Prestige Institute of Management & Research, Gwalior

NIRF I NAAC 'A' GRADE I AUTONOMOUS

Course Curriculum

BCA

2024-28

Prestige Institute of Management & Research, Gwalior

Airport Road, Opposite DD Nagar, Gwalior (M.P.) INDIA

Prestige Institute of Management & Research, Gwalior

Four Years (8 Semester) CBCS Programme

First Semester

S. No.	Code	Subject	Cat	L	T	P	C	Contacts Hrs/Wk	IA*		EA*		Total Marks
									Max	Min	Max	Min	
1	BCA - 101	Programming in C	CC	3	1		4	4	40	14	60	21	100
2	BCA - 102	Computer Organization and Architecture	CC	3	1		4	4	40	14	60	21	100
3	BCA - 103	Discrete Mathematics	CC	3	1		4	4	40	14	60	21	100
4	BCA - 104	English and Communication Skills	AEC	3	1		4	4	40	14	60	21	100
5	BCA - 105	Principles and Practices of Management	MDE	3	1		4	4	40	14	60	21	100
6	BCA - 106	Programming in C Lab	CC		1	2	2	3	20	7	30	11	50
7	BCA - 107	MS Office (LAB)	AEC		1	2	2	3	20	7	30	11	50
8	BCA - 108	Sports	VAC	-	-	-	-	-	-	-	-	-	-
		Total		**15**	**7**	**4**	**24**	**26**	**240**	**84**	**360**	**127**	**600**

Prestige Institute of Management & Research, Gwalior

Four Years (8 Semester) CBCS Programme

Second Semester

BCA II Semester

S. No.	Code	Subject	Cat	L	T	P	C	Contacts Hrs/Wk	IA*		EA*		Total Marks
									Max	Min	Max	Min	
1	BCA - 201	Data Structure	CC	3	1		4	4	40	14	60	21	100
2	BCA - 202	DBMS	CC	3	1		4	4	40	14	60	21	100
3	BCA - 203	Statistical Methods	CC	3	1		4	4	40	14	60	21	100
4	BCA - 204	Environmental Science and Sustainability	MDE	3	1		4	4	40	14	60	21	100
5	BCA - 205	Data Structure Lab	CC		1	2	2	3	20	7	30	11	50
6	BC – 206	DBMS Lab	CC		1	2	2	3	20	7	30	11	50
7	BCA - 207	Self-Learning (Swayam/NPTEL MOOC)	Self-Study	-	2	-	4	2	-	-	100	40	100
8	BCA-208	Personality Development	VAC										
		Total		**12**	**8**	**4**	**24**	**26**	**200**	**70**	**400**	**146**	**600**

Prestige Institute of Management & Research, Gwalior

Four Years (8 Semester) CBCS Programme

Third Semester

S. No.	Code	Subject	Cat	L	T	P	C	Contacts Hrs/Wk	IA*		EA*		Total Marks
									Max	Min	Max	Min	
1	BCA – 301	Introduction to Operating System	CC	3	1		4	4	40	14	60	21	100
2	BCA - 302	Object Oriented Programming in C++	CC	3	1		4	4	40	14	60	21	100
3	BCA - 303	Mathematics III (Linear Algebra)	CC	3	1		4	4	40	14	60	21	100
4	BCA - 304	Web Technologies	CC	3	1		4	4	40	14	60	21	100
5	BCA - 305	Project I on Web Technologies	SEC	2	1		2	2	20	7	30	11	50
6	BCA – 306	C++ Lab	SEC		1	2	2	2	20	7	30	11	50
7	BCA – 307	Indian Constitution	AEC	2	0		2	2	20	7	30	11	50
8	BCA – 308	Personality Development*		2		-	2	2	50	18			50
		Total		**16**	**8**	**2**	**24**	**24**	**270**	**95**	**330**	**117**	**600**

Prestige Institute of Management & Research, Gwalior

Four Years (8 Semester) CBCS Programme

Fourth Semester

S. No.	Code	Subject	Cat	L	T	P	C	Contacts Hrs/Wk	IA*		EA*		Total Marks
									Max	Min	Max	Min	
1	BCA – 401	Programming in Java	CC	3	1		4	4	40	14	60	21	100
2	BCA – 402	Design and analysis of algorithms	CC	3	1		4	4	40	14	60	21	100
3	BCA – 403	Mathematics IV (Calculus)	CC	3	1		4	4	40	14	60	21	100
4	BCA – 404	Python Programming	SEC	3	1		4	4	40	14	60	21	100
5	BCA – 405	Programming in Java Lab	CC		1	2	2	3	20	7	30	11	50
6	BCA – 406	Python Programming Lab	CC		1	2	2	3	20	7	30	11	50
7	BCA – 407	Reasoning Part I	SEC	2				2					
8	BCA – 408	Entrepreneurship Development	CC	3	1		4	4	40	14	60	21	100
		Total		**17**	**7**	**4**	**24**	**28**	**240**	**84**	**360**	**127**	**600**

