; Modes of communication, topology, categories of network (LAN, MAN,WAN); Reference models: OSI reference model, TCP/IP reference model, ISDN.

Physical Layer: Overview of analog & digital signals, transmission media (guided & unguided); TDM, FDM, WDM; Circuit switching: time division & space division switch, Telephone network.

# UNIT 2

Data link layer: Framing(character and bit stuffing), Types of errors ,error detection & correction methods; Flow control: Protocols: Stop & wait ARQ, Sliding Window Protocols HDLC; Medium access sub layer: Channel Allocation, LAN Protocols, FDM, TDM, CSMA/CD/CA, ALOHA protocols, Overview of IEEE standards, IEEE802.3 Ethernet, IEEE 802.11, IEEE 802.15.1

# UNIT 3

Network layer: Internetworking devices, Routing: techniques, static vs. dynamic routing; Routing algorithms: flooding, distance vector routing, link state routing; Protocols: ARP, RARP, ICMP; IP Addressing: classful address, subnetting ; IPv4 and datagram, IPv6; Congestion control algorithms

#### UNIT 4

Transport layer: Design issues, Connection management, TCP window Management, Port No., Socket Address, User Datagram Protocol, Transmission Control Protocol.

#### UNIT 5

Application layer: DNS; E-mail, SMTP, FTP, POP, SNMP, , TFTP, HTTP; Introduction to Network Security: Symmetric and Asymmetric Cryptography

# TEXT BOOKS:

1. B. A. Forouzan - "Data Communications and Networking (3rd Ed.) " - TMH

2. A. S. Tanenbaum - "Computer Networks (4th Ed.)" - Pearson Education/PHI

3. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

# **Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	With a new approach of communication, a student shall be able to transfer data through respective medium; also he can opt various ways of networking using topologies. A student can also understand the difference between the time and frequency domain transmission in order to analyze various switching modes
CO2	For new IEEE standard, a student should overcome the previous phenomena for networking using different domains. He/ she should know the conditions regarding the channel allocations, collision detection and its avoidance

CO3	For a particular data transfer system, student shall be able to analyze which router is good for networking using different algorithms. A student shall able to differ between the approaches used in congestion control and protocols in network layer
CO4	He/she should be able to know the duties regarding respective layer. A student should be aware of the fact when to use TCP and when to use UDP for synchronization between hop points so that a student can analyze encryption and decryption techniques for proper data transfer
CO5	For securing data and a system, a student can evaluate different procedures and algorithms based on network security and he/she should learn about the protocols to used according to the format of data transfer
CO6	Design and plan cryptography algorithm

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1			1	1						
CO2	1		1	2	1							
CO3	2	3		1	1	1		1				
CO4	1	2	2	1		2	1					
CO5		1	1	2	1	2		1				
CO6	2	1	1	1	1	1	1	1				
Avg.	1.33	1.33	0.83	1.16	0.83	1.16	0.33	0.5				

Course code	: BCS-P32				
Course Name	: Networking Lab				
Semester /Year	: III				
		L	Т	Р	С

#### Course Objectives: The objectives of this course are

Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

# **Course Contents**

- **1.** Understand the fundamental principle of computer.
- **2.** Compare routing algorithms
- **3.** Practice packet file transmission

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Understand the structure and organization of computer networks; including the division into network layers, role of each layer, and relationships between the layers.
CO2	Understand the basic concepts of application layer protocol design; including client/server models, peer to peer models, and network naming.
CO3	In depth understanding of transport layer concepts and protocol design; including connection oriented and connection-less models, techniques to provide reliable data delivery and algorithms for congestion control and flow control
CO4	Design network programs
CO5	Ability to implement client/server communication

# School of CA & IT

CO6	Ability to configure the routing table

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2		2	2	2	2	2	2	2				
CO3			2		2	2		2				
CO4		2	1	1		1	2	1				
CO5	1	2	1	1		1	1	1	1			
CO6	2	1	1	1			1		1			
Avg.	1.0	1.16	1.16	0.83	0.66	1.0	1.0	1.0	0.33			

Course code	: BCS-SEC1.1				
Course Name	: Computer Organization				
Semester /Year	: III				
		L	Τ	P	С
		4	0	0	4

#### **<u>Course Objectives</u>:** The objectives of this course are

- 1. To understand the structure, function and characteristics of computer systems.
- 2. To understand the design of the various functional units and components of computers.
- 3. To identify the elements of modern instructions sets and their impact on processor design.
- 4. To explain the function of each element of a memory hierarchy,
- 5. To identify and compare different methods for computer I/O.

#### **Course Content**

### UNIT 1

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, ArithmeticLogic, Shift Microoperation, Arithmetic Logic Shift Unit, Design of Fast adders, Arithmetic Algorithms(addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.

# UNIT 2

**Control Design:** Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (RegisterTransfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a wordin memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control,Micro programmed control(Microinstruction, Microprogram sequencing, Wide-Branch addressing,Microinstruction with Next-address field, Prefetching Microinstruction).

# UNIT 3

**Processor Design:** Processor Organization: General register organization, Stack organization, addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced InstructionSet Computer.

Input-Output Organization: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct

Memory access, Input-Output processor, Serial Communication.

### UNIT 4

**Memory Organization:** Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2Dand 21/2D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.

TEXT BOOKS:

- 1. Computer System Architecture, PHI/Pearson Education, 3rd Edition, M. Morris Mano
- 2. Digital Computer Fundamentals, Tata McGraw Hill, 6th Edition, Thomas C. Bartee

**Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	Explore the principles of computer design and understand the basic
	organization of computer and BUS architecture of the system.
CO2	Understand the digital representation of data in a computer system and
	performing arithmetic calculations on data.
CO3	Examine the different types of control logic designs in processors,
	instruction set principles and instruction format.
	Illustrate the effect of addressing modes on the execution time of a
	program
CO4	Identify the concepts of memory system, memory mapping Categorize the
	computer memory types based on performance and cost and interpret
	replacement algorithms.
CO5	Explain the concepts of input/output organization, different
	communication schemes and data transfer modes.
CO6	Ability to analyze memory hierarchy and its impact on computer
	Cost/performance.
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# **CO-PO Mapping**

	. <b>T T</b>	8										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	2	-	-	-	2	3	2
CO2	3	2	2	2	-	2	-	-	-	1	3	2
CO3	3	2	2	2	-	1	-	-	-	1	3	2
CO4	2	1	1	1	-	1	-	-	-	1	2	1
CO5	2	1	1	1	-	1	-	-	-	1	2	1
CO6	2	1	1	1	1	1	1	2				
Avg.	2.5	1.5	1.5	1.5	0.16	1.16	0.16	0.33	0	1.0	2.16	1.33

Course code	:	BCS-SEC1.2				
Course Name	:	Introduction to Logic				
Semester /Year	:	III				
			L	Τ	P	С
			3	1	0	4

# L - Lecture T - Tutorial P - Practical C - Credit

#### **<u>Course Objectives</u>:** The objectives of this course are

Introduction to Logic will **teach you the basics of formal logic, which provides symbolic methods for representing and assessing the logical form of arguments**. You will develop an understanding of symbolic language and logic, as well as familiarity with precise models of deductive reasoning

#### **Course Contents**

#### UNIT 1

Introduction: logic, truth tables, equivalence, language to logic, applications to circuit design, exponential

growth, Semantic Tableaux, problem solving with semantic Tableaux.

# UNIT 2

Propositional logic: Syntax of propositional logic, rules of natural deduction, the sequent calculus, resolution

in propositional logic: Normal forms, Resolving arguments, Resolution, Combinatorial search problems.

# UNIT 3

Predicate Logic: Introduction, objects, predicates and quantifiers, functions, first order languages,

quantifiers, scope, and binding, Interpretations, higher order logic, semantic tableaux in predicate logic.

# UNIT 4

Resolution in Predicate Logic: Normal Forms, Herbrand Universes, Resolution, Unification, Problem solving using resolution

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# TEXT BOOKS:

- 1. The Essence of Logic. John Kelly. Prentice-Hall International
- 2. Virginia Klenk, Understanding Symbolic Logic, 5/e, Pearson Education

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Define Logic and various Logic concepts and its application in Computer
	software development.
CO2	Classify, compare, explain use of propositional logic in knowledge representation and truth verification.
CO3	Make use of predicate logic in knowledge representation and truth verification.
CO4	Examine,, simplify, test the use of resolution in propositional logic.
CO5	Deduct, explain, prove use of resolution in predicate logic.
CO6	Build ,create, combine, estimate application of Logics in day to day life

# **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3								
CO2	3	2		1								
CO3	3	2		1								
CO4	3	2		2								
CO5	3		3									
CO6				2								
Avg.	2.5	1.5	0.8	1.5								

Course code	: BCS-SEC1.3				
Course Name	: Multimedia Systems				
Semester /Year	:				
		L	T	P	С
		3	1	0	4

#### **<u>Course Objectives:</u>** The objectives of this course are

- 1. To learn and understand technical aspect of Multimedia Systems
- 2. To understand the standards available for different audio, video and text applications
- 3. To learn various multimedia authoring systems.

#### **Course Contents**

#### UNIT 1

Introduction to Multimedia, Applications of Multimedia, Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software, Authoring Tools, MIDI

# UNIT 2

Multimedia Building Blocks- Text, Image, Sound, Video, Animation

#### UNIT 3

Sound, Analog and Digital Audio, Sampling, Audio File Formats, Conversion from Analog to Digital Audio

# UNIT 4

Bitmap and Vector Images Image standards and classifications, Image File Formats, Image Compression for JPEG, GIF, and PNG, Lossy ad Lossless Compression for Images and Audio, Animation Concepts and Techniques, Computer Animation, Video capture and representation, and Database.Content based retrieval for text and images, Video Video representation, Colors, Video Compression, MPEG standards, MHEG Standard, Video File Formats

# UNIT 5

Recent developments in Multimedia, Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Content Based Retrieval

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# TEXT BOOKS:

- 1. Buford "Multimedia Systems" Addison Wesley.
- 2. Agrawal & Tiwari "Multimedia Systems" Excel.

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Understanding of technical aspect of Multimedia Systems
CO2	Describe various multimedia blocks
CO3	Understand various file formats for audio, video and text media.
CO4	Understand the image file formats
CO5	Appraise the recent developments in multimedia
CO6	Discuss technical aspects of multimedia

# **CO-PO Mapping**

	PP	8										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3		3								
CO2	2	3		2								
CO3	2	3	3	2			1					
CO4	2	3	3	2			1					
CO5	2	3	3	3	2		1					
CO6	2	3		3								
Avg.	2	3	1.5	2.5	0.3	0	0.5	0	0	0	0	0

[No. of Hours: 6]

[No. of Hours: 10]

[No. of Hours: 8]

[No. of Hours: 4]

Course code	: BCS-SEC1.4				
Course Name	: SYSTEM ANALYSIS & DESIGN				
Semester /Year	: IIIrd Semester				
		L	Τ	Р	С
		4	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

#### **Course Objectives: The objectives of this course are**

- 1. To study different types of system and life cycle of system development.
- 2. To learn roles of system analyst and different information gathering tools.
- 3. To learn use tools for structured analysis, cost/benefit strategies and feasibility study.
- 4. To learn process and stages of system design and form design.
- 5. To learn system testing and quality assurance with proper hardware and software selection.

# **COURSE CONTENTS**

#### Unit I

System Concepts and Information System Environment- The System Concept, Definition, Characteristics of Systems, Elements of a System, Open and Closed and closed system, Formal and Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System

#### Unit II

The System Development Life Cycle- Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation and Maintenance. The Role of the Systems Analyst, Academic and Personal Qualifications, Skills of System Analyst

#### Unit III

Systems Planning and Initial Investigation- Strategies for Determining Information Requirement, Problem Definition and Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews and Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis. Information Gathering- Kind of Information needed. Information about the firms, Information gathering tools, the art of Interviewing, Arranging the Interview, Guides to Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives.

#### Unit IV

The Tools of Structured Analysis- The Dataflow Diagram (DFD), Data Dictionary, Decision Table, Decision Trees and Structured English.

#### Unit V

Input/Output and Forms Design- Input Design, CRT Screen Design, Output Design, Requirements form Design.

# [No. of Hours: 12]

#### 49

# **Text Books:**

TB1. Elias M.Awad, "Systems Analysis and Design" Galgotia Publication

TB2. System Analysis and Design Handbook: V. K. Jain, Wiley dreamtech

# **Reference Books:**

RB1. Hoffer, "Modern Systems Analysis and Design" Addision Wesley

RB2. Kendall, "Introduction to System Analysis and Desogm", McGraw Hill

# **Course outcomes (COs):**

# Upon successful completion of the course a student will be able to

<b>CO</b> #	Detailed Statement of the CO
CO1	Defining the concept of system, analysis, design, system analyst and system
	development life cycle.
CO2	Understand and describe the work done during the development of a system.
CO3	Apply the fact-finding techniques to collect information to generate the system's
	requirements for the development of a system constructs.
CO4	Analyze the system using data flow diagram, data dictionary and process
	specification tools to understand how each process is working and connected to
	others. Analyze the GUI, input/output screen and reports layouts.
CO5	Evaluate the system planning tools and techniques and testing of software projects to
	ensure its correctness and completeness.
CO6	Implement the newly developed system and giving training to the users.

# **CO-PO** Mapping

	<b>PO1</b>	<b>PO2</b>	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11	<b>PO12</b>
CO1	2	1	1	1	1			1				
CO2	2	3	2	2		2	3			1	1	1
CO3	1	3	2	3	1		1			1	2	1
CO4	2	3	1	3			2	1		1	2	1
CO5		1	1	1		2	1			1		
CO6	2	1		1	2	2	3	1		1	3	1
AVG	1.5	2	1.2	1.8	0.7	1	1.7	0.5		0.8	1.3	0.7

Course code	: BCS-SEC1.5				
Course Name	: Introduction to Blockchain				
Semester /Year	:				
		L	Τ	Р	С
		3	1	0	4

#### **<u>Course Objectives</u>:** The objectives of this course are

The objective of this course is to provide conceptual understanding of how blockchain technology can be used to innovate and improve business processes. The course covers the technological underpinning of blockchain operations in both theoretical and practical implementation of solutions using blockchain technology.

### **Course Contents**

Unit I

Introduction to Blockchain Technology and its Importance Basic Crypto Primitives I – Cryptographic Hash

Unit II

Basic Crypto Primitives II – Digital Signature Evolution of the Blockchain Technology Elements of a Blockchain

Unit III

Blockchain Consensus I – Permissionless Models Blockchain Consensus II – Permissioned Models

Unit IV

Smart Contract Hands On I – Ethereum Smart Contracts (Permissionless Model) Smart Contract Hand On II – Hyperledger Fabric (Permissioned Model)

#### Unit V

Decentralized Identity Management, Blockchain Interoperability, Blockchain Applications

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Explain the fundamental characteristics of blockchain using bitcoin
CO2	Demonstrate the application of hashing and public key cryptography in protecting the blockchain
CO3	Demonstrate the application of hashing and public key cryptography in protecting the blockchain
CO4	Demonstrate the application of hashing and public key cryptography in protecting the blockchain
CO5	Explain elements of trust in Blockchain: validation, verification, consensus
CO6	Design Decentralized Identity.

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3				2							
CO2		2			2							
CO3			2									
CO4				2	2							
CO5	2			1						2		
CO6	1	2	2	2	2	2	2	2				
Avg.	1.0	0.66	0.66	0.83	1.33	0.33	0.33	0.33		0.33		

Course code	:	BCS-401					
Course Name	:	DBMS					
Semester /Year	:	IV					
				L	Т	Р	С
				4	0	0	4

#### **<u>Course Objectives</u>:** The objectives of this course are

- 1. Develop a broad understanding of database concepts and database management system software, data models, schemas and instances, data constraints, relational algebra and calculus.
- 2. Acquire Knowledge to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
- 3. Be able to write SQL commands to create and manipulate databaseobjects. Be able to discuss importance of normalization and improve the database design by applying various normal forms

# **BCA-401: Database Management System**

#### Unit I( No. of Hours: 7)

Database fundamental concepts, Advantages and Disadvantages of DBMS, Database Administrator, Architecture of DBMS, Schema and Sub Schema, Data Models: Hierarchical data Model, Network Data Model, Relational Data Model.

#### Unit II ( No. of Hours: 7)

Keys: Super Key, candidate key, Primary key, Foreign Key; Referential Integrity, Entity, Attribute, Relationship, Generalization and Specialization, Entity – Relationship (E-R) Data Model,

#### Unit III ( No. of Hours: 8)

Relationship Degree, Relational Algebra, Relational calculus: Tuple relational calculus, Domain relational calculus.

#### Unit IV (No. of Hours: 10)

Database design and Normalization: Function Dependency, Lossless – Join Decomposition, Dependency Preservation, Anomalies in a database, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF

Unit V(No. of Hours: 10)

SQL: Creating table, DDL, DML, Restricting and Sorting Data, Single-Row Functions, Aggregated Data Using the Group Functions, Joining, Sub queries, Keys.

# **REFERENCE BOOKS**:

- 1. Elmsari and Navathe, "Fundamental of Database System", Addison Wesley. New York.
- 2. H.Korth& A. Silberschatz, "DATABASE SYSTEM CONCEPTS", TMH.
- 3. Date. CJ, "An Introduction to Database System", NarosaPublishingHouse. New Delhi.
- 4. Desai, B, "An Introduction to Database Concepts", GalgotiaPublications. New Delhi.
- 5. Ullman. J.D, "Principles of Database Systems", Galgotia Publications, New Delhi.

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Able to understand the basic concepts of DBMS, Difference between
	DBMS and File Processing System, applications of DBMS and various
	DBMS Models
CO2	Able to understand the basic concepts of ER Model and How to draw ER
	Diagrams domain relation expression for SQL queries
CO3	Ability to define various constraints and writing queries using SQL syntax.
CO4	Applying the Relational algebra and Calculus to define expressions for queries
CO5	Examine the use of normalization and functional dependency for database design.
CO6	Create SQL queries for DDL,DML,DQL etc.

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			1	1						
CO2	3	1	2			1	1	2				
CO3		2	3	1	1	2	2					
CO4	1	3	2	2		2	1				1	1
CO5		2	2	1	1	1		1		2	1	1
CO6	2	2	2	4			1	1	1	1		
Avg.	1.5	1.83	1.83	1.33	0.5	1.16	0.83	0.66	0.16	0.5	0.33	0.33

Course code	: BCS-P41					
Course Name	: DBMS Lab					
Semester /Year	: IV					
		Ι	[]	Т	Р	С
		0	)	0	4	2

#### **<u>Course Objectives</u>:** The objectives of this course are

- 1. Working expertise of DDL and DML commands with their application on solving real time problems.
- 2. Ability to apply filters using where clause and nested queries, integrity constraints at table level and column level and to use built-in functions including numeric, character and date functions.
- **3.** Adequate knowledge to fetch data from multiple tables using different types of JOIN operations.
- **4.** Knowledge of the generic structure of PL/SQL programs.

#### **Course Content**

1.	SQL queries for Data Definition and Data Manipulation Language.
2.	SQL queries using logical operations (=,<,>,etc)
3.	SQL queries using SQL operators
4.	SQL query using character, number, date and group functions
5.	SQL queries for relational algebra
6.	SQL queries for extracting data from more than one table
7.	SQL queries for sub queries, nested queries

# **Course outcomes** (COs):

Upon successful completion of the course a student will be able to

CO1	Translate an information model into a relational database schema and
	to implement the schema using RDBMS
CO2	Apply advanced SQL features like views, indexes, subqueries, etc. for database management
CO3	Analyze SQL structures like join.
CO4	Examine database administration concepts likeGRANT, REVOKE etc. through SQL commands.
CO5	Work in teams to design solutions for real world problems/case studies by creating efficient database schema.
CO6	Work in teams to design solutions for real world problems/case studies by creating efficient database schema.

# **CO-PO Mapping**

	<b>F F</b>	0										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			1	1						
			2									
CO2	3	1	2	1	2	1						
CO3	2	2	3	1	1	2						
CO4	1	3	2	2		2	1			1		
CO5	2	2	2	1	1	1	2	1	2	2	1	1
CO6	2	2	2	1			1	1	1	1		
Avg.	2.16	1.83	2.16	1.0	0.83	1.16	0.66	0.33	0.5	0.66	0.16	0.16

Course code	: BCS-402				
Course Name	: Software Engineering				
Semester /Year	: IV				
		L	Τ	P	С
		4	0	0	4

# **<u>Course Objectives</u>:** The objectives of this course are

- To provide the concepts of software crisis, issues, characteristics, evolution and application with respect to software engineering.
- To give fundamental aspects of software development with respect to requirement engineering, requirement analysis, design, coding, testing and maintenance.
- To give knowledge of practical implementation of software coding style and software testing strategies for software development.
- To provide the practical knowledge in software design, object oriented design and software development in terms of software implementation and maintenance.
- To provide the practical knowledge for ensuring the quality and reliability of software during software development using models

# **Course Contents**

# UNIT1

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC)

Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

# UNIT 2

Software Requirement Specifications (SRS) : Requirement Engineering Process- Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

# UNIT 3

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

# UNIT 4

Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of products. Static Testing Strategies: Formal Technical, Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

# UNIT 5

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities.

An Overview of CASE Tools.Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

#### TEXT BOOKS:

- 1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed.Boston: McGraw Hill, 2001
- 2. Jalote, Pankaj, "Software Engineering Ed.2"New Delhi: Narosa 2002
- 3. Schaum's Series, "Software Engineering" TMH
- 4. Ghezzi Carlo and Others "Fundamentals of Software Engineering" PHI

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Learn the concepts of software crisis, issues, characteristics, evolution and application with respect to software engineering.
CO2	Know the fundamental aspects of software development with respect to requirement engineering, requirement analysis, design, coding, testing and maintenance.
CO3	Find the practical implementation of software coding style, design and software testing strategies.
CO4	Enhance the knowledge of management of software project from initial stage to final stage for software development.
CO5	Access the practical knowledge for ensuring the quality and reliability of software during software development using models.
CO6	Design COCOMO model

# **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		1		2	2					
CO2	3	1		2	1	1	1					
CO3	1	2	3	2	3	1	2	1			1	
CO4	2	1	1		1	1	2	3				
CO5	1	2	3	3	2	2	2	1			1	
CO6	1	2	3	1	1	2	2	1				
Avg.	1.83	1.5	1.66	1.5	1.33	1.5	1.83	1.0	0	0	0.33	

Course code	: BCS-SEC2.1				
Course Name	: Object Oriented Programming using C++				
Semester /Year	: IV				
		L	Т	P	С
		3	1	0	4

#### **<u>Course Objectives</u>:** The objectives of this course are

The objective of course is to develop programming skills of students, using object oriented programming concepts, learn the concept of class and object using C++ and develop classes for simple applications.

#### **Course Contents**

**Unit I** : Introduction: Introduction to OOP, Basic Concepts of OOP, Applications of OOP. Introduction to C++, Introduction to C++ stream I/O, declarations in C++, Creating New data types in C++, function Prototypes, Inline functions, Reference Parameters, Const Qualifier, Dynamic memory allocation, default arguments, Unary Scope resolution operator, Linkage specifications.

**Unit II**: Class, Constructors, Friend Class : Introduction, Comparing class with Structure, Class Scope, Accessing Members of a class, Constructor, Destructor, Const objects, Const member functions, Friend class, Friend function, This pointer, Data abstraction and Information hiding, container classes and Iterators

**Unit III**: Overloading & Inheritance: Operator Overloading, Fundamentals, Restrictions, Overloading stream, Insertion and stream extraction operators, Overloading unary & binary operators, Converting between types, Overloading ++ and --.

**Unit IV**: Inheritance, Introduction, Protected members, Casting base \_class pointers to derived \_class pointers Overloading Base class members in a Derived class, Public, Protocols and Private inheritance, Direct base classes and Indirect Base Classes, Using Constructors and Destructors in Derived classes, Implicit Derived class object to base class object conversion.

**Unit V** : Virtual Functions: Introduction, Type fields and switch statements, Virtual functions, Abstract base classes and concrete classes, Polymorphism, Dynamic binding, Virtual destructors. C++ Stream I/O: Streams, Stream Input, Stream Output, Unformatted I/O, Stream manipulators, Stream format states, Stream error, States.

Files : File Operations – File pointers – error Handling during file Operations

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TEXT BOOKS:

- 1. Herbert Scheldt, "Complete Reference".
- 2. E. Balagurusamy "Object Oriented Programming with C++".
- 3. YashwantKanetkar, "Let Us C++".
- 4. C++ Programming by Herbert Scheldt 2004.

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Identify importance of object oriented programming and difference between structured
CO2	Able to make use of objects and classes for developing programs
CO3	Able to use various object oriented concepts to solve different problems.
CO4	Implement Inheritance
CO5	Understand use of friend function
CO6	Understand virtual functions

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2					2						
CO2		2		2								
CO3			1					1				
CO4							2	1				
CO5	2			2			1	1				
CO6	2	1	1	2								
Avg.	1.0	0.5	0.33	1.0	0	0.33	0.5	0.5	0	0	0	0

Course code	: BCS-P42				
Course Name	: C++ Lab				
Semester /Year	: IV				
		L	Τ	P	С
		0	0	4	2

# **<u>Course Objectives</u>:** The objectives of this course are

- To learn the fundamental programming concepts and methodologies which are essential to building good C/C++ programs.
- To practice the fundamental programming methodologies in the C/C++ programming language via laboratory experiences. Microsoft Visual Studio is the programming environment that will used.
- To code, document, test, and implement a well-structured, robust computer program using the C/C++ programming language.
- To write reusable modules (collections of functions).

# **Course Contents**

- **1.** use oop concepts to implement the program
- 2. write program to implement different types of inheritance
- 3. write program to implement virtual functions

# **Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	Create and analyze algorithms for solving simple problems.
CO2	Write program using classes and objects
CO3	Implement different form of inheritance
CO4	Implement different OOPs concepts
CO5	Design class using friend funtion
CO6	Design Virtual functions

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				2		2					
CO2		3	2	2								
CO3			2									
CO4												
CO5			2	1	2							
CO6	2	2	1	1			2					
Avg.	0.66	0.83	1.16	0.66	0.66	0	0.33	0	0	0	0	0

Course code	: BCS-SEC2.2				
Course Name	: Programming in Python				
Semester /Year	: IV				
		L	Τ	P	С
		4	0	0	4

# **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

# **Course Objective**

- To understand why Python is a useful language for developers.
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to identify Python object types.
- To learn how to use indexing and slicing to access data in Python programs.
- To define the structure and components of a Python program.
- To learn how to write loops and decision statements in Python.
- To learn how to write functions and pass arguments in Python.
- To learn how to read and write files in Python.
- To learn how to design object oriented programs with Python classes.
- To learn how to use class inheritance in Python for reusability.
- To learn how to use exception handling in Python applications for error handling.
- To learn about the regular expressions

# **Course Contents**

**Unit I**: Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

Overview of Programming : Structure of a Python Program, Elements of Python

**Unit II**: Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator,

Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)

Unit III: CreatingPython Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass), Defining Functions, default arguments, Errors and Exceptions.

Unit IV : Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables, Strings andLists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, Listvalues, Accessing elements, List length, List membership, Lists and for loops, Listoperations, List deletion. Cloning lists, Nested lists.

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries.Data Structures: Arrays, list, set, stacks and queues.

Unit V: Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertion sorting.

Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists

Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries. Data Structures: Arrays, list, set, stacks and queues.

Searching and Sorting: Linear and Binary Search, Bubble, Selection and Insertionsorting.

#### **TEXT BOOKS:**

- TB1. Budd T A, "Exploring Python", McGraw-Hill Education, 1<sup>st</sup> Edition, 2011.
- TB2. Mark Lutz, "Learning Python", O'Reilly, 4<sup>th</sup> Edition, 2013.
- TB3. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 1<sup>st</sup> Edition, 2013.

#### **REFERENCE BOOKS:**

- RB1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs", Cengage Learning, 1<sup>st</sup> Edition, 2011.
- RB2. Allen Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly, 2<sup>nd</sup>Edition, 2015.
- RB3. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, 1<sup>st</sup> Edition, 2017.
- RB4. Joel Grus, "Data Science from Scratch", O'Reilly, 2<sup>nd</sup> Edition, 2019.
- RB5. Tony Gaddis, "Starting out with Python", Pearson, 3<sup>rd</sup> Edition, 2014.

**Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Knowledge and remember the programming constructs used in python.
CO2	Understanding the facts behind the sequences, functions, modules, files,
	database and object oriented etc. used in Python
CO3	Apply data structure primitives like strings, lists, tuples, sets and
	dictionaries on various types of data with or without using functions,
	object-oriented concepts to the programs in Python etc.
CO4	Distinguish and analyze basic constructs of Python and how constructs
	can be used all together.
CO5	Evaluate the programming constructs of Python to provide verdict on
	findings.
CO6	Create python programs using various programming constructs of
	Python.

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1		2				2		
CO2	3	3	3	2	1	1				2		
CO3	3	3	3	2	1	1						
CO4	3	3	3	2	1	1	1	1		2	1	
CO5	3	3	3	2	1	1			2			2
CO6	3	3	3	3	1	1	1	1	1	1	1	1
Avg.	3	5.3	5.3	2	0.8	1.2	0.3	0.3	0.5	1.2	0.3	0.5

Course code	: BCS-P42				
Course Name	: Programming in Python Lab				
Semester /Year	: IV				
		L	Τ	Р	С
		0	0	4	2

#### **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to identify Python object types.
- To learn how to use indexing and slicing to access data in Python programs.
- To define the structure and components of a Python program.
- To learn how to write loops and decision statements in Python.
- To learn how to write functions and pass arguments in Python.
- To learn how to read and write files in Python.
- To learn how to design object oriented programs with Python classes.
- To learn how to use class inheritance in Python for reusability.
- To learn how to use exception handling in Python applications for error handling.
- To learn about the regular expressions

#### **Course Contents**

- **1.** To acquire programming skill in core python
- 2. To acquire object oriented skill in python
- **3.** To develop the ability to write database application in Python

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Describe the program creation in Python through usage of appropriate constructs
CO2	Demonstrate the working of basic programming constructors in Python.
CO3	Apply data structure primitives like strings, lists, tuples, sets and dictionaries on various types of data with or without using functions, object-oriented concepts to the programs in Python etc.
CO4	Analyze basic constructs of Python and how constructs can be used all together.
CO5	Evaluate the programs and its logic.
CO6	Develop programs using methods of constructs define in Python.