Prestige Institute of Management & Research, Gwalior

Four Years (8 Semester) CBCS Programme

Fifth Semester

S. No.	Code	Subject	Cat	L	T	P	C	Contacts Hrs/Wk	IA*		EA*		Total Marks
									Max	Min	Max	Min	
1	BCA – 501	Programming in Advance Java	CC	3	1		4	4	40	14	60	21	100
2	BCA – 502	Software Engineering	CC	3	1		4	4	40	14	60	21	100
3	BCA – 503	Oracle	CC	3	1		4	4	40	14	60	21	100
4	BCA – 504	Programming in Advance Java lab	CC		1	2	2	3	20	7	30	11	50
5	BCA – 505	Oracle Lab	SEC		1	2	2	3	20	7	30	11	50
6	BCA – 506	Internship/ Field Project	SEC				4		50	18	50	18	100
7	BCA - 507	Introduction to Web Analytics	CC	3	-	2	4		40	14	60	21	100
8	BCA – 508	Reasoning Part II	SEC	2				2					
		Total		14	5	6	24	20	250	88	350	124	600

Prestige Institute of Management & Research, Gwalior

Four Years (8 Semester) CBCS Programme

Sixth Semester

S. No.	Code	Subject	Cat	L	T	P	C	Contacts Hrs/Wk	IA*		EA*		Total Marks
									Max	Min	Max	Min	
1	BCA –601	Computer Networks	CC	3	1		4	4	40	14	60	21	100
2	BCA –602	Computer Graphics and Multimedia	CC	3	1		4	4	40	14	60	21	100
3	BCA –603	Software Testing	CC	3	1		4	4	40	14	60	21	100
4	BCA –604	Introduction to AI & Machine Learning	CC	3	1		4	4	40	14	60	21	100
5	BCA –605	Generative AI Tools	SEC	1	-	2	2	3	20	7	30	11	50
6	BCA –606	Computer Graphics and Multimedia Lab	SEC		-	4	2	3	20	7	30	11	50
7	BCA –607	Project	SEC				4	0	50	18	50	18	100
8	BCA –608	SEO (VAC)	VAC	-	-	-	-						
		Total		13	4	6	24	22	250	88	350	124	600
		*SEO is non credit but mandatory. And will be evaluated and added in internal assessment sheets											

Prestige Institute of Management & Research, Gwalior

Four Years (8 Semester) CBCS Programme

Seventh Semester

S. No.	Code	Subject	Cat	L	T	P	C	Contacts Hrs/Wk	IA*		EA*		Total Marks
									Max	Min	Max	Min	
1	BCA –701	Data Mining	CC	3	1		4	4	40	14	60	21	100
2	BCA –702	Research Methodology	CC	3	1		4	4	40	14	60	21	100
3	BCA –703	Data science using Python	CC	3	1		4	4	40	14	60	21	100
4	BCA –704	Cyber Security and Law	MDE	3	1		4	4	40	14	60	21	100
5	BCA –705	Research project I	SEC				4		40	14	60	21	100
6	BCA –706	Advance Data science using Python Lab	SEC		-	4	2		20	7	30	11	50
7	BCA –707	Data Mining Lab Using Weka	SEC		-	4	2		20	7	30	11	50
8	BCA - 708	Reasoning Part III	SEC	2				2					
		Total		12	4	0	24	16	200	70	300	105	600
		*reasoning classes will be carried out in form of workshop and will be part of internal assessment. Mandatory non credit course (Student has to get pass in the subject.)											