# **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1			3	1	2				
CO2	3	1	2	3		3	2	3				
CO3	3	2	3	3	1	2	2	3				
CO4	2	1	3	3	2	3	2	3				
CO5	3	1	3	1	2	3	2	3				
CO6	3	2	2	3	1	2	2	3	1	1		1
Avg.	2.8	1.3	2.3	2.2	1	2.7	1.8	2.8	0.2	0.2		0.2

Course code	: BCS-SEC2.3				
Course Name	: R Programming				
Semester /Year	: IV				
		L	Τ	Р	С
		3	1	0	4

# Course Objectives: The objectives of this course are

The objective of this module to make students exercise the fundamentals of statistical analysis in R environment. They would be able to analysis data for the purpose of exploration using Descriptive and Inferential Statistics. Students will understand Probability and Sampling Distributions and learn the creative application of Linear Regression in multivariate context for predictive purpose.

# **Course Contents**

Course code	: BCS-SEC2.3				
Course Name	: R Programming				
Semester /Year	: IV				
		L	Т	Р	С
		3	1	0	4

 $L \ \ - \ Lecture \ T - Tutorial \ P - Practical \ C - Credit$ 

# Course Objectives: The objectives of this course are

The objective of this module to make students exercise the fundamentals of statistical analysis in R environment. They would be able to analysis data for the purpose of exploration using Descriptive and Inferential Statistics. Students will understand Probability and Sampling Distributions and learn the creative application of Linear Regression in multivariate context for predictive purpose.

# **Course Contents**

# Unit I

Introduction to R:What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), packageDescription(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf

# Unit II

R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

# Unit III

R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List

# Unit IV

Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast().

# Unit V

Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Spotting Problems in Data with Visualization: visually Checking Distributions for a single Variable - R –Pie Charts: Pie Chart title and Colors – Slice Percentage

TEXT BOOKS:

- 1. William N. Venables and David M. Smith, An Introduction to R. 2nd Edition. Network Theory Limited.2009
- 2. Norman Matloff, The Art of R Programming A Tour of Statistical Software Design, No Starch Press.2011

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Describe key terminologies, concepts and techniques employed in Statistical Analysis.
CO2	Define, Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
CO3	learn the main R data structures – vector and data frame.
CO4	Implement Arrays in R
CO5	Understand mean, median, mode and standard deviation
CO6	Design correlation problems

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2			3									
CO3		2										
CO4	2		1									
CO5	1	2		2								
CO6	2	3	2									
Avg.	1.16	1.16	1.0	0.33	0	0	0	0	0	0	0	0
Course code	: BCS-P42 SEC2 Lab											
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Course Name	: R Programming Lab											
Semester /Year	: IV											
		L	Τ	P	С							
		0	0	4	2							

#### **Course Objectives:** The objectives of this course are

- □ Master the use of the R and RStudio interactive environment.
- □ Expand R by installing R packages.
- □ Explore and understand how to use the R documentation.
- □ Read Structured Data into R from various sources.

#### **Course Contents**

- 1. download and install R and RStudio.
- 2. install and load add-in packages.

#### **Course outcomes** (COs):

CO1	Show the installation of R Programming Environment.
CO2	Utilize and R Data types for developing programs.
CO3	Make use of different R Data Structures
CO4	Develop programming logic using R Packages.
CO5	Design R programs
CO6	Plan data base with R language

### **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								
CO2	1	3	1	1								
CO3	1	1	2	1								
CO4				2								
CO5	1			2								
CO6	2	3	2	1	2							
Avg.	1.33	1.5	1.0	1.33	0.33	0	0	0	0	0	0	0

Course code	: BCS-SEC2.4				
Course Name	: Perl - CGI				
Semester /Year	: IV				
		L	Τ	Р	С
		3	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

#### Course Objectives: The objectives of this course are

- Basic introduction to programming using Perl.
- Knowledge of CGI scripts.
- Basic Object Oriented Concepts and database connectivity in Perl.

#### **Course Contents**

Unit I Installation of Perl, Variables in Perl, Comments in Perl: Single Line, Multi Line;

Unit II **Loops in Perl:** for Loop, for-each Loop, while Loop, do-while Loop;

Conditional Statements: if-Else Statement, switch Statement;

#### Unit III

**Data Structures in Perl**: Scalar, Array, Associative Array or Hash, Array functions; Hash in Perl; Functions in Perl; Blocks in Perl; Access Modifiers in PERL; Referencing & Dereferencing in Perl; Special Variables in PERL;

#### Unit IV

**File Handling;** Exception and error handling in PERL; Including files and/or modules in a PERL program; PERL & HTML; Function Prototyping; Oops in Perl; Exporting functions in Perl; Pattern Matching / Regular expression in Perl;

#### Unit V

**Database handling**; Multithreading; Socket Programming: use IO::Socket::INET;

TEXT BOOKS:

#### School of CA & IT

- 1. CGI Programming with Perl, 2nd EditionCreating Dynamic Web Pages, Gunther Birznieks, Scott Guelich, ShishirGundavaram, O'Reilly Media.
- 2. IvanBayross, "Web Technologies Part-II" BPB Publications

#### **Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	Understand basics of Perl
CO2	Understand list arrays and hash.
CO3	Understand modules
CO4	Understand multithreading & socket programming
CO5	Design web page using HTML
CO6	Plan pattern matching expression in perl

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	2	2	2									
CO3	2	2		2								
CO4	2	1										
CO5	2		2	1	2							
CO6	2	1	3	1	2	1						
Avg.	2.16	1.33	1.16	0.66	0.66	0.16	0	0	0	0	0	0

Course code	: BCS-P42				
Course Name	: SEC2 Lab				
Semester /Year	: IV				
		L	Τ	P	С
		0	0	4	2

#### $L \ \ - \ Lecture \ T - Tutorial \ P - Practical \ C - Credit$

#### Course Objectives: The objectives of this course are

- Describe the Perl Programming Language
- Implement Scalars Data Structures
- List Control Structures
- Implement Arrays

#### **Course Contents**

Describe the Perl programming language. Implement scalars List control structure Implement basic I/O and regular expression

### **Course outcomes** (COs):

CO1	Working with Web Server
CO2	Understand loops in perl
CO3	Understand syntax of perl
CO4	Create dynamic web pages
CO5	Design file handling in perl
CO6	Implement database handling

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	1	3	2									
CO3			2									
CO4	2	1	2									
CO5	1	2	2	2								
CO6	2	1	2	3	2	2	1					
Avg.	1.5	1.5	1.83	0.83	0.33	0.33	0.16					

Course code	: BCS-SEC2.5				
Course Name	: Java Script				
Semester /Year	: IV				
		L	Τ	P	С
		3	1	0	4

#### **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

- Develop familiarity with the JavaScript language.
- Learn to use best-practice idioms and patterns.
- Understand concepts commonly used in dynamic language programming, such as introspection, higher-order functions, and closures.
- Understand advanced language features such as prototypical interhitance.
- Become adept at implementing client-side interfaces through the use of the DOM, jQuery and AJAX.
- Become familiar with common libraries and tools that are used in web application development.

#### **Course Contents**

**Unit I** Introduction to JavaScript

SCRIPT and NOSCRIPT tags Placing JavaScript on a webpage Using variables

Using functions Operators Conditionals and loops

Unit II Putting JavaScript to Work

Events The navigator object Cookies and local data JavaScript timers: SetTimeout and SetInterval

Arrays JavaScript arrays Properties and methods of arrays Associative arrays

#### Unit III Forms

Accessing the form element The form object Accessibility Validation Using form-based navigation

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Unit IV Introduction to jQuery

What is jQuery Downloading data using jQuery

Unit V jQuery: Styling Elements

Selecting elements Reading and setting Cascading Style Sheets (CSS) properties Classes Adding and removing elements Modifying content

### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

G01	
COI	Apply intermediate and advanced web development practices.
CO2	Create visualizations in accordance with UI/UX theories.
CO3	Create webpages that function using external data.
CO4	Understand JQuery
CO5	Plan HTML with CSS
CO6	Design jQuery

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1								
CO2	1	3	1	2								
CO3			2			2						
CO4												
CO5	2	2										
CO6	2	2	2	1	1	1	1					
Avg.	1.33	1.33	1.16	0.66	0.16	0.5	0.16					

Course code	: BCS-P42				
Course Name	: Java Script Lab				
Semester /Year	: IV				
		L	Τ	Р	С
		0	0	4	2

#### **<u>Course Objectives</u>:** The objectives of this course are

- To develop an ability to design static dynamic websites.
- Prepare java script for dynamic effects
- Understand analyze and create xml documents
- Use appropriate client or server side applications.

**Course Contents** 

- Design static home page, login page.
- Write java script to validation
- Develop and demonstrate inline CSS
- Develop pop-up boxes

#### **Course outcomes** (COs):

CO1	Design and implement dynamic website
CO2	Create web pages using HTML css.
CO3	Analyze web pages its element and attribute
CO4	Able to decide which type of style sheet is suitable to use in particular case by analyzing the inline, internal and external type of CSS.
CO5	Analyze xml documents
CO6	Design client – server applications

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	-	1	-	2	-	-	-
CO2	2	2	3	1	-	-	1	-	1	-	-	-
CO3	1	1	1	-	-	-	-	-	2	-	-	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-
CO5		1	2									
CO6	1	2	1	2	1	1	2					
Avg.	1.5	2.0	2.0	0.66	0.5	0.16	0.66	0	0.66	0	0	0

Course code	: BCS-501				
Course Name	: Web Technology				
Semester /Year	: V				
		L	Т	P	С

#### **<u>Course Objectives:</u>** The objectives of this course are

- 1. To learn the basic concepts of world wide web.
- 2. To learn the basic concepts and syntax of HTML and CSS programming.
- 3. To be able to develop logics which help them to create programs and applications using HTML & CSS language.
- 4. To use the types of CSS and CSS Overriding in a web site.
- 5. To learn the skills that will help the students in creating websites with great look and feel using CSS.

#### **Course Contents**

#### **Unit-I: Introduction**

Introduction to the Internet, Introduction to HTML Terminology, **Designing a Webpage:** Design Considerations and Planning, Basic Tags and Document Structure, HTML Tags, Head Tags, Title Tags, Body Tags, Metadata, Saving an HTML Page

#### Unit II:Page Formatting and Links

#### Hours]

Adding a New Paragraph, Adding a Line Break, Inserting Blank Space, Preformatted Text, Changing a Page's Background Color, Div Element. **Text Items and Objects:** Headings, Comments, Block Quotes, Horizontal Lines. Special Characters.**Creating Lists:** Numbered (Ordered) Lists, Bulleted (Unordered) Lists, Nested Lists, Definition Lists. What are Links?, Text Links, Image Links, Opening a Page in a New Window or Tab, Setting all Links on a Page to Open in a New Window or Tab, Linking to an Area on the Same Page (Bookmarks), Linking to an E-mail Address, Linking to Other Types of Files. **Images:** Introduction to Images for Webpages, Adding Images to Webpages, Resizing an Image, Alternative (ALT) Text, Image Labels.

#### **UNIT III: Tables& Forms**

Inserting a Table, Table Borders, Table Headers,Col and row span, **IFrames:** What is an Iframe?, Inserting Iframes, Setting Height and Width, Using an Iframe for a link target. **Forms:** About Forms, Text Boxes, Text Areas, Check Boxes, Menu Lists, Radio Buttons, The Submit Button, The Reset Button, Changing the Tab Order, Sending to E-mail, event handling **UNIT IV:Video and Audio** [6 Hours]

# [8 Hours]

# [8

[8 Hours]

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About Video and Audio Files, Linking to Video and Audio Files, Adding Video, Adding Audio, Using YouTube to Display Video.

#### **UNIT V:Cascading Style Sheets**

#### [12 Hours]

CSS Introduction, CSS Syntax, Creating an External CSS, Linking to a CSS, Adding Comments and Notes to a CSS, Creating an Internal Style Sheet, ID and Class, Inline Styling. **Working With Text in CSS:** Emphasizing Text (Bold and Italic), Decoration, Indentation, Transformation, Text Alignment, Fonts, Font Sizes, Letter Spacing, Text Color, Margins, Padding, Borders, Styling Links, Number and Bullet Styles, Sizing Elements, Text Wrapping, Shadowing. Colors, Images, Fixed Images. **Images in CSS:** Opacity, Floating Images, Image Galleries, Image Sprites. **Box Model in CSS:** What is a box model?, Margin, Padding, Border, Outline. **Adding a Navigation Bar in CSS:** Vertical Navigation Bar, Horizontal Navigation Bar – Inline, Horizontal Navigation Bar – Floating. **CSS Tables:** Borders, Collapsed Borders, Table Width and Cell Height, Table Color, Table Text Element, Table Padding.

#### **Book References:**

- 1. HTML & CSS: The Complete Reference, Fifth Edition, Thomas A. Powell.
- 2. Burdman, "Collaborative Web Development", Addison Wesley
- 3. Sharma & Sharma, "Developing E-Commerce Sites" Addison Wesley
- 4. IvanBayross, "Web Technologies Part-I" BPB Publications

#### **Course outcomes** (COs):

CO1	Able to understand the basic concepts and write HTML programs.
CO2	Able to design and develop various programming
	problems using CSS programming concepts.
CO3	Able to Implement concepts like changing look-n-feel of the multiple web pages from single source using CSS.
CO4	Able to decide which type of style sheet is suitable to use in particular case by analyzing the inline, internal and external type of CSS.
CO5	Able create and evaluate the websites with professional look and feel using both HTML and CSS.
CO6	Create Audio Video in web page.

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	1	-	1	-	2	-	-	-
CO2	2	2	3	1	-	-	1	-	1	-	-	-
CO3	1	3	2	-	-	-	-	-	2	-	-	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	1	-	-	-	-	-	-	-	-	1
CO6	2	1	1	2	1			1				
Avg.	2.16	2.5	2.16	0.66	0.33	0	0.33	0.16	0.83	0	0	0.16

Course code	: BCS-P51				
Course Name	: Web Technology Lab				
Semester /Year	: V				
		L	Т	P	С
		0	0	4	2

#### **<u>Course Objectives:</u>** The objectives of this course are

- 1. To learn the basic concepts of world wide web.
- 2. To learn the basic concepts and syntax of HTML and CSS programming.
- 3. To be able to develop logics which help them to create programs and applications using HTML & CSS language.
- 4. To use the types of CSS and CSS Overriding in a web site.
- 5. To learn the skills that will help the students in creating websites with great look and feel using CSS.

#### **Course Content**

- 1. Analyze a web page and identify its elements and attributes.
- 2. Create web pages using XHTML and Cascading Style Sheets.
- 3. Build dynamic web pages using JavaScript (Client side programming)

### **Course outcomes** (COs):

CO1	Able to understand and implement the basic website concepts and write HTML programs
CO2	Able to design and develop various programming problems using CSS programming concepts.
CO3	Able to Implement concepts like changing look-n-feel of the multiple web pages from single source using CSS.
CO4	Able create and evaluate the websites with professional look and feel using both HTML and CSS.
CO5	Embed audio and video in web page
CO6	Combine HTML with CSS

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	1	-	1	-	2	-	-	-
CO2	2	2	3	1	-	-	1	-	1	-	-	-
CO3	1	3	2	-	-	-	-	-	2	-	-	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	1	-	-	-	-	-	-	-	-	1
CO6	2	1	1	2	2	1	1	2	1			
Avg.	2.16	2.5	2.16	0.66	0.5	0.16	0.5	0.33	1.0	0	0	0.16

Course code	: BCS-502				
Course Name	: .Net Programming				
Semester /Year	: V				
		L	Τ	P	С
		3	1	0	4

#### **<u>Course Objectives</u>:** The objectives of this course are

- 1. To study the features of .NET Technologies and to understand the framework and environment.
- 2. To learn C# programming fundamentals for console application development.
- 3. To learn use of C# libraries and exception handling techniques.
- 4. To learn ADO. NET and advance features of C#.
- 5. To learn .NET assemblies and attributes

#### **Course Contents**

#### UNIT 1(No. of Hours:07)

Introduction to .NET Framework- .NET framework, MSIL, CLR, CLS, CTS, Just in time (JIT) Compiler, Base class library, Namespaces, Assemblies, DLL Hell -Problem ,Garbage Collection.

#### UNIT 2(No. of Hours:11)

C# Object oriented programming- OOPs, Classes and objects, loops, Array, Encapsulation, Inheritance, Polymorphism, Interface ,Constructor and Destructors, Method Overloading ,Method overriding, Operator Overloading, Modifiers, Indexers , Collections Namespaces, Delegates, Exception Handling.

#### UNIT 3 (No. of Hours:07)

Microsoft .NET IDE- Creating a Project and solution, Building project, Debugging project, Solution Explorer, Toolbox, Server Explorer, Property Window, Windows Forms and Controls in details-The Windows Forms Model, Creating Windows Forms Windows Forms Properties and Events, Windows Form Controls .

#### UNIT 4 (No. of Hours:08)

ADO.Net, C# windows forms for data control: Grid, Datasource and databinding controls, Connected and disconnected scenarios, Dataset, connections, Adapters, commands, datareaders.

#### UNIT 5(No. of Hours:09)

ASP.net-Introduction to ASP.NET, Architecture ,Working with Web and HTML Controls, Web forms ,Using Rich Server Controls, Overview of ASP.NET Validation Controls, Data base connectivity using ASP.net.

#### **Reference Books:**

- 1. Addison Wesley C# Developers Guide to ASP.Net
- 2. Wiley," Beginning Visual C# 2008", Wrox
- 3. Claudia M. Baca, Patti, PMP: Project Management Professional Workbook, Sybex, Workbook
- 4. C#.Net Developers Guide- Greg Hack, Jason Werry, SaurabhNandu. (SyngRess)
- 5. Wrox Press Professional C# 3rd Edition Simon Robinson, Jay Glynn

#### **Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	Knowledge and remember.NET Framework, its runtime
	environment and application development IDE of Visual Studio.
CO2	Understand the concept of object oriented for making programs.
CO3	Implement C# language constructs in the form of stand-alone console and window form applications.
CO4	Analyze and Understand database concepts in ADO.NET and apply the knowledge to implement distributed data-driven applications.
CO5	Design, document, debug ASP.NET web forms with server and validation controls and implement ASP.NET web services.
CO6	Create the programs based on console, windows and web application .

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	3	-	3	1	1	-	-	-	-	-
CO2	1	-	3	-	-	-	1	-	-	-	-	-
CO3	-	-	3	-	2	-	-	-	-	-	-	-
CO4	2	-	2	-	2	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	1	-	-	-	-	-
CO6	2	2	1	4				1	1	1		
Avg.	1.16	0.33	2.5	0.66	1.16	0.16	0.5	0.16	0.16	0.16		

Course code	: BCS-P52				
Course Name	: C# .Net Lab				
Semester /Year	: V				
		L	Τ	Р	С
		0	0	4	2

#### **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

- 1. To learn and understand different types of statements in C#.
- 2. Use of data base for making dynamic websites using C# programming
- 3. Programming concepts in .Net Framework.
- 4. Data base connectivity using ADO.net
- Understand and use of different graphical tools for the development of web page and website using C# programming

#### **Course Contents**

2. Program to print ARMSTRONG number.

3. Program using loop that examines all the numbers between 2 and 1000, and displays only Perfect numbers.(A perfect number is the one whose sum of their divisors equals the number itself).For example given the number 6, the sum of its divisors is 6(1+2+3).Hence, 6 is a perfect number.

- 4. Program to accept an array of integers (10) and sort them in ascending order.
- 5. Program to implement the concept of abstract class.
- 6. Program to implement the concept of sealed class.
- 7. Program for jagged array and display its item through foreach loop.

8. Program in C Sharp using a class that gets the information about employee's such as Emp Id, First Name, Last Name, Basic Salary,Grade,Address, Pin Code and Contact Number. Write a method that calculates the Gross Salary (Basic +DA+HRA) and returns to the calling program and another method for the Net salary (Gross - (P.F + Income Tax)).Finally write a method that prints, a pay slip of an employee, containg all the above components in a proper format to the console.(Grade A = 20,000, B=15,000 and C=10,000) DA=56% and HRA=20%., Pf=780, ITax.

- 9. Program to demonstrate boxing and unboxing.
- 10. Program to find number of digit, character, and punctuation in entered string.
- 11. Program using C# for exception handling.

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12. Program to implement multiple inheritances using interface.

13. Program in C# using a delegate to perform basic arithmetic operations like addition, subtraction, division, and multiplication.

- 14. Program to get the user's name from the console and print it using different namespace.
- 15. Demonstrate the concept of Multithreading using locks in C Sharp
- 16. Program to implement Indexer.
- 17. Program to design two interfaces that are having same name methods how we can access these methods in another class.
- 18. Program to implement method overloading.
- 19. Program to implement method overriding
- 20. Program in C sharp to create a calculator in windows form.

21. Create a front end interface in windows that enables a user to accept the details of an employee like EmpId ,First Name, Last Name, Gender, Contact No, Designation, Address and

Pin. Create a database that stores all these details in a table. Also, the front end must have a provision to Add, Update and Delete a record of an employee.

22. Create a database named MyDb (SQL or MS Access).Connect the database with your window application to display the data in List boxes using Data Reader.

23. Program using ADO.net to insert, update, delete data in back end

24. Display the data from the table in a DataGridView control using dataset.

25. Create a registration form in ASP.NET and use different types of validation controls.

26. Display the data from the table in a Repeater control using dataset in ASP.net.

#### **Course outcomes** (COs):

CO1	Understand the basics of C# programming, different graphics tools and
	their use.
CO2	Development of static and dynamic web pages using standard tools and
	learn various properties of the tools.
CO3	Develop interactive and user friendly websites using front end and back
	end programming.
CO4	To develop, implement and creating Applications with ADO.NET and
	SQL server
CO5	Create user interactive web pages using ASP.Net.
CO6	Create console, windows and web applications

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1			3	1	2				
CO2	3	1	2	3		3	2	3				
CO3	3	2	3	3	1	2	2	3				
CO4	2	1	3	3	2	3	2	3				
CO5	3	1	3	1	2	3	2	3				
CO6	2	3	2	2			1	1	2	1		
Avg.	2.66	1.5	2.33	2.0	0.83	2.33	1.66	2.5	0.33	0.16	0	0

Course code	: BCS-DSE1.1				
Course Name	: Theory of Computation				
Semester /Year	: V				
		L	Τ	P	С
		4	0	0	4

#### **Course Objectives:** The objectives of this course are

- To give an overview of the theoretical foundations of computer science from the perspective of formal languages
- To illustrate finite state machines to solve problems in computing
- To explain the hierarchy of problems arising in the computer sciences.
- To familiarize Regular grammars, context frees grammar.

#### **Course Contents**

#### UNIT 1

Introduction of Finite Automata- Alphabets, Strings, Languages, Finite Automata (FA), acceptance of strings and languages, Deterministic Finite Automata (DFA) and Non Deterministic Finite Automata (NFA), transition diagrams and Language recognizers. Conversions and Equivalence: Equivalence between NFA with and without ε-transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output-Moore and Mealy machines.

#### UNIT 2

Regular Expressions & Languages- FA and Regular Expressions, Conversion from RE to FA and FA to RE, Pumping lemma for regular languages, Closure properties of regular languages, Equivalence and minimization of Automata.

#### UNIT 3

Context Free Grammars and Languages-CFG, Leftmost, Rightmost derivations, Ambiguity in grammars and languages. Simplification of Context Free Grammars, Chomsky normal form (CNF), Greibach normal form (GNF), Pumping Lemma for Context Free Languages.

#### UNIT 4

Push Down Automata-Definition and languages of PDA, Equivalence & conversion of CFG's and PDA's, Deterministic PDA.

#### UNIT 5

Turing Theory-Turing Machines, definition, model, design of TM, Variations of TM-Multitape TMs, Non Deterministic TM, Universal TM, The Church-Turing thesis Recursively enumerable languages, Context -Sensitive Languages and the Chomsky Hierarchy. Unsolvable Problems-Halting Problem, Post's Correspondence Problem (PCP).

#### TEXT BOOKS:

- 1. Hopcroft JE. and Ullman JD., "Introduction to Automata Theory, Languages & Computation", Narosa.
- 2. K.L.P Mishra & N. Chandrasekharan "Theory of Computer Science", PHI
- 3. Ash & Ash "Discrete Mathematics", TMH
- 4. Martin—Introduction

#### **Course outcomes** (COs):

CO1	To use basic concepts of formal languages of finite automata techniques												
CO2	To Design Finite Automata's for different Regular Expressions and Languages												
CO3	To Construct context free grammar for various languages												
CO4	To solve various problems of applying normal form techniques, push down automata and Turing Machines												
CO5	To participate in GATE, PGECET and other competitive examinations												
CO6	Ability to recognize different types of languages												

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		2	1	1				2		
CO2	3	2	1		1		1			2		
CO3	2	1		1	1	1				1		
CO4	2	1	2			2	1			1		
CO5		2	3	1	1	1	2			1		
CO6	2	1	1	2	1	2	1					
Avg.	1.83	1.33	1.16	1.0	0.83	1.16	0.83	0	0	1.16		

Course code	: BCS-DSE 1.2				
Course Name	: Microprocessor				
Semester /Year	: V				
		L	Τ	P	С
		3	1	0	4

#### **<u>Course Objectives</u>:** The objectives of this course are

- **1.** To introduce students with the architecture and operation of typical microprocessors and microcontrollers.
- **2.** To familiarize the students with the programming and interfacing of microprocessors and microcontrollers.
- **3.** To provide strong foundation for designing real world applications using microprocessors and microcontrollers.

**Course Contents** 

#### UNIT 1 [8 Hours]

Introduction to Microprocessor, History of Microprocessors, Micro-Computers and Micro-Controllers, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing & Address Decoding.

#### UNIT 2 [8 Hours ]

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Peripheral Mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting.

#### UNIT 3 [ 8 Hours ]

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, Stack, Subroutine, Restart, Conditional call and return instructions, 8085 Interrupts, 8085 vector interrupts, RIM & SIM Instruction.

#### UNIT 4 [ 8 Hours ]

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Program: Addition, subtraction, multiplication & division of 8-bit numbers, finding largest & smallest numbers in an array, sorting of array, BCD-to-Binary conversion, Binary-to-BCD conversion.

#### UNIT 5 [8 Hours]

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, Direct Memory Access and 8237 DMA controller.

#### TEXT BOOKS:

- 1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
- 2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill.

### **Course outcomes** (COs):

CO1	Recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
CO2	Identify a detailed s/w & h/w structure of the Microprocessor.
CO3	Illustrate how the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.
CO4	Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.
CO5	Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements.
CO6	Plan circuits for various applications using microcontrollers

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		2	1	1						
CO2	3	2	1		1		1					
CO3	2	1		1	1	1						
CO4	2	1	2			2	1					
CO5		2	3	1	1	1	2					
CO6	2	1	1	2	2	2	2		2		2	2
Avg.	1.83	1.33	1.16	1.0	1.0	1.16	1.0	0	0.33	0	0.33	0.33

Course code	: BCS-DSE1.3				
Course Name	: Analysis & Design of Algorithm				
Semester /Year	: V				
		L	Т	P	С
		3	1	0	4

#### **<u>Course Objectives</u>:** The objectives of this course are

- 1. Understand the important concepts of algorithms design and their analysis.
- 2. Analyze the efficiency of alternative algorithmic solutions to the problem.
- 3. Understand different algorithm paradigms like Divide and Conquer, Greedy, Dynamic, Backtracking and Branch and Bound.
- 4. Identify the appropriate data structures, algorithm design techniques and assess their impact on the performance of programs.

#### **Course Contents**

#### UNIT-I(No. of Hours:09)

Algorithms, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms Growth of Functions: Asymptotic notations ,Recurrences and Solution of Recurrence Equations-The Iteration method, The Recurrence–Tree Method, The Master Method.

#### UNIT-II(No. of Hours:08)

Sorting in polynomial Time: Insertion sort, Merge sort and Quick sort, Sorting in Linear Time: Radix Sort, Bucket Sort. Red-Black Trees, Augmenting Data Structure.

#### UNIT-III(No. of Hours:09)

Greedy Technique: Fractional Knapsack Problem, Activity Selection Problem, Dynamic Programming: 0/1 Knapsack Problem, Matrix-Chain Multiplication. Branch-and-Bound: Assignment Problem, Traveling Salesperson Problem;

#### UNIT-IV(No. of Hours:09)

Graph: Introduction, Representation of Graph, BFS, DFS, Minimum Spanning Tree: Prims Algorithm, Kruskal Algorithm, Single Source Shortest Paths: Bellman-Ford Algorithm, Dijkstra Algorithm, All Pair Shortest Paths: Floyd-Warshall Algorithm.

### UNIT-V(No. of Hours:06)

NP-Completeness: P, NP, NP-Hard & NP-Complete Class, Reducibility & NP-Complete Problems.