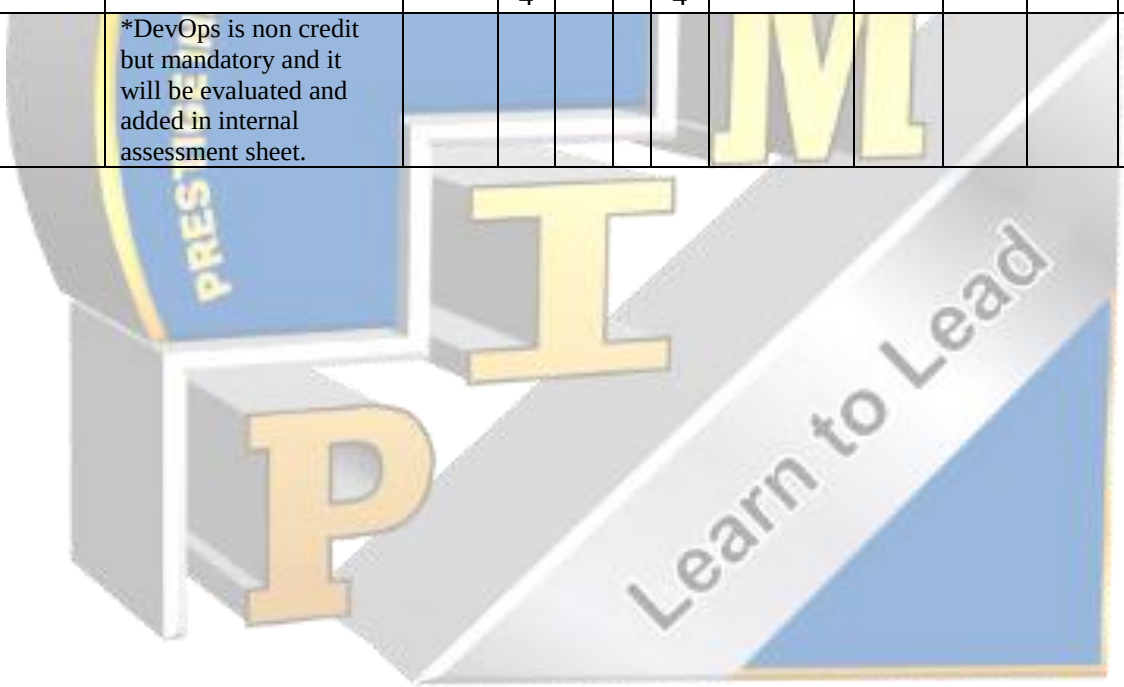
Learn to Lead

Prestige Institute of Management & Research, Gwalior

Three Years (8 Semester) CBCS Programme

Eighth Semester

S. No.	Code	Subject	Cat	L	T	P	C	Contacts Hrs/Wk	IA*		EA*		Total Marks
									Max	Min	Max	Min	
1	BCA-801	Mobile Application Development	CC	3	1		4	4	40	14	60	21	100
2	BCA-802	Cloud Computing	CC	3	1		4	4	40	14	60	21	100
3	BCA-803	Mobile Application Development Lab	CC	3	1		4	4	40	14	60	21	100
4	BCA-804	R-Programming	SEC	3	1		4	4	40	14	60	21	100
5	BCA-805	R - Programming Lab	SEC		-	4	2	2	20	7	30	11	50
6	BCA-806	Research project II	SEC				4	0	40	14	60	21	100
7	BCA-807	French Language	SEC	2			2	2	20	7	30	11	50
8	BCA-808	DevOps*	VAC										
		Total		14	4	4	24	20	240	84	360	127	600
		*DevOps is non credit but mandatory and it will be evaluated and added in internal assessment sheet.											



Programming in C PAPER CODE: 101	Max. Marks: 100 Min. Marks: 40 External 60 Internal: 40

Credits: 4

Course Objectives

This course aims to introduce students to the fundamentals of programming and structured problem-solving using the C language. It covers essential concepts like algorithms, flowcharts, programming techniques, and debugging tools. Students will learn C syntax, control structures, arrays, strings, functions, pointers, structures, and preprocessor directives. The course emphasizes logic building, modular programming, and hands-on coding for developing efficient and maintainable programs.

Course outcomes

CO1a:	Understand the problem solving constructs and techniques through flowcharts
CO1b:	Understand various tokens and predefined functions of C language.
CO2:	Understand & apply control statements and arrays to solve problems for Computers.
CO3:	Create modular program using functions and utilize various storage class.
CO4:	Understand & apply pre-processor directives, structures, and union in solving problems.

CO/PO Matrix

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	-	3
CO1b	2	2	2	-	3
CO2	2	2	2	-	3
CO3	2	2	2	-	3
CO4	2	2	2	-	3

Course Mapping:

Local	Regional	National	Global
N	N	Y	N

Professional Ethics	Gender	Human Values	Environment &Sustainability
Y	N	Y	N

Employability	Entrepreneurship	Skill Development
Y	Y	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

UNIT 1: **Programming fundamentals:** program concept, algorithms, flow charts - symbols, rules for making flow chart, types of flowchart, advantage & disadvantage, techniques of problem solving: programming techniques – top down, bottom up, modular, structured - features, merits & demerits, programming logic- simple, branching, looping. Testing & debugging and their tools.

UNIT 2: Programming in c including features of 'c', c tokens, variables, identifiers, keywords, data types, constants, operator and expression, operators: arithmetic, logical, relational, conditional and bit wise operators, precedence and associativity of operators, type conversion in expression, basic input/output and library functions single character input/output i.e. getch(), getchar(), Getche(), putchar(),formatted input output i.e. printf() and scanf().

UNIT 3: **Branching constructs:** If statement, if.....else statement, nesting of if....else statement, else if ladder, the ?: operator, switch statement, compound statement, loop controls: for, while, do-while loops, break, continue, goto statement, arrays : what is array, declaring initializing 1d, 2d and 3d array. String: declaration, string functions – strcat, strcpy, strcmp, strlen, strstr.

UNIT 4: **Functions:** Categories of functions user defined and library function, recursion, function arguments, return values and nesting of function, calling of functions, scope and life of variables - local and global variable, storage classes - auto, extern, static, pointers: operations on pointers, operators for pointers, pointers and function, array of pointers, pointer and strings.

UNIT 5: **Preprocessor directives:** #define, defining functions like macros, include, conditional compilation directives. Structures: the concept of structure, initializing a structure, the structure tag, dot operator, array of structure, structure and pointer, arrow operator and nesting of structure. Unions: initialization and use of it in a program. Command line arguments

Suggested Readings:

1. Kanitkar Y. *Let us C.* BPB Publicatiuon.
2. *C Programming*. Schaum's series.
3. Balgurusuamy. *Programming in ANSI C*. Tata McGraw Hill

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Assignment 1	5
Assignment 2	5
Assignment 3	5
Skill Development	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

will vary as per credits

Unit	Marks
1	10
2	10
3	10
4	10
5	10
Case study/Matching/Assertions	10
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE
BCA I SEMESTER

Computer Organization and Architecture **PAPER CODE: 102**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives: The course focus on structure and function of the computer system. Analyze and understand the Logic Gates, Boolean algebra, Combinational and sequential circuits, instruction sets. Addressing modes, Memory hierarchy, I/O systems DMA technique.