#### **REFERENCE BOOKS:**

- 1. S. Horowitz, "Fundamentals of Computer Algorithms", University Press, 2<sup>nd</sup> Edition, 2008.
- 2. R. Panneerselvam, "Design and Analysis of Algorithms", PHI, 2<sup>nd</sup> Edition, 2016
- 3. T. H. Cormen, "Algorithms Unlocked", MIT Press, 1<sup>st</sup> Edition, 2013.
- 4. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press, 1<sup>st</sup> Edition, 2014.
- 5. R. Neapolitan and K. Naimipour, "Foundations of Algorithms", Jones & Bartlett Publishers, 4<sup>th</sup> Edition, 2010.
- 6. A.Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 3<sup>rd</sup> Edition, 2012.
- 7. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI, 2<sup>nd</sup> Edition, 2006.
- 8. J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2<sup>nd</sup> Edition, 2009

### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Remember the basic concepts and complexities for various algorithms.											
	Demonstrate P and NP complexity classes of the											
	Problem.											
CO2	Understand the concepts of asymptotic notations to											
	Explain the complexities of various algorithms.											
CO3	Apply and solve various sorting and tree-based algorithms.											
CO4	Finding efficient solutions using various algorithms for given problems.											
CO5	Evaluate and checking innovative solutions for real-world problems using different paradigms											
CO6	Construct the solution for real-world problems using various problem solving techniques											

#### **CO-PO Mapping**

		0										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	2	3	3	2	-	-	-	-	-	-	-	-
CO3	3	2	3	2	1	-	-	-	-	-	-	-
CO4	2	2	2	3	2	1	-	-	-	2	-	-
CO5	2	3	2	2	3	2	1	-	2	1	2	2
CO6	2	2	2	1	-	-	1	1	1	1	-	-
Avg.	2.33	2.33	2.16	1.66	1	0.5	0.33	0.16	0.5	0.66	0.33	0.33

Course code	: BCS-DSE1.4				
Course Name	: Graph Theory				
Semester /Year	: V				
		L	Τ	P	С
		3	1	0	4

#### $L \ \ - \ Lecture \ T - Tutorial \ P - Practical \ C - Credit$

#### **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

1. To understand and apply the fundamental concepts in graph theory

2. To apply graph theory based tools in solving practical problems

3. To improve the proof writing skills.

#### **Course Contents**

#### Unit-1

Definition, examples and basic properties of graphs, pseudo graphs, complete graphs, bi-partite graphs, isomorphism of graphs, paths and circuits

#### Unit-II

Eulerian circuits, Hamiltonian cycles, the adjacency matrix, weighted graph, travelling salesman's problem,

#### Unit-III

Shortest path Algorithms: Dijkstra's, Floyd-Warshall algorithm.

#### Unit-IV

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees- prims, Kruskal, fundamental circuits.

#### Unit V

Coloring and covering partitioning of graph, Chromatic number, Chromatic partitioning, Chromatic polynomials, Matching, covering, Four color problem.

#### TEXT BOOKS:

- 1. Joshi K. D., "Fundamental of discrete mathematics", New Age International
- 2. John Truss, "Discrete mathematics for computer scientist"
- 3. C. L. Liu, "Discrete mathematics
- 4. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, 2nd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint 2003.

### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Understand and explain the basic concepts of graph theory
CO2	Defines a graph, identifying edges and vertices.
CO3	Analyze the basic concepts of mathematical logic
CO4	Evaluate some real time problems using concepts of graph theory.
CO5	Defines Eulerian graphs.
CO6	Make use of theoretical knowledge and independent mathematical thinking in graph theory questions' investigation.

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				2		2	2				
CO2		2	2									
CO3			2	2	2					2		
CO4	2	1		2							2	
CO5	2	3		1	2							
CO6	2		2	1								
Avg.	1.33	1.0	1.0	1.0	1.0		0.33	0.33		0.33	0.33	

Course code	: BCS-DSE1.5				
Course Name	: Ethical Hacking				
Semester /Year	: V				
		L	Т	P	С
		3	1	0	4

#### **<u>Course Objectives</u>:** The objectives of this course are

Upon completion of the course students should be able to: Plan a vulnerability assessment and penetration test for a network. Execute a penetration test using standard hacking tools in an ethical manner

#### **Course Contents**

#### Unit I

Introduction to ethical hacking. Fundamentals of computer networking. TCP/IP protocol stack. IP addressing and routing. TCP and UDP. IP subnets. Routing protocols. IP version 6.

#### Unit II

Installation of attacker and victim system. Information gathering using advanced google search, archive.org, netcraft, whois, host, dig, dnsenum and NMAP tool: Vulnerability scanning using NMAP and Nessus. Creating a secure hacking environment.

#### Unit III

System Hacking: password cracking, privilege escalation, application execution. Malware and Virus. ARP spoofing and MAC attack.

#### Unit IV

Introduction to cryptography, private-key encryption, public-key encryption. Cryptographic hash functions, digital signature and certificate, applications. Steganography, biometric authentication, network-based attacks, DNS and Email security.

#### Unit V

Packet sniffing using wireshark and burpsuite, password attack using burp suite. Social engineering attacks and Denial of service attacks. Text Book:

- Hands-on Ethical Hacking and Network Defense.
- The Basics of Hacking and Penetration Testing Patrick Engebretson.
- The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws.
- Black Hat Python: Python Programming for Hackers and Pentesters.

### **Course outcomes** (COs):

CO1	To gain knowledge about Ethical hacking and penetration testing.
CO2	To learn about various types of attacks, attackers and security threats and vulnerabilities present in the computer system.
CO3	To examine how social engineering can be done by attacker to gain access of useful & sensitive information about the confidential data.
CO4	To learn about cryptography, and basics of web application attacks.
CO5	To gain knowledge of the tools, techniques and ethical issues likely to face the domain of ethical hacking and ethical responsibilities.
CO6	Design hacking using tool nmap etc.

### **CO-PO Mapping**

		0										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	2	2	3									
CO3	2	3	2		2	2						
CO4	3	3		2	2							
CO5	2	1										
CO6	1	1	1	2	2	2	2	1				
Avg.	2.16	2.0	1.0	0.66	1.0	0.66	0.33	0.16				

Course code	: BCS-DSE2.1				
Course Name	: Cryptography and Network Security				
Semester /Year	: V				
		L	Т	Р	С
		4			4

#### **<u>Course Objectives</u>:** The objectives of this course are

- Understand the basic Knowledge of Network Security Concepts & the Challenges and Scope of Information Security
- Understand the basic Concept of Block Cipher, stream ciphers & the Importance of Cryptographic Algorithms and their Uses.
- Learn and Understand Encryption Techniques & Access Control Mechanism Used for User Authentication and Authorization.
- Understand the concept of authentication of message in network by using different techniques.

#### Course Contents UNIT 1

Introduction To security: Attacks, Services & Mechanisms, Security, Attacks, Security Services, Conventional Encryption: Classical Techniques, Conventional Encryption Model, and steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operations.

#### UNIT 2

Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RC5, Placement & Encryption Function, Key Distribution, Random Number Generation, Placement of Encryption Function.

#### UNIT 3

Hash Functions: Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Function Birthday Attacks,

Security of Hash Function, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signature, Authentication Protocol, Digital Signature Standard (DDS)

#### UNIT 4

Network & System Security: Authentication Applications: Kerberos X-509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP)/Mime Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management.

#### TEXT BOOKS:

- 1. William Stallings, "Cryptography and Network Security: Principles and Practice" Prentice hall, New Jersey
- 2. Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag
- 3. AtulKahate, "Cryptography and Network Security" TMH

**Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	Able to understand & remember basics of cryptography & security like
	active and passive attacks and encryption and decryption techniques
CO2	Able to understand and apply the concept of linear and differential crypt
CO3	Able to understand & remember basics of conventional encryption
	techniques like DES, Blowfish etc
CO4	Able to understand basics of message authentication like digital signature
	,SET Authentication protocol lik kerberose etc
CO5	Basic concepts of system level security
CO6	Illustrate various Public key cryptographic techniques

#### **CO-PO** Mapping

		8										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			1	1						
CO2	1	3	1	2	1							
CO3	2	3		2	1	1		1				
CO4	1	2	2	1		2	1					
CO5	1	3	1	2	1	2		1				
CO6	2	1	2	2		2		2	2	2	2	2
Avg.	1.66	2.0	1.0	1.5	0.66	1.33	0.16	0.66	0.33	<mark>0.33</mark>	<mark>0.33</mark>	0.33
Course code	: BCS-DSE2.2											
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Course Name	: Cloud Computing											
Semester /Year	: V											
		L	Τ	Р	С							
		3	1	0	4							

L - Lecture T - Tutorial P - Practical C - Credit

### **<u>Course Objectives</u>:** The objectives of this course are

- Explain the various models and services of cloud
- Identify the technical foundations of cloud systems architectures.
- Analyze the problems and solutions to cloud application problems.
- Apply principles of best practice in cloud application design and management.
- Identify and define technical challenges for cloud applications and assess their
- Importance

### Course Contents UNIT 1

CLOUD COMPUTING FUNDAMENTALS: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

### UNIT 2

CLOUD APPLICATIONS: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.

### UNIT 3

MANAGEMENT OF CLOUD SERVICES: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an

organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

### UNIT 4

APPLICATION DEVELOPMENT: Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

TEXT BOOKS:

- 1. GautamShroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition.
- 2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media; 1 edition
- 3. Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition

**Course outcomes** (COs):

Upon successful completion of the course a student will be able to

CO1	Understand the fundamental principles of distributed computing
CO2	Understand how the distributed computing environments known as Grids can be built from lower level services.
CO3	Understand public, private and hybrid clouds
CO4	Analyze the performance of Cloud Computing
CO5	Understand the concept of Cloud Security
CO6	Create design a private cloud

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# **CO-PO** Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			1	1						
CO2	1	2	1	2	1							
CO3	2	2		2	1	1		1				
CO4	1	2	2	1		2	1					
CO5		2	1	2	1	2		1				
CO6												
Avg.	1.16	1.5	0.66	1.16	0.66	1.0	0.16	0.33				

Course code	: BCS-DSE2.3				
Course Name	: Mobile Computing				
Semester /Year	: V				
		L	Τ	Р	С
		4	0	0	4

L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives: The objectives of this course are

- To gain knowledge of the concept of Mobile Computing
- To gain knowledge of Adhoc networks

### **Course Contents**

### UNIT 1

Introduction to Mobile Computing, Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, cellular system architecture, Multiple Access Protocols : TDMA, FDMA and CDMA, GSM, GPRS, handoffs, Near-far problem, channel allocation in cellular systems.

### UNIT 2

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, TCP over wireless- Indirect TCP, Snoop Protocol, Fast retransmit and Mobile TCP, Mobile IP, WAP: Architecture, applications.

### UNIT 3

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system (CODA), Disconnected operations.

### UNIT 4

Mobile Agents computing, transaction processing in mobile computing environment, location management- static and dynamic, Ping pong effect, location based services.

### UNIT 5

What is Ad-hoc Network?, Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (AODV)

### TEXT BOOKS:

- 1. ShambhuUpadhyaya, AbhijeetChaudhary, Kevin Kwiat, Mark Weises, "Mobile Computing", Kluwer Academic Publishers
- 2. UWE Hansmann, LotharMerk, Martin-S-Nickious, Thomas Stohe, "Principles of Mobile Computing", Springer International Edition

# **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

		4
CO1	Explain the concept of mobile computing, wireless telephony and cellular standards	
CO2	Appraise the various applications of cellular networks in the form of GSM, CDMA	
CO3	Explain the concept of wireless networks 802.11 and its MAC issues and TCP over wireless.	
CO4	Apply the concept of data management and replication in Mobile computing context	
CO5	Explain the concept of Adhoc networks	
CO6	Discuss and elaborate Various adhoc routing algorithms	

#### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		3								
CO2	2	2	3	3								
CO3	2	2		3			3					
CO4	2	2		2								
CO5	2	2		2								
CO6	2	2		2								
Avg.	2	2	0.5	2.5	0	0	0.5	0	0	0	0	0

Course code	: BCS-DSE2.4				
Course Name	: Datawarehousing and Datamining				
Semester /Year	: V				
		L	Τ	Р	С
		3	1	0	4

### L - Lecture T – Tutorial P – Practical C – Credit

### **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

- To help student Learn the concepts of Datawarehouse & Datamining
- Understanding the dimensional modeling technique for designing a datwarehouse.
- Study datawarehouse architecture, OLAP and project planning aspects in building a datawarehouse.
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

### **Course Contents**

### UNIT 1

DSS - Uses, definition, Operational Database, Introduction to DATA Warehousing. Data-Mart, Concept of Data-Warehousing, Multi-Dimensional Database Structures, Client/Server Computing Model & Data Warehousing,

Parallel Processors & Cluster Systems, Distributed DBMS implementations.

### UNIT 2

DATA Warehousing, Data Warehousing Components, Building a Data Warehouse, Warehouse Database.

Mapping the Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support. Data

Extraction, Cleanup & Transformation Tools, Metadata.

### UNIT 3

Business Analysis, Reporting& Query Tools & Applications. On line Analytical Processing (OLAP), Patterns & Models. Statistics. Artificial Intelligence.

### UNIT 4

Knowledge Discovery, Data Mining. Introduction to Data-Mining, Techniques of Data-Mining, Decision Trees.

Neural Networks, Nearest Neighbor & Clustering, Genetic Algorithms. Rule Introduction. Selecting & Using the Right Technique.

#### TEXT BOOKS:

1. Margaret H. Dunham, "Data-Mining. Introductory & Advanced Topics", Pearson Education

2. Pieter Adriaans, DolfZantinge, "Data-Mining", Pearson Education

### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Define, list, label, relate and show the functionality of the various data
	mining and data warehousing component
CO2	Explain, compare, classify, outline strengths and limitations of various data
	mining and data warehousing models
CO3	Identifying, develop, construct choose, build and apply the various
	analyzing techniques of various data
CO4	Analyze, compare, simplify or list different methodologies used in data
	mining and data ware housing.
CO5	Compare, deduct, determine, mark or criticize different approaches of data
	ware housing and data mining with various technologies
CO6	Improve, change, develop, design, modify or propose new applications or
	tools for data mining

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2		2										
CO3			2	3								
CO4				3				2				
CO5	2	2										
CO6	1											
Avg.	0.5	1.16	0.3	1				0.3				

Course code	: BCS-DSE2.5				
Course Name	: Foundation of Data Science				
Semester /Year	: V				
		L	Τ	Р	С
		4	0	0	4

L - Lecture T - Tutorial P - Practical C - Credit

#### **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

- Work with sampling and cleaning of data
- Work with different modeling methods

**Course Contents** 

UNIT 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.

UNIT 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.

UNIT III –

INTRODUCTION TO R

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.

UNIT IV –

MAP REDUCE

Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication

by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop MapReduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting

- Reducing phase execution. UNIT 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.

# **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Students will develop relevant programming abilities.
CO2	Students will demonstrate proficiency with statistical analysis of data.
CO3	Apply programming logic in R language
CO4	Understand Hadoop and map reduce
CO5	Analyze map architecture
CO6	Design multiple plot in a window

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			2								
CO2	2		1	1	2							
CO3	2		2		1							
CO4		2	2			2	1	1				
CO5	1	2				2	1	1				
CO6	2	2	1			2	1	1				
Avg.	1.66	1.0	1.0	3.0	0.5	1.0	0.5	0.5				

Course code	: BCS-601					
Course Name	: Computer Graphics					
Semester /Year	: VI					
		Ι	L	Т	Р	С
		4	1	0	0	4

L - Lecture T - Tutorial P - Practical C - Credit

### **<u>Course Objectives</u>:** <u>The objectives of this course are</u>

- To acquire knowledge about the display devices.
- To understand scalar and vector quantities and how to perform different mathematical operations on them.
- To understand the working of different line and circle drawing algorithms.
- To understand clipping and the algorithms associated with it.
- To study about the different types of curves and their properties.
- To develop an understanding about 2D and 3D transformations.
- An introduction to the concept of animation, its principles, types and systems.

### **Course Contents**

### Unit I

Graphics Primitives: Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display Plotters, Printers. Input Devices: Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera.

### Unit II

Input Techniques: Positioning techniques, Potentiometers, Constraints, Scales & Guidelines, Rubber-Band techniques, Dragging Dimensioning techniques and Graphical Potentiometers, Pointing and Selection: the use of selection points defining a boundary rectangle, multiple selections, Menu selection.

Mathematics for Computer Graphics: Point representation, Vector representation, Matrices and operations related to matrices, Vector addition and vector multiplication, Scalar product of two vectors, Vector product of two vectors.

### Unit III

Line Drawing Algorithms: DDA Algorithms, Bresenham's Line algorithm.

Segment & Display files: Segments, Functions for segmenting the display file, Posting and posting a segment, segment naming schemes, Default error conditions, Appending to segments, Refresh concurrent with reconstruction, Free storage allocation, Display file structure.

Graphics Operations: Clipping, Point Clipping, Line Clipping, Polygon Clipping. Filling: Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm.

### Unit IV

Conics, Curves and Surfaces: Quadric surfaces: Sphere, Ellipsoid, and Torus. Superquadrics: Superellipse, superellipsoid, Spline & Bezier Representations: Interpolation and approximation splines, parametric continuity conditions, Geometric Continuity Conditions, Spline specifications. Bezier curves and surfaces.

Transformation: 2D transformation, Basic Transformations, Composite transformations: Reflection, Shearing, Transformation between coordinate systems. 3D Graphics: 3D Display Methods, 3D transformations, Parallel projection, Perspective projection, Visible lines and surfaces identification, Hidden surface removal.

### Unit V

Animation: Introduction to Animation to Animation, Principles of Animation, Types of Animation, Types of Animation Systems: Scripting, Procedural, Representational, Stochastic, etc. Animation Tools: Hardware-SGI, PC's Amiga etc.

### TEXT BOOKS:

- 1. Donald Hearn and M Pauline Baker, "Computer Graphics" PHI
- 2. Steven Harrington, "Computer Graphics: A Programming Approach" TMH
- 3. Prajapati A.K. "Computer Graphics" PPM Ed2

### **Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	Implementation of Computer Graphics in different fields.
CO2	Understand and Implement different line drawing and circle drawing algorithms in 'C' Language.
CO3	Implementation and use of 2D and 3D transformations in graphic applications.
CO4	Implementation of the tools of animation systems.

# School of CA & IT

CO5	Implement the various clipping algorithms.
CO6	Plan line programs

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			1								
CO2	2		1	2				2				
CO3	2		1	2				2				
CO4		2	2									
CO5			2				2					
CO6	2	2	1	2	1	2	1					
Avg.	1.5	0.66	1.16	1.16	0.16	0.33	0.33	0.66				

Course code	: BCS-DSE3.1				
Course Name	: Advance Java				
Semester /Year	: VI				
		L	Т	P	С
		4	0	0	4

L - Lecture T - Tutorial P - Practical C - Credit

### Course Objectives: The objectives of this course are

- Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
- Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swingand Event Handling.
- Design and develop Web applications
- Designing Enterprise based applications by encapsulating an application's business logic.
- Designing applications using pre-built frameworks

### **Course Contents**

### UNIT 1

Core Java: Introduction Operator, Data Types, Variable, Arrays, Control statements, Methods & classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling,

### UNIT 2

Introduction to AWT, AWT controls, Layout manager, Menus, Images, Graphics, Java Swing: Creating a swing applet and application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner Frame.

### UNIT 3

JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database. Swings, Java Beans: Application Builder tools, the bean developer kit (BDK). JAR files, Introspection, Developing a simple bean, using Bound properties. The Java Beans API, Session Beans, Entry Beans, Introduction to Enterprise Java beans (EJB).

#### UNIT 4

Introduction to RMI (Remote Method Invocation): A simple client server application using RMI, Java Servlets: Servlet API basic, Life cycle of a servlet, Running Servlet, Debugging Servlets. Thread-safe servlets HTTP Redirects, Cookies, Introduction to Java Server ages (JSP).

### TEXT BOOKS:

- 1. MargarelLevingYoung."The complete Reference Internet" TMH
- 2. Naughton, Schidt, "The Complete Reference JAVA2", TMH
- 3. Balagurusamy E, "Programming in JAVA, TMH

### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	learn the Internet Programming, using Java Applets
CO2	create a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings
CO3	apply event handling on AWT and Swing components.
CO4	learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
CO5	Design java Beans
CO6	Design JSP/Servlet

# **CO-PO Mapping**

		<u> </u>										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				3							
CO2	2				2							
CO3		2			2	2		2				
CO4			2									
CO5		1	2	2	2							
CO6	2	1	3	1	1							
Avg.	1.0	0.66	1.16	0.5	1.66	0.33	0	0.33	0	0	0	0

Course code	: BCS-P61				
Course Name	: Advance Java Programming Lab				
Semester /Year	: VI				
		L	Τ	P	С
		0	0	4	2

### L - Lecture T - Tutorial P - Practical C - Credit

### Course Objectives: The objectives of this course are

- Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
- Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
- Design and develop Web applications
- Designing Enterprise based applications by encapsulating an application's business logic.
- Designing applications using pre-built frameworks.

### **Course Contents**

**Swing, threading, and collections** are all covered in Core Java. Web services, database connectivity, JSP, Servlets, EJB, and other subjects are covered in Advanced Java.

CO1	Implement GUI program using AWT and Swing
CO2	Implement ActionEvent and ItemEvent
CO3	Design java servlets
CO4	Understand java bean and its properties.
CO5	Design JDBC connection using mysql
CO6	Design JDBC connection using oracle

# **CO-PO Mapping**

		<u> </u>										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	2						
CO2	2	3	2	1	1							
CO3	2	2	1	1	1	2	1					
CO4			2	1	1							
CO5	2	2	1	1	1	2						
CO6	2	2	1	1	1	2	2					
Avg.	1.83	1.83	1.33	1.0	1.0	1.33	0.5					

Course code	: BCS-DSE3.2				
Course Name	: ASP.NET				
Semester /Year	: VI				
		L	Τ	Р	С
		3	1	0	4

### L - Lecture T – Tutorial P – Practical C – Credit

#### **<u>Course Objectives</u>:** The objectives of this course are

• To study web development technology and tools provided by Microsoft . NET platform

#### **Course Contents**

Unit I

Introduction to .NET framework :Managed Code and the CLR- Intermediate Language, Metadata and JIT Compilation - Automatic Memory Management. Unit II

Language Concepts and the CLR: Visual Studio .NET - Using the .NET Framework.

**The Framework Class Library:** NET objects - ASP .NET - .NET web services – Windows Forms

#### Unit III

**ASP.NET Features:** Change the Home Directory in IIS - Add a Virtual Directory in IIS- Set a Default Document for IIS - Change Log File Properties for IIS - Stop, Start, or Pause a Web Site.

#### Unit IV

**Creating Web Controls:** Web Controls - HTML Controls, Using Intrinsic Controls, Using Input Validation Controls, Selecting Controls for Applications - Adding web controls to a Page.

#### Unit V

**Creating Web Forms:** Server Controls - Types of Server Controls - Adding ASP.NET Code to a Page.

#### TEXT BOOKS

1. Addison Wesley – C# Developers Guide to ASP.Net

#### **Course outcomes** (COs):

#### Upon successful completion of the course a student will be able to

CO1	Explain the three pillars of object oriented programming
CO2	Develop working knowledge of C# programming constructs and the .NET Framework
CO3	Write an object oriented program using custom classes
CO4	Build and debug well-formed Web Forms with ASP
CO5	Perform form validation with validation controls
CO6	Design data base connection with ASP.NET

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		3								
CO2	2	2	3	3								
CO3	2	2		3			3					
CO4	2	2		2								
CO5	2	2		2								
CO6	2	1	2	1	2	3		1				
Avg.	2.0	1.83	0.83	2.33	0.33	0.5	0.5	0.16				

Course code	: BCS-P61				
Course Name	: DSE3.2 Lab				
Semester /Year	: VI				
		L	Т	P	С
		0	0	4	2

### $L \ - Lecture \ T - Tutorial \ P - Practical \ C - Credit$

### **Course Objectives:** The objectives of this course are

- Design web pages
- Use .NET framework
- Learn ADO.NET

### **Course Contents**

- Implement command line argument program
- Implement array
- Implement conditional loop statement
- Implement inheritance
- Implement multiple inheritance

#### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Understand the Microsoft .NET Framework and ASP.NET page
	structure
CO2	Implement loops and arrays
CO3	Design inheritance
CO4	Design web application with variety of controls
CO5	Access the data using inbuilt data access tools
CO6	Use Microsoft ADO.NET to access data in web Application

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2					2						
CO2		2		2	2	3						
CO3			2									
CO4		2		2								
CO5	2	1	3		2							
CO6	2	2	2		1							
Avg.	1.0	1.16	1.16	0.66	0.83	0.83	0	0	0	0	0	0

Course code	: BCS-DSE3.3				
Course Name	: Android Programming				
Semester /Year	: VI				
		L	Τ	P	С
		4	0	0	4

### $L \ \ - \ Lecture \ T - Tutorial \ P - Practical \ C - Credit$

### **<u>Course Objectives</u>:** The objectives of this course are

- 1. This course facilitates classroom and laboratory learning.
- 2. Letting students develop competence and confidence in android programming.
- 3. Understand the entire Android Apps Development Cycle.
- 4. Enable the students to independently create Android Applications.
- 5. Access and work with databases under the Android operating system.

### **Course Contents**

### UNIT I (No. of Hours:10)

History of Android, The Open Handset Alliance, Android Core building blocks, Android Architecture, Android SDK, Creation of New AVD, DVM, Creating run configuration, Building a sample Android application.

### UNIT II (No. of Hours:10)

OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

### UNIT III (No. of Hours:10)

AnatomyofAndroidApplication,Android terminologies,Application Context, Activities, Activity lifecycle. Services, Intents and its Types,Android Manifest File and its common settings, Using Intent Filter

UNIT IV (No. of Hours:10)

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Android Toast, Event handling, Images, Designing User Interfaces with Layouts.

### **Reference Books:**

- Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education2nd edition.
- 2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd.
- 3. Mark L Murphy, "Beginning Android", Wiley India Pvt. Ltd.
- 4. Sayed Y Hashimi and Satya Komatineni, "Pro Android", Wiley India Pvt. Ltd.
- 5. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.

**Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Knowledge and remember the basics of Java and Android
CO2	Describe the life cycles of Activities, Applications etc.
CO3	Apply the major components of Android API set to make apps. Use the development tools in the Android development environment.
CO4	Classifying and finding uses of UI –components and java Constructs.
CO5	Make UI-rich apps using all the major UI components.
CO6	Create Android apps using Java programming language.

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1	3	2	3	2	1					
CO2	1	2	3	2	2	1	2	1			1	
CO3	2	1		1		2	1					
CO4	1	1	3	2	3	1		1			1	
CO5	1	1	3	2	2		1	2			1	
CO6	1	1	2				1		1	1		
Avg.	1	1.16	2.33	1.5	1.66	1	1	0.66	0.16	0.16	0.5	0

Course code	: BCS-P61				
Course Name	: Android Lab				
Semester /Year	: VI				
		L	Τ	P	С
		0	0	4	2

L - Lecture T - Tutorial P - Practical C - Credit

#### Course Objectives: The objectives of this course are

1. Install and configure Android application development tools.

- 2. Design and develop user Interfaces for the Android platform.
- 3. Apply Java programming concepts to Android application development.
- 4. Apply essential Android Programming concepts.
- 5. Develop various Android applications related to layouts & rich uses interactive

### **Course Contents**

- . Program to show method overloading in java.
- 2. Program to show method overriding in java.
- 3. Program to use abstract class in java.
- 4. Program to implement interface in java.

5. Program to use use the concept of multithreading in java.a)using Thread classb)using Runnable interface.

6. Program to multilevel inheritance in java.

- 7. Write an Android App to create dialog box.
- 8. Program to use final keyword in java.
- 9. Program to use super in java.
- 10. Program to handle exceptions encountered in java.
- 11. Android program to print hello world.
- 12. Android program to print addition of two numbers.
- 13. Android program to create a calculator.

- 14. Android program to create implicit intent.
- 15. Android program to create explicit intent.
- 16. Android program to create toggle button.
- 17. Android program to create spinner.
- 18. Android program to create EMI calculator.
- 19. Android program to use image view.
- 20 .Android program to use different type of layouts.

# **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Understand the basics of Java programming, different graphics tools and
	their use.
CO2	Development of static and dynamic web APPs using standard tools and
	learn various properties of the tools.
CO3	Develop interactive and user friendly APPs using front end and back end
	programming.
CO4	Develop simple applications using tools available in android studio.
CO5	Implement interactive graphics applications that use graphics tools,
	using android studio.
CO6	Create Android apps using Java programming language.

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1			3	1	2				
CO2	3	1	2	3		3	2	3				
CO3	3	2	3	3	1	2	2	3				
CO4	2	1	3	3	2	3	2	3				
CO5	3	1	3	1	2	3	2	3				
CO6	3	2	2	2			1	1	2	1		
Avg.	2.83	1.33	2.33	2	0.83	2.33	1.66	2	0.33	0.16	0	0

Course code	: BCS-DSE3.4				
Course Name	: NoSQL				
Semester /Year	:				
		L	Τ	Р	С
		4	0	0	4

L - Lecture T – Tutorial P – Practical C – Credit

#### Course Objectives: The objectives of this course are

- Distinguish the different types of NoSQL databases
- Understand the impact of the cluster on database design
- Explain where HBase, MongoDB, Cassandra

**Course Contents** 

#### UNIT-I

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL,

Key Points.

#### UNIT-II

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use

and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

#### UNIT-III

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against

Varying Aggregate Structure.