Course Outcomes: At the end of the course, students will be able to-

	PO1	PO2	PO3	PO4	PO5
CO1a-Understand the concepts of Logic Gates, map simplification, Different Digital Circuits.	2	2	1	1	3
CO 1b-Use of the data representation Techniques and codes.	2	2	2	1	3
CO2-Understand the concepts of computer organization.	2	2	2	-	3
CO3-Understand central processor organization.	2	2	2	-	3
CO4-Understanding the various types of Memories and I/O organization.	2	3	3	-	3

Course Mapping:

Local	Regional	National	Global
Y	Y	Y	Y

Professional Ethics	Gender	Human Values	Environment &Sustainability
N	N	N	N

Employability	Entrepreneurship	Skill Development
Y	N	Y

Course Pedagogy:
Lecture, Case study, hands on analysis

Course Contents:

Unit-I
Digital Logic Circuits: Logic gates Boolean algebra, map simplification, combinational circuits, and sequential circuits.

Unit-II
Data Representation: Representation signed and unsigned integer, fixed-point representation, floating – point representation, other binary codes.

Unit-III
Basic Computer Organization and Design: Computer instruction, Instruction codes, timing and control, execution and instruction, input-output and interrupt, priority interrupt, computer system design.
Unit-IV
Central Processor Organization: Processor bus organization, arithmetic logic unit (ALU) instruction formats, addressing modes, data transfer and manipulation, program control, microprocessor organization.

Unit-V
Memory Organization: Auxiliary memory, microcomputer memory hierarchy, associative memory, virtual memory, cache memory. **Input-Output Organization:** Peripheral devices. Asynchronous and synchronous data transfer, direct memory access (DMA), input –output processor (IOP).

Suggested Text Books:

1. Williams S. *Computer Organization and Architecture*, PHI.
2. Mano M. M. *Computer Organization and Architecture*, PHI.
3. John P. Hayes, *Computer Architecture and Organization*, Tata McGraw Hill.

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Assignment 1	5
Assignment 2	5
Assignment 3	5
Skill Development	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

will vary as per credits

Unit	Marks
1	10
2	10
3	10
4	10
5	10
Case study/Matching/Assertions	10
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE

BCA I SEMESTER

MATHEMATICS-I **DISCRETE MATHEMATICS** **PAPER CODE: 103**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives: This course introduces foundational concepts in logic, set theory, relations, and functions essential for mathematical reasoning. It aims to develop understanding of Boolean algebra for logical circuit simplification and switching theory applications. Students will also explore fundamental graph theory concepts and algorithms for solving network-related problems.

Course Outcomes:

CO1a	Understand the key concept of propositions and quantifiers.
CO1b	Construct proofs of basic set-theoretic identities involving unions, intersections, and Cartesian products
CO2	Understand the concept of relation and function and its operations.
CO3	Evaluate Boolean algebra expressions and functions and simplify the Boolean expression representing switching circuit.
CO4	Demonstrate graph, path, cycles, complement of a graph, trees and its types

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	2	2	-	3
CO1b	3	2	2	-	3
CO2	3	2	3	-	3
CO3	3	2	3	-	3
CO4	3	2	2	-	3

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

UNIT 1:
Introduction and Preliminaries: Logical connectives, Truth tables, Tautologies and Contradiction, Logical equivalence, Algebra of propositions. Quantifiers, existential quantifiers and universal quantifiers.

UNIT-2:
Set Theory: Set, Singleton set, Finite and Infinite sets, Subsets, Proper subsets, Equality of sets, Union, Intersection and Difference of sets, Universal set, De Morgan laws, Symmetric difference of sets, Cartesian product of sets.

UNIT 3:
Relations: Relation between two sets, Binary relation on a set, Types of binary relations, Equivalence relation, Equivalence class, Partition of a set, Fundamental theorem of equivalence relation, Composition of relations.
Functions: Function or mapping, one-one, Many-one, into and onto mappings, Identity mapping, Constant mapping, Equality of mappings, Inverse of a mapping, Composition of mappings.

UNIT 4:
Boolean algebra: Definition and properties of Boolean algebra, a brief introduction to the application of Boolean algebra to switching theory, conversion of complicated switching circuits to simple one, Disjunctive and Conjunctive normal forms.

UNIT 5:
Graph Theory: Introduction of graph theory, types of graph, Paths and Circuits, Trees and their properties, binary trees, spanning trees, Kruskal's and Prim's algorithms for minimum spanning tree.

Suggested Readings:

1. Tremblay, J. P., & Manohar, R. (1975). *Discrete mathematical structures with applications to computer science*. McGraw-Hill, Inc.
2. Deo, N. (2017). *Graph theory with applications to engineering and computer science*. Courier Dover Publications.
3. Discrete Mathematics by B.R. Thakur (Ram Prasad Publication).
4. Discrete Mathematic by D.C. Agrawal (Shree Sai Publication).

Reference Books

1. Liu, C. L. (1987). *Elements of discrete mathematics*. Tata McGraw-Hill Education.
2. Johnsonbaugh, R. (2005). *Discrete Mathematics*. Pearson Education.
3. Bernard, K., Robert, B., & Sharon, R. (1996). *Discrete mathematical structures*. Prentice Hall of India.

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

will vary as per credits

Unit	Marks
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE

ENGLISH AND COMMUNICATION SKILLS PAPER CODE: 104	Max. Marks: 100 Min. Marks: 40 External 60 Internal: 40

Credits: 04

Course Objective : To enable students to learn general English grammar and its use in daily life.

Course Outcomes:

CO1a	Students will be able to acquire a wide vocabulary and understanding of basic functional grammar and knowledge for reading, writing and spoken language.
CO1b	Students will be able to develop creative and critical writing skills along with developing an interest and appreciation of literary texts.
CO2	To enable the learners to communicate effectively and appropriately in real life situations.
CO3	Students will be able to demonstrate the use of basic and advanced business writing skills and to produce clear and concise written business documents.
CO4	Students will be able to summarize and synthesize information into a coherent text and develop language competence, presentation and public speaking skills.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	-	3	1	2
CO1b	2	-	3	-	1
CO2	3	3	3	3	2
CO3	2	3	3	3	3
CO4	3	2	3	3	3

Course Mapping:

Local	Regional	National	Global
Y	Y	Y	Y

Professional Ethics	Gender	Human Values	Environment &Sustainability
Y	Y	Y	Y

Employability	Entrepreneurship	Skill Development
Y	Y	Y

Course Pedagogy: ***Lecture, PPT's , Role plays, Mock Group Discussions, Extempore, JAM etc.***

Course Content:

UNIT 1: Review of English Grammar, Vocabulary Building (Synonyms, Antonyms, Homonyms, Idioms, Proverbs, One word substitution), Paragraph Writing, Precis Writing, Report Writing

UNIT 2: Where the Mind is without fear by R.N. Tagore, Life by Sarojini Naidu, Our Trees Still grow in Dehra by Ruskin Bond, The Bird with the Golden Wings by Sudha Murthy

UNIT 3: Communication,- Definition and Process of Communication, Essentials of Effective Communication, Barriers to Communication & Role of Communication in Organizational Effectiveness, Non-Verbal Communication: Meaning, Types and Importance, Listening, Difference between Listening and Hearing

UNIT 4: Business Correspondence, Essentials of Effective Business Correspondence, Structure of Business Letter, Types of Business Letter: Enquiry, Reply, Orders, Complaints, and Circular Letter, Writing Emails, Drafting of Notices, Agendas, Minutes, Job Application Letters, Preparation of a Curriculum Vitae(CV) and Resume, their difference and usage.

UNIT 5: Public Speech – Composition Principles, Speech Delivering Skills, Group Discussion: Do's and Don'ts of Group Discussions, Communication in Committees, Seminars and Conferences

Suggested Readings:

- *Chaturvedi, P.D, Mukesh. The Art and Science of Business Communication. 4th ed. 2017, Pearson, India*
- *Higgins, Jessica. 10 Skills for Effective Business Communication. Foreword by Ben Way 2021. Embassy Books, India.*
- *Kumar, Sanjay &PushpLata. Communication Skills. 2nd ed. 2015. Oxford University Press, India*
- *Swan, Michael. Practical English Usage 4th Ed, 2016. Oxford University Press, India.*
- *Wren and Martin. High School English Grammar&Composition.Revised by NDV Prasada Rao. Regular Edition, S. Chand Publishing. India.*

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Assignment 1	5
Assignment 2	5
Assignment 3	5
Skill Development	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

will vary as per credits

Unit	Marks
1	10
2	10
3	10
4	10
5	10
Case study/Matching/Assertions	10
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE

PRINCIPLES AND PRACTICES OF MANAGEMENT **PAPER CODE: BCA 105**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives: After the completion of this subject, the students will be able tointroduce the fundamental concepts of management.

CO1a	Understand the concepts and functions of Management.
CO1b	To articulate management agenda using tools and techniques of planning
CO2	Devise the organization structure and distill the organization function.
CO3	Developing skills in directing individuals and groups.
CO4	Analyze various control systems and their effectiveness in achieving organization goals.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	2	1	1	2
CO1b	1	3	2	1	2
CO2	1	2	3	2	1
CO3	1	1	2	3	2
CO4	2	1	2	2	3

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	N

Professional Ethics	**Gender**	**Human Values**	**Environment &Sustainability**
Y	Y	Y	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

UNIT 1: Introduction to Management

Concept, Nature& Functions of Management, Evolution of Management: Early Contributors; Management vs. Administration, Management Skills, Levels of Management, Introduction to Functions of Management, Responsibility of Managers.

UNIT 2: Planning

Planning: Nature, Significance of Planning, Types of Planning, Process of Planning, Objectives and Management By Objective (MBO), setting objectives, policies, Planning premises, Planning Tools and Techniques, Decision making steps and process.

UNIT 3: Organizing

Nature and purpose, Definition and Importance of Organizing: Concept, Forms of Organizational Structure, Formal and informal organization, organization chart, organization structure, departmentalization, delegation of authority, centralization and Decentralization, Span of Management.

UNIT 4: Directing

Foundations of individual and group behavior – motivation – motivational techniques – job enlargement –job enrichment – leadership – types and theories of leadership – communication – process of communication– barrier in communication – effective communication.

UNIT V: Controlling and Coordinating-

Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

Suggested Readings:

- *Koontz Harold &Weihrich Heinz (2008). Essentials of management (5th ed.). New Delhi; Tata Mc GrawHill.*
- *Robbins S.P. and Decenzo David A. (2009). Fundamentals of Management Essential Concepts and Applications 6th ed.). Delhi: Pearson Education*
- *Weihrich Heinz ond Koontz Harold (2008). Management: A Global and Entrepreneurial Perspective (12th ed.). New Delhi: McGraw Hill*

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Assignment 1	5
Assignment 2	5
Assignment 3	5
Skill Development	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
will vary as per credits

Unit	Marks
1	10
2	10
3	10
4	10
5	10
Case study/Matching/Assertions	10
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

Programming in C Lab PAPER CODE: 106	Max. Marks: 50 Min. Marks: 18 External 30 Internal: 20

Credits: 1

Course Objectives:

This course aims to introduce students to the fundamentals of programming using the C language. It focuses on structured problem-solving techniques through flowcharts, algorithms, and modular approaches. Students will learn to develop efficient programs using C constructs such as operators, loops, arrays, strings, functions, pointers, structures, and file handling.

Course Outcomes:

CO1a	Read understand and trace the execution of programs written in C language
CO1b	Write the C program for a given algorithm using control statements with input and output.
CO2	Write the modular program for given problem.
CO3	Write the program to solve problem using array, structure and pointers
CO4	Implement the solutions of real world problem.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	1	3	1	-	3
CO1b	1	3	2	-	3
CO2	1	3	2	-	3
CO3	1	3	2	-	3
CO4	1	3	2	-	3

Course Mapping:

Local	Regional	National	Global
			Y

Professional Ethics	Gender	Human Values	Environment & Sustainability
Y	N	N	N

Employability	Entrepreneurship	Skill Development
Y	Y	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

BCA – 106 Programming in C Lab

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series S = 1/2+1/3+1/4+……
4. WAP to compute the sum of the first n terms of the following series S =1-2+3-4+5…….
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):
   *
   ***
   *****
   ****
   ****
10. WAP to perform following actions on an array entered by the user:
    i) Print the even-valued elements
    ii) Print the odd-valued elements
    iii) Calculate and print the sum and average of the elements of array
    iv) Print the maximum and minimum element of array
    v) Remove the duplicates from the array
    vi) Print the array in reverse order The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.
11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.
13. Write a program in which a function is passed address of two variables and then alter its contents.
14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc()/ calloc() functions .
16. Write a menu driven program to perform following operations on strings:
    a) Show address of each character in string
    b) Concatenate two strings without using strcat function.
    c) Concatenate two strings using strcat function.
    d) Compare two strings
    e) Calculate length of the string (use pointers)
    f) Convert all lowercase characters to uppercase
    g) Convert all uppercase characters to lowercase
    h) Calculate number of vowels
    i) Reverse the string
17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration
19. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration
20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion
21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix operations (2-D array implementation): a) Sum b) Difference c) Product d) Transpose.
22. WAP to count frequency of each element of an array.

23. WAP to find encoded array from original array for any parameter.
24. WAP to perform following operation on string without using Library function:
    a) Length of a string
    b) Reverse of a String
    c) Check it is palindrome or not
25. WAP to count sum of each digit of string if string have only digits.
26. WAP to calculate sum of n number using command line argument.
27. WAP to convert lower to upper case or vice-versa of each character of string..
28. WAP to count vowel's in a string.
29. WAP to create a structure of student (ID, Name, Age) perform Insert and display operation.
30. WAP to perform operation on file handling:
    a) Write character into a file.
    b) Read character from a file.
    c) Create Copy a file.

Suggested Text Books:

1. Kanitkar Y. *Let us C.* BPB Publicatiuon.
2. *C Programming*. Schaum's series.
3. Balgurusuamy. *Programming in ANSI C*. Tata McGraw Hill.

Course Evaluation Criteria:

Instruments	Marks
Assignment -1	5
Assignment -2	5
Assignment -3	5
Viva	5
Total(Internal assessment)	20

Marks Distribution Scheme for final exams: (For 1 Credit Course)*

***will vary as per credits**

Unit	Marks
External Viva	30

Total (Internal Assessment + External Assessment)	**50**

MS Office (LAB) PAPER CODE: 107	Max. Marks: 50 Min. Marks: 18 External: 30 Internal: 20

Credits: 1

Course Objective: To equip learners with fundamental skills in MS Office tools—Word, Excel, and PowerPoint enabling efficient document creation, data analysis using formulas and functions, and professional presentation design.

Course outcomes

After the completion of course, students will be able to:

CO1a: Understand computer basics fundamentals to familiar with computer and its parts.
CO1b: Working with MS Word, various menus and formatting structures along with special features.
CO2: Hands on MS Excel spread sheet including various formatting techniques.
CO3: Working with MS Excel functions and formulas and statistical functions.
CO4: Hands on ms power point presentation slide with its features.

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	3	3	3
CO1b	3	2	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2

Course Mapping:

Local	Regional	National	Global
Y/N	Y/N	Y/N	Y/N

Professional Ethics	Gender	Human Values	Environment &Sustainability
Y/N	Y/N	Y/N	Y/N

Employability	Entrepreneurship	Skill Development
Y/N	Y/N	Y/N

Course Pedagogy:
Lecture, Case study, hands on analysis.

Course Content:

UNIT 1: Introduction to MS office

Computer Basic, Creating Folder, Paint Directories, input units, Output unit, Central Processing Units, hard ware, Soft ware, Windows short cut keys.

UNIT 2: MS Word

New, Open, Close, Save, Save As Formatting Text: Font Size, Font Style, FontColor, Use the Bold, Italic, and Underline, Change the Text Case, Line spacing, Paragraph spacing, Shading text and paragraph, Working with Tabs and Indents. Header and Footer: Inserting custom Header and Footer, Inserting objects in the header and footer, Add section break to a document. Working with bullets and numbered lists. Tables and Mail merge.

UNIT 3: MS Excel

Introduction to Excel interface, Understanding rows and columns, Naming Cells, Working with excel workbook and sheets, Formatting excel work book: New, Open, Close, Save, Save As Formatting Text: Font Size, Font Style, Font Color, Use the Bold, Italic, and Underline, Wrap text, Merge and Centre, Currency, Accounting and other formats, Modifying Columns, Rows & Cells. Sort and Filter Data with Excel: Sort and filtering data Using number filter, Text filter, Custom filtering, Removing filters from columns, Conditional formatting.

UNIT 4: MS Excel Functions and Formulas

Lookup and reference functions-VLookup, HLookup, Index, Match, Address, Offset.
Logical Functions- If/Else, True, False, AND, OR, NOT.
Data Base functions- Dget, Dmax/min, Dproduct, Dsum, Dvar, Dvarp.
Date and Time functions- Date, Day, Day360, Seconds, Minutes, Hours, Now, Today, Month, Year.
Math and Trig functions- Round, Rand, Int, LCM, Mod, Even, Sum, Sumif, Sumifs.
Statistical functions- Average, Averagea, Averageif, Count, CountA,Countblank, Countif, Forecast, Max, MaxA, Min, MinA,Avedev.

UNIT 5: MS Power Point

Inserting new slide, changing layout of slides, Duplicating slides, Copying and pasting slide, Applying themes to the slide layout, changing theme color, Slide background, Formatting slide background, and Using slide views. Master slide and its usages, Shapes, Clipart and Picture, Word Art, Smart Art Change the Order of Objects, Inserting slide header and footer, Inserting Text boxes, Inserting shapes, using quick styles, Inserting Word art, Inserting symbols, Inserting Chart.

Suggested Readings:

1. **Microsoft Office 2003: The Complete Reference, Jennifer, Guy Hart-Davis, Curt Simmons, Jennifer Ackerman Kettel, McGraw-Hill Osborne Media.**
2. **Analyzing Business Data With Excel, Forecasting, Statistics, and Data Management, Shroff/O'Reilly.**
3. **MICROSOFT OFFICE 365 ALL-IN-ONE FOR BEGINNERS & POWER USERS: The Concise Microsoft Office 365, by Tech Demystified.**
4. **Mastering Financial Mathematics In Microsoft Excel: A Practical Guide for Business Calculations, Alastair L. Day, PHI.**

Course Evaluation Criteria:

Instruments	Marks
Assignment -1	5
Assignment -2	5
Assignment -3	5
Viva	5
Total(Internal assessment)	20

Marks Distribution Scheme for final exams: (For 1 Credit Course)*

***will vary as per credits**

Unit	Marks
External Viva	30

Total (Internal Assessment + External Assessment)	**50**

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COURSE OUTLINE

Data Structure **PAPER CODE: BCA-201**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objective: To enable students with the knowledge and skills necessary to design implement and analyze efficient solutions to computational problems.

Course Outcomes:

CO1a	Understand the basic concepts of data structure & articulate linear data structure and permitted operations
CO1b	Understand and apply linked list data structure for solving problems
CO2	Articulate the tree data structures and permitted operations
CO3	Articulate the graph data structures and permitted operations
CO4	Implement Searching and Sorting algorithms & Understand the concepts of file organization techniques

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	1	1	1	2
CO2	3	1	1	1	2
CO3	3	1	1	1	2
CO4	2	1	1	1	2

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	N

Course Pedagogy:

Lecture, hands on analysis

Course Content:

UNIT 1: Introduction To Data Structure: need and classification of data structure, Array, Records, Stacks: Introduction to Stack & Primitive Operation on Stack, Stack as an Abstract Data Type, Stacks Application: Infix, Post Fix, Prefix and Recursion, Conversion from infix to postfix/prefix expression using Stack, Evaluation of postfix/ prefix expressions

UNIT 2: Queue: Introduction to Queues, Primitive Operations on the Queues, Queue as an Abstract Data Type, Circular Queue, Dequeue, Priority Queue, Applications of Queue.
Pointer, It's Limitation and Operation. Linked List & their type: linear, circular & Doubly linked list, Operations on various type of linked list, application of Linked list.

UNIT 3: Tree: General & Binary Tree. Conversion of General to Binary Tree. Binary Search Tree (BST) & It's Representation And Operation. Traversal Methods- In Order, Preorder & Post Order, Application of Binary Tree: Manipulation of Arithmetic Expression. Multiway Search Tree, Balance Tree & Their Types.

UNIT 4: Graph: Graph & Their Category & Representations, Traversing Technique: Breadth First & Depth First Search. Spanning Trees (St), Technique of Minimum Spanning Tree (MST), Application of Graphs: Pert & Related Techniques.

UNIT 5: Heaps and Hash Table. Introduction to file organization; Sequential, Indexed sequential, Relative & Direct file organization. Searching & Sorting: Linear & Binary Search. Sorting: Concept, selection sort, Bubble sort merge Sort, Tree sort & Partition - Exchange sort.

Suggested Readings:

1. Trembley &Sorrenson. *Data Structure*. Tata Mcgraw Hill.
2. Salaria R.S. *Data Structures and Algorithms using C++.* Khanna Publishing.
3. Lipschuists. *Data Structure*. Schaum's Outline Series. Mcgraw Hill Publication.

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

***will vary as per credits**

Unit	**Marks**
1	10
2	10
3	10
4	10
5	10
Case Study	10
Final Examination	60
Total	100

COURSE OUTLINE

Database Management System **PAPER CODE: BCA 202**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objective : This course covers fundamentals of database architecture, database management system. Principles and methodologies of database design and techniques for database application development.

Course Outcomes:

CO1a	Understand the Database concepts, DBMS software and supported architecture.
CO1b	Understand to design and implement databases using concepts of data models
CO2	Understand and analyze databases using normalization concepts.
CO3	Apply SQL and relational algebra expressions to retrieve and manage database
CO4	Understand transaction processing and concurrency control concepts

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	1	1	-	1	2
CO1b	2	1	1	2	2
CO2	2	2	-	1	3
CO3	2	3	3	2	2
CO4	2	2	1	1	2

Course Mapping:

Local	**Regional**	**National**	**Global**
No	No	Yes	Yes

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
Yes	No	Yes	No

Employability	**Entrepreneurship**	**Skill Development**
Yes	No	Yes

Course Pedagogy:
Lecture, Case study, hands on Practical

Course Content:

UNIT 1: **Introduction:** Database system concepts, Data base system, Advantages of database systems; **Data Architecture of data system**: View/Schema, logical, conceptual and physical and their interrelationship DDL, DML and data dictionary, Data base administrator. Integrity Constraints, Generalization, Specialization, Aggregation, **Entity Relationship Model:** Entity, Attributes, Strong & weak entities, Relationships, E-R Modeling Symbols

UNIT 2: **Relational DBMS;** RDBMS Terminology, Relational Data Structure, Data Integrity, Codd's Rule, Overview of Relational Algebra and Relational Calculus, Relational Database Design: Primary Keys, Foreign Keys, Candidate Keys, Relationships, Normalization, Purpose of Normalization, First Normal Form, Second Normal Form, Third Normal Form

UNIT 3: Introduction to SQL:
Basic SQL queries to retrieve and manipulate data, Data Definition Language (DDL) commands, Data Manipulation Language (DML) commands, Data Control Language (DCL) Commands, Transaction Control Language (TCL) Commands.

UNIT 4: Advanced SQL & JOIN Operations:
Complex SQL queries to retrieve and manipulate data, Introduction to functions and expressions, GROUP BY, ORDER BY, and HAVING clauses, Introduction to JOIN operations (INNER JOIN, LEFT JOIN, and RIGHT JOIN)

UNIT V: Data Security & Integrity:
Transactions: Transaction concept, Transaction Properties, Transaction States, Concurrency Control: Concurrency Control Schemes - Lock Based Protocols, Timestamp Based Protocols, Deadlock handling, User Defined Transactions, Database Security, Database Recovery.

Suggested Readings:

1. ***Ullman. Principles of Database Systems, 2e. Galgotia Publications.***
2. ***Silberschatz, Korth, &Sudershan. Database System Concepts, 5e. McGraw Hill.***
3. ***Desai, Bipin C. An Introduction to Database System. Galgotia Publications.***

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
***will vary as per credits**

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Final Examination	60
Total	100

COURSE OUTLINE

COURSE OUTLINE

MATHEMATICS II **STATISTICAL METHODS** **PAPER CODE: 203**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives: This course aims to introduce fundamental statistical concepts, data presentation techniques, and measures of central tendency and dispersion.It equips students with knowledge of probability theory, correlation, regression analysis, and probability distributions. Students will also learn