UNIT-IV

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

### UNIT-V

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, GraphDatabase. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Explain and compare different types of NoSQL Databases
CO2	Compare and contrast RDBMS with different NoSQL databases.
CO3	Demonstrate the detailed architecture and performance tune of Document- oriented NoSQL databases.
CO4	Apply Nosql development tools on different types of NoSQL Databases.
CO5	Explain performance tune of Key-Value Pair NoSQL databases.
CO6	Design NoSQL databases

#### **CO-PO Mapping**

		0										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1			1						
CO2	2	2	2			1						
CO3	2	1	2			1						
CO4		1	2		2	1						
CO5			1		2	1						
CO6	2	1	2	2	2	1						
Avg.	1.5	1.16	1.66	0.33	1.0	1.0						

Course code	: BCS-DSE3.4				
Course Name	: NoSQL Lab				
Semester /Year	:				
		L	Τ	P	С
		0	0	2	2

 $L \ - Lecture \ T - Tutorial \ P - Practical \ C - Credit$ 

### **Course Objectives:** The objectives of this course are

- Distinguish the different types of NoSQL databases
- Understand the impact of the cluster on database design

### **Course Contents**

- Compare NoSQL & RDBMS. ...
- What is NoSQL? ...
- What are the features of NoSQL? ...
- Explain the difference between NoSQL v/s Relational database? ...
- Explain "Polyglot Persistence" in NoSQL? ...
- How does NoSQL DB budget memory? ...
- How to script NoSQL DB configuration? ...
- Does NoSQL Database Interact With Oracle Database

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Define commons and use the four times of NeCOL Databases
COI	Define, compare and use the four types of NoSQL Databases
	(Document-oriented, KeyValue Pairs, Column-oriented and Graph)
CO2	Demonstrate an understanding of the detailed architecture, define objects,
	load data, query data and performance tune Column-oriented NoSQL
	databases.
CO3	Explain the detailed architecture, define objects, load data, query data and
	performance tune Document-oriented NoSQL databases.
CO4	Apply Nosql development tools on different types of NoSQL Databases.
CO5	Analyze performance of nosql to sql
<b>CO6</b>	Design no sql queries

### **CO-PO Mapping**

		0										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	2	2	2									
CO3	2	1	2		1							
CO4		1	2	3	1							
CO5			1	1	1							
CO6	2	2	1	2	3							
Avg.	1.5	1.33	1.5	1.0	1.0							

Course code	: BCS-DSE4.1				
Course Name	: Design of Compilers				
Semester /Year	: VI				
		L	Τ	P	С
		3	1	0	4

### $L \ \ - \ Lecture \ T - Tutorial \ P - Practical \ C - Credit$

#### **Course Objectives:** The objectives of this course are

The main objective of this course is to introduce the major concept areas of language translation and compiler design and to develop an awareness of the function and complexity of modern compilers. This course is a study of the theory and practice required for the design and implementation of interpreters and compilers for programming languages.

#### Course Contents UNIT 1

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler.

Programming Language: High level languages, lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission. Lexical Analysis: The role of Lexical Analyzer, A Simple approach to the design of Lexical Analyzer, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer.

### UNIT 2

The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG. Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive descent Parsers, Predictive Parser, Bottom-up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC

### UNIT 3

Intermediate Code Generation: Different Intermediate forms: Three address code, Quadruples & Triples, Syntax Directed Translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation. Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management.

Error Detection and Recovery: Lexical phase errors. Syntactic phase errors, semantic errors.

### UNIT 4

Code Optimization and Code Generation: Local optimization, Peephole optimization, Basic blocks and flow Graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection.

### TEXT BOOKS:

- 1. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa
- 2. A.V. Aho, R. Sethi and J.D.Ullman, "Compiler Principle, Tech & tools" AW
- 3. H.C. Holub "Compiler Design in C", Printice Hall Inc.
- 4. Apple, "Modern Computer Implementation in C: Basic Design" Cambridge Press

**Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	To realize basics of compiler design and apply for real time applications.
CO2	To introduce different translation languages
CO3	To understand the importance of code optimization
CO4	To know about compiler generation tools and techniques
CO5	To learn working of compiler and non compiler applications
CO6	Use the different compiler construction tools to develop a simple compiler

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	2	2			2	2				2		
CO3			2			2				2		
CO4			2	2	2	1				1	2	
CO5		1		2	1	1				1		2
CO6	2		2	2	1							
Avg.	1.0	0.5	1.0	1.0	1.0	1.0				1.0	0.33	0.33

Course code	: BCS-DSE4.2					
Course Name	: Advance DBMS					
Semester /Year	: VI					
		Ι	[]	Т	Р	С
		4	1	0	0	4

### L - Lecture T – Tutorial P – Practical C – Credit

### **<u>Course Objectives</u>:** The objectives of this course are

- To understand the different types of database system architectures.
- To study and design distributed database with its applications
- To study the transaction process and problem during concurrent transaction procession and solutions of it
- To study the recovery techniques used after transaction failure.

### **Course Contents**

### UNIT 1

**Transaction Processing Concepts:** Transaction system, testing of serializability, Serializability of Schedules Conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, Checkpoints, deadlock handling

### UNIT 2

**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version Schemes, Recovery with concurrent transaction.

### UNIT 3

**Distributed DBMS Concepts and design:** Introduction, functions and architecture of a DDBMS, transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database, Introduction to OODBMS.

### TEXT BOOKS:

1. Adv. DBMS by V.K. Jain, Cyber Tech Publication, 5A/13 Ansari Road, Daryagang, N.Delhi.-110002

- 2. Date C.J. "An Introduction to Database System". Addision Wesley
- 3. Korth, Silbertz, Sudarshan, "Database Concepts" McGraw Hill
- 4. Elmasri, Navathe, "Fundamentals of Database Systems" Addision Wesley

### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Defining the concept of transactions, serializability, recovery, concurrency, and distributed & object-oriented DBMS.
CO2	Understanding the concept of transaction in database, significance of serializability in transaction execution, recovery of failed transactions.
CO3	Illustrate the serializability and concurrency problems and methods for controlling it.
CO4	Apply and comparing the locking techniques for controlling concurrent transaction execution.
CO5	Evaluate distributed DBMS concepts and architectures. Understanding concept of OODBMS.
CO6	Case studies based on serializability and locking protocols.

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1					
CO2	2	1		1								
CO3	2	2		2	1	1		1				
CO4	3	2	1	1			1					
CO5	2	1	1				1					
CO6	2	2	1	2								
Avg.	2.2	1.5	0.7	1.2	0.3	0.2	0.5	0.2				

Course code	: BCS-DSE4.3				
Course Name	: Advance Computer Network				
Semester /Year	: VI				
		L	Τ	P	С
		4	0	0	4

### $L \ \ - \ Lecture \ T - Tutorial \ P - Practical \ C - Credit$

#### Course Objectives: The objectives of this course are

- To gain knowledge of the concept of Advanced Computer Networks
- To understand wireless network Protocols

### Course Contents UNIT 1

Introduction: Overview of computer network, seven-layer architecture, TCP/IP suite of protocol.

### UNIT 2

Mac protocols for high-speed LANS, MANs & WIRELESS LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet etc.) Fast access technologies. (For example, ADSL, Cable Modem, etc.)

### UNIT 3

IPv6: why IPv6, basic protocol, IPv6 main header extension headers, support for QoS, security, etc, ESP, Authentication header

### UNIT4

Network security:. Symmetric and asymmetric cryptography, Secure-HTTP, SSL,, Key distribution

protocols. Digital signatures, digital certificates.

### TEXT BOOKS

- 1. W. R. Stevens, "TCP/IP illustrated, Volume 1: The protocols", Addison Wesley 1994.
- 2. G. R. Wright. "TCP/IP illustrated, Volume 2: The implementation", Addison Wesley 1995
- 3. B. A. Forouzan "Data Communications and Networking (3rd Ed.) " TMH
- 4. S. Tanenbaum "Computer Networks (4th Ed.)" Pearson Education/PHI

5. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Explain the concept of TCP/IP and differentiate it from OSI	
CO2	Explain the concept of High Speed LAN's	
CO3	Explain the concept of fast access technologies and wireless LAN.	
CO4	Discuss IPv6 and differentiate it from IPv4	
CO5	Appraise Network Security concepts	
CO6	Discuss Digital Signatures	

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		3								
CO2	2	2	2	3								
CO3	2	2		3			3					
CO4	2	2	1	2								
CO5	2	2	2	2			2					
CO6												
Avg.	1.66	1.66	0.83	2.16	0	0	0.83	0	0	0	0	0
Course code	: BCS-DSE4.4											
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Course Name	: Artificial Intelligence											
Semester /Year	: VI											
		L	Т	P	С							
		3	1	0	4							

# L - Lecture T – Tutorial P – Practical C – Credit

### Course Objectives: The objectives of this course are

- To impart knowledge about Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems
- To understand NLP

### **Course Contents**

### UNIT 1

Introduction to Artificial Intelligence, Simulation of sophisticated & Intelligent Behavior in different

area problem Solving in games, 8 Puzzle, Rubik cube, water jug problem etc. natural language, automated reasoning.

# UNIT 2

Artificial Intelligence and search algorithm, un-informed search informed search, hill climbing algorithm, Best first search, A\* Search algorithm and AO\* algorithm.

# UNIT 3

Knowledge Representation, First order predicate calculus, Horn Clauses, Introduction to PROLOG, Semantic Nets, Partitioned Nets, Minskey frames, Case Grammar Theory, Production Rules Knowledge Base, the Interface

System, Forward & Backward Deduction.

# UNIT 4

Expert System Existing Systems (DENDRAL, MYCIN), Inference Engine, domain exploration Meta Knowledge,

Expertise Transfer, Self Explaining System.

### UNIT 5

Understanding Natural Languages. Parsing techniques, Context free and transformational grammars,

transition nets, augmented transition nets, Top down and Bottom Parser, Shanks Conceptual Dependency,

grammar free analyzers, sentence generation, and translation.

### TEXT BOOKS:

- 1. Winston, "LISP", Addision Wesley.
- 2. Marcellous, "Expert Sys tem Programming", PHI.
- 3. Elamie, "Artificial Intelligence", Academic Press.

# **Course outcomes** (COs):

CO1	Demonstrate fundamental understanding of the history of AI
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI
CO4	Apply different search algorithms in real world
CO5	Apply heuristic search to solve problems.
CO6	Design an expert system

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	2	2	3					
CO2	2			1	2							
CO3	2	2	2	2	1						1	2
CO4	1			2								
CO5		2			1						1	2
CO6	2	1	2	1	2						2	2
Avg.	1.5	1.0	0.83	1.16	1.66	0.33	0.5	0	0	0	0.66	1.0

Course code	: BCS-DSE4.5					
Course Name	: Internet of Things					
Semester /Year	: VI					
		]	L	Т	Р	С
		•	3	1	0	4

### **Course Objectives:** The objectives of this course are

- Able to understand the application areas of IOT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor
- Networks
- Able to understand building blocks of Internet of Things and characteristics

#### **Course Contents**

#### Unit I

Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples . Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability.

### Unit II

Hardware for IoT: Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.

### Unit III

Network & Communication aspects in IoT: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

### Unit IV

Programming the Ardunio: Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoT

### Unit V

Challenges in IoT Design challenges: Development Challenges, Security Challenges, Other challenges

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IoT Applications : Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, Communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.

### References

1.Olivier Hersent, DavidBoswarthick, Omar Elloumi"The Internet of Things key applications and protocols", willey

2. Jeeva Jose, Internet of Things, Khanna Publishing House

- 3. Michael Miller "The Internet of Things" by Pearson
- 4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016

# **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	The students will be thorough about the technology behind the IoT and associated technologies
CO2	The students will be able to use the IoT technologies in practical domains of society
CO3	The students will be able to gain knowledge about the state of the art methodologies in IoT application domains
CO4	Apply smart lighting
CO5	Analyze challenges in IOT
CO6	Design Ardunio programming

### **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2			2			2					
CO2		2	3	2								
CO3		2	2				2					
CO4	2											
CO5	2	2		2		2		2				
CO6	2	1	2	1	1	1	2	1				
Avg.	1.33	1.16	1.16	1.16	0.16	0.5	1.0	0.5				

Course code	: BCS-DSE 4.6					
Course Name	: Machine Learning					
Semester /Year	: VI					
		]	L	Т	Р	С
			3	1	0	4

### Course Objectives: The objectives of this course are

The main objective of this course is to enabling the student with basic knowledge on the techniques to

build an intellectual machine for making decisions behalf of humans. This course covers the techniques on how to make learning by a model, how it can be evaluated, what are all different algorithms to construct a learning model.

# **Course Contents**

Unit I Probability Theory, Linear Algebra, Convex Optimization - (Recap) Introduction: Statistical Decision Theory - Regression, Classification, Bias Variance

Unit II

Linear Regression, Multivariate Regression, Subset Selection, Shrinkage Methods, Principal Component Regression, Partial Least squares Linear Classification, Logistic Regression, Linear Discriminant Analysis

Unit III

Perceptron, Support Vector Machines Neural Networks - Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation

Unit IV

Decision Trees, Regression Trees, Stopping Criterion & Pruning loss functions, Categorical Attributes, Multiway Splits, Missing Values, Decision Trees - Instability Evaluation Measures

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Bootstrapping & Cross Validation, Class Evaluation Measures, ROC curve, MDL, Ensemble Methods - Bagging, Committee Machines and Stacking, Boosting

Unit V

Gradient Boosting, Random Forests, Multi-class Classification, Naive Bayes, Bayesian Networks Undirected Graphical Models, HMM, Variable Elimination, Belief Propagation

**Text Book** 

Marco Gori , Machine Learning: A Constraint-Based Approach, Morgan Kaufmann. 2017 Ethem Alpaydin, Machine Learning: The New AI, MIT Press-2016

# **Course outcomes** (COs):

CO1	Appreciate the importance of visualization in the data
	analytics solution
CO2	Apply structured thinking to unstructured problems
CO3	Understand a very broad collection of machine
	learning algorithms and problems
CO4	Learn algorithmic topics of machine learning and
	mathematically deep enough to introduce the required
	theory
CO5	Develop an appreciation for what is involved in
	learning from data.
CO6	Design Bayesian Network

# **CO-PO Mapping**

		<u> </u>										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2	2	2	2	2					
CO2		2	3	2		2						
CO3			2	2								
CO4				2				1				
CO5	2	2		2				2				
CO6	2	2	1	2				1				
Avg.	1.0	1.0	1.33	2.0	0.33	0.66	0.33	0.66				

Course code	: BCS-P62				
Course Name	: Project				
Semester /Year	: VI				
		L	Τ	P	С
		0	0	4	2

### **<u>Course Objectives:</u>** The objectives of this course are

To give you the tools to initiate a project plan Manage both stakeholders and relationships, organize their team Develop a project charter, and build a business case for a project.

### **Course outcomes** (COs):

### Upon successful completion of the course a student will be able to

CO1	Demonstrate a sound technical knowledge of their selected project topic.
CO2	Undertake problem identification, formulation and solution.
CO3	Design engineering solutions to complex problems utilizing a systems approach
CO4	Communicate with engineers and the community at large in written an oral forms.
CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer.
CO6	Demonstrate data base connection

### **CO-PO Mapping**

		0										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2	2	2	2	2	1	2	2	2	2
CO2		2	3	2		2		1	2	2	1	1
CO3			2	2		2			1		1	
CO4				2								
CO5	2			2	2	2	2	2				
CO6	2	2	2	3	2		2	2				
Avg.	1.0	0.66	1.5	2.16	1.0	1.33	1.0	1.0	0.83	0.66	0.66	0.5

Course code	: BCS-SM				
Course Name	: Seminar				
Semester /Year	: VI				
		L	Τ	P	С
		4	0	0	4

 $L \ \ - \ Lecture \ T - Tutorial \ P - Practical \ C - Credit$ 

# Course Objectives: The objectives of this course are

Identify and compare technical and practical issues related to the area of course Specialization Outline annotated bibliography of research demonstrating scholarly skills.

# **Course outcomes** (COs):

CO1	Establish motivation for any topic of interest and develop a thought process for technical presentation.
CO2	Organize a detailed literature survey and build a document with respect to technical publications.
CO3	Analysis and comprehension of proof-of-concept and related data.
CO4	Effective presentation and improve soft skills.
CO5	Ability to speak correctly
CO6	Make use of new and recent technology (e.g. Latex) for creating technical reports

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	1	2	1		1	1	2	2
CO2	3			2		1	2	1	1	1	1	2
CO3	3	2	1			2	1					1
CO4	2	1	2	2	1	2	3	1			1	
CO5	1	2	1	3	2	2	2				1	
CO6	1	2	1	1		2	2	2	2	2		
Avg.	2.0	1.33	1.33	1.16	0.66	1.83	1.83	0.66	0.66	0.66	0.83	0.83

Course code	: BCS-GE1				
Course Name	: Statistics				
Semester /Year	: I				
		L	Τ	P	С
		4	0	0	4

# <u>Course Objectives:</u> <u>The objectives of this course are</u>

- To study methods of collection, classification, tabulation of data.
- To apply various statistical methods and analyses the data
- To find correlation between the data.
- To study probability and probability distribution to solve various real life problems
- To test hypothesis using various statistical test.

# **Course Contents**

# UNIT I: DATA & ITS DIAGRAMMATIC REPRESENTATION

Definition of Statistics, Data ,Primary data & secondary data, classification of data, tabulation of data ,individual series, Discrete frequency Distribution ,continuous frequency distribution, Exclusive and inclusive continuous series, Diagrammatic representation of data ,Tabular form ,1D(All Bar Diagrams),2D,3D diagrams ,pictogram, cartogram, graphical form, Histogram, Frequency polygon, frequency curve, Ogive.

# **UNIT II: MEASURE OF CENTRAL TENDANCY & DISPERSION**

Mean (Arithmetic Mean, Weighted Mean, Harmonic Mean, Geometric Mean), Median, Mode, Histogram & Mode, Relationship between mean, median, mode. Definition of dispersion, Range, Quartile deviation & its coefficient, Inter Quartile deviation, Mean deviation & its coefficient, Standard deviation.

# UNIT III: CORRELATION & REGRESSION ANALYSIS

Correlation definition, types of correlation, Karl Pearson coefficient of correlation, Spearman coefficient of correlation, repeated rank. Regression, regression lines, Regression line of Yon X & X on Y, Regression coefficient, Relationship between correlation & regression coefficient.

**UNIT IV: PROBABILITY & PROBABILITY DISTRIBUTIONS** probability & probability distribution: probability, Sample space & events ,types of event, conditional probability, Bayes theorem, Mathematical expectation, Probability distribution: random variables, binomial distribution, Poisson Distribution, Normal distribution.

# UNIT V: SAMPLING, HYPOTHESIS TESTING & STATISTICAL TEST

Sampling & its type, Probability & Non probability sampling, Hypothesis, Null hypothesis, Alternative hypothesis, Type I & Type II Errors Statistical Test, Parametric test & Non parametric test, F test, T test, ANOVA -1, ANOVA 2, Chi square test as a goodness of fit, Chi square test as test of independence.

### TEXT BOOKS:

- 1. Gerald Keller : Managerial Statistics 9th Edition.
- 2. Richard Levin & David Rubin : Statistics for management, Prentice Hall.
- 3. Anderson, Sweeny & Williams: Statistics for Business and Economics, South W

# **Course outcomes** (COs):

CO1	Analyze, statistical data graphically using frequency distributions and cumulative frequency distributions.
CO2	Analyze statistical data using measures of central tendency, dispersion and location.
CO3	Calculate and interpret the correlation between two variables. And find regression lines
CO4	To understand concepts of Probability and its application including probability Distribution
CO5	To design hypothesis and apply various parametric and non-parametric statistical test to test the hypothesis
CO6	Understand probability and bayes theorem

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	1	2	1					
CO2	3	1		2		1	2	1				
CO3	3	2	1	1		2	1					
CO4	2	1	2	2	1	2	3	1			1	
CO5	1	2	1	3	2	2	2				1	
CO6	1			3								
Avg.	2.0	1.16	1.16	2.0	0.66	1.5	1.5	0.33	0	0	0.33	0

Course code	: BCS-GE2				
Course Name	: Operation Research				
Semester /Year	: II				
		L	Т	P	С
		4	0	0	4

### **Course Objectives:** The objectives of this course are

The course aims at building capabilities in the students for analysing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints. The objective of this course is to enable the student to understand and analyse managerial and engineering problems to equip him to use the resources such as capitals, materials, productions, controlling, directing, staffing, and machines more effectively.

### **Course Contents**

### UNIT 1

**Linear programming:** Mathematical formulations of LP Models graphical and simplex method of solving LP problems; sensitivity analysis; duality.

# UNIT 2

**Transportation problem:** Various methods of finding Initial basic feasible solution and optimal solution –North West Corner Rule, Least Cost Method, Vogel's Approximation Method.

### UNIT 3

Assignment model: Hungarian Method. Game Theory: Concept of game; Two-person zero-sum game; Pure and Mixed Strategy Games; Saddle Point;

# UNIT 4

**Sequencing Problem:** Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, Two jobs and m - Machines Problems.

### UNIT 5

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**Project Management:** Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control

TEXT BOOKS:

- 1. Apte-Operation Research and Quantitative Techniques (Excel Books)
- 2. S Kalawathy-Operation Research (Vikas IVth Edition)
- 3. Natarajan- Operation Research(Pearson)
- 4. Singh & Kumar—Operation Research(UDH Publisher edition 2013)

# **Course outcomes** (COs):

CO1	Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods
CO2	Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.
CO3	Model competitive real-world phenomena using concepts from game theory.
CO4	Formulate Network models for service and manufacturing systems
CO5	Develop mathematical skills to analyse and solve integer programming and network models arising from a wide range of applications.
CO6	Effectively communicate ideas, explain procedures and interpret results and solutions in written and electronic forms to different audiences

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2		2				2						
CO3		1	2				2					
CO4	2	1	2	2			1					
CO5		1	1									
CO6	2	1	1									
Avg.	1.0	1.0	1.0	0.33		0.33	0.5					

Course code	: BCS-GE3				
Course Name	: Economics				
Semester /Year	: III				
		L	Τ	Р	С
		4	0	0	4

# Course Objectives: The objectives of this course are

- **1.** Students will analyze the perfromance functioning of the government.
- 2. Students will think critically about economic models, evaluating the assumptions and implications.
- 3. Analyze the economic enviornment in which the organisation operates.
- 4 It will commence with making the students understand the basic economic theories.
- 5. To gain an understanding of core economic principles and how they apply to a wide range of real world issues.

# **Course Contents**

### UNIT 1

**Introduction to Economics;** Nature and Scope of Management Economics, Significance in decision-making and fundamental concepts, Objectives of a firm, Gap between theory and practice and role of managerial economist.

### UNIT 2

**Demand Analysis;** Law of Demand, Exceptions to the law of Demand, Determinants of Demand. Elasticity of Demand- Price, Income, Cross and Advertising Elasticity; Uses of Elasticity of Demand for managerial decision making, measurement of Elasticity of Demand. Demand forecasting meaning, significance and methods.

### UNIT 3

**Supply Analysis**; Law of Supply, Supply Elasticity; Analysis and its uses for managerial decision making.

Production concepts & analysis; Production function, single variable-law of variable proportion, two variable- Law of returns to scale. Cost concept and analysis, short-run and long-run cost curves and its managerial use.

# UNIT 4

Market Equilibrium and Average Revenue Concept. Market Structure: Perfect Competition, features,

determination of price under perfect competition. Monopoly: Feature, pricing under monopoly, Price

Discrimination. Monopolistic: Features, pricing under monopolistic competition, product differentiation.

Oligopoly: Features, kinked demand curve, cartels, price leadership. Pricing Strategies; Price determination, full cost pricing, product line pricing, price skimming, penetration pricing.

# UNIT 5

**National Income;** Concepts and various methods of its measurement, Inflation, types and causes, Business Cycle, Profit concept and major theories of profits; Dynamic Surplus theory, Risk & Uncertainty bearing theory and Innovation theory.

# TEXT BOOKS:

- 1. Dwivedi D.N. Managerial Economics (Vikas Publication, 7th Edition)
- 2. Petersen/jain Managerial economics-4e (Prentice hall)
- 3. Raj Kumar-Managerial Economics(UDH PUBLISHERS, 2013 edition)
- 4. Damodaran Suma Managerial Economics (Oxford 2006)

# **Course outcomes** (COs):

CO1	Understand theories and principles in microeconomics including price theory, market structure.
CO2	Analze the importance and functioning of the government markets and institutions in the context of social and economic problems
CO3	Focus on National Income unemployment and inflation
CO4	Ability to apply in depth knowledge for one or more specialisation
CO5	Engage and succeed in their professional careers through teamwork, proactive involvement and effective communication
CO6	Understand and evaluate the differentiate between cost and revenue.

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	2	1	-	-	2	2	1		2
CO2	-	-	-	3	-	-	-	-	-	-	2	3
CO3	2	1	2	1	-	-	-	-	-	1	-	3
CO4	3	1	2	2	3	2	2	-	-	-	-	-
CO5	1	2	2	2	3	-	2	1	2	-	-	1
CO6	1	1		1								
Avg.	1.5	1.16	1.0	1.83	1.16	0.33	0.66	0.16	0.66	0.33	0.33	1.5

Course code	: BCS-GE4				
Course Name	: Organisational Behaviour				
Semester /Year	: IV				
		L	Τ	P	С
		4	0	0	4

# <u>Course Objectives:</u> <u>The objectives of this course are</u>

- . Enhance the Employabality and caree Skills of students.
- Identify the processes used in developing communication and resolving conflictd.
- Make them Employable.
- Develop their confidence and help them attend interviews successfully and achieve growth.
- Explain group dynamics and demonstrate skills required for working in groups.

Course Contents

# UNIT 1

Basic forms of Business Ownership, Special forms of ownership: Franchising, Licensing, Leasing; Choosing a form of Business ownership; Corporate Expansion: mergers and acquisitions, diversification, forward and backward integration, joint ventures, Strategic alliance Evolution of Management Theory. Managerial functions and Roles, Insights from Indian practices and ethos.

# UNIT 2

Overview of Planning: Types of Plans& The planning process; Decision making: Process, Types and Techniques. Control: Function, Process and types of Control; Principles of organizing: Common organizational structures, Delegation & Decentralization: Factors affecting the extent of decentralization, Process and Principles of delegation.

# UNIT 3

Importance of organizational Behavior, Perception and Attribution: Concept, Nature, Process, Personality: Personality: Learning: Concept and Theories of Learning, reinforcement, Motivation: Concepts and their application, Need, Content & Process theories, Contemporary Leadership issues: Charismatic, Transformational Leadership. Emotional Intelligence

# UNIT 4

Groups and Teams: Definition, Difference between Groups and teams; Stages of Group Development, Group Cohesiveness, Types of teams. Analysis of Interpersonal Relationship: Transactional Analysis, Johari Window Organizational Power and Politics: Nature of organizational politics. Conflict: Concept, Sources, Types, Stages of conflict, Management of conflict, Organizational Change: Concept, Resistance to change, Managing resistance to change, Implementing Change, Kurt Lewin Theory of Change. Managing Stress: Insights from Indian ethos

# TEXT BOOKS:

- 1. Gilbert: Principles of Management, McGraw Hill.
- 2. Greenberg Jerald and Baron Robert A.: Behaviour in Organisations:
- 3. Understanding and Managing the Human Side of Work, Prentice Hall of India.

### **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	To inculcate professional and ethical attitude at a work place
CO2	To make effective communication and interpersonal skills
CO3	Develop an ability of decision making
CO4	Recognize the role of motivation on performance.
CO5	Gain an understanding of the need for organisation and job redesign
CO6	Evaluate and apply various approaches for organizational effectiveness

### **CO-PO** Mapping

		8										
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	2	1	-	-	2	2	1		2
CO2	-	-	-	3	-	-	-	-	-	-	2	3
CO3	2	1	2	1	-	-	-	-	-	1	-	3
CO4	3	1	2	2	3	2	2	-	-	-	-	-
CO5	1	2	2	2	3	-	2	1	2	-	-	1
CO6	1	2	2	1	1							
Avg.	1.5	1.33	1.33	1.83	1.33	0.33	0.66	0.5	0.66	0.33	0.33	1.5

Course code	: BCS-GE5				
Course Name	: Consumer Affair				
Semester /Year	:				
		L	Τ	P	С
		4	0	0	4

### **<u>Course Objectives</u>:** The objectives of this course are

To able to understand consumer protection and legislation.

- To develop understanding of methods of seeking a remedy.
- To understand advertising strategies and regulations.
- To formulate and implement consumer education programmes.

• To disseminate information to enable consumers to acquire knowledge of basic consumer rights and obligations

• To improve consumer awareness on unfair business practices.

### **Course Contents**

### **Unit 1: Conceptual Framework**

**Consumer and Markets**: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. **Experiencing and Voicing Dissatisfaction**: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

# **Unit 2: The Consumer Protection Law in India**

**Objectives and Basic Concepts**: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.

**Organizational set-up under the Consumer Protection Act**: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

**Unit 3: Grievance Redressal Mechanism under the Indian Consumer Protection Law** 

Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. **Leading Cases decided under Consumer Protection law by Supreme Court/National** 

# School of CA & IT

**Commission**: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

### **Unit 4: Role of Industry Regulators in Consumer Protection**

- i. Banking: RBI and Banking Ombudsman
- ii. Insurance: IRDA and Insurance Ombudsman
- iii. Telecommunication: TRAI
- iv. Food Products: FSSAI
- v. Electricity Supply: Electricity Regulatory Commission
- vi. Real Estate Regulatory Authority

# **Unit 5: Contemporary Issues in Consumer Affairs**

**Consumer Movement in India:** Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

**Quality and Standardization**: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

# Note: Unit 2 and 3 refers to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified

### **Suggested Readings:**

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) *Consumer Affairs,* Universities Press.

2. Choudhary, Ram Naresh Prasad (2005). *Consumer Protection Law Provisions and Procedure*, Deep and Deep Publications Pvt Ltd.

3. G. Ganesan and M. Sumathy. (2012). *Globalisation and Consumerism: Issues and Challenges*, Regal Publications

4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi

5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company

6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.

7. E-books :- www.consumereducation.in

8. Empowering Consumers e-book,

9. ebook, www.consumeraffairs.nic.in

10. The Consumer Protection Act, 1986 and its later versions.

# **Course outcomes** (COs):

# Upon successful completion of the course a student will be able to

CO1	Learners will pick up the concept of Consumer Behaviour, types of
	Consumers, Diversity of Consumers.
CO2	Learners will acquire basic knowledge about issues and dimensions of
	Consumer Behaviour
CO3	Learners would develop their skill of understanding and analyzing
	consumer information and using it to create consumer oriented marketing
	strategies.
CO4	Students could know the difference between influenced buying pattern and
	impulse buying pattern.
CO5	Students are well versed in analyzing the consumer trends and
	psychology.
CO6	To describe the target market and determine the positioning strategy
	according to consumer characteristics and behaviour

# **CO-PO Mapping**

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	2	1	-	-	2	2	1		2
CO2	-	-	-	3	-	-	-	-	-	-	2	-
CO3	2	1	2	1	-	-	-	-	-	1	-	-
CO4	-	-	-	-	-	-		-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	2		2	1	2					2		1
Avg.	1.0	0.5	0.66	1.0	0.5	0	0	0	0	0.66	0.33	0.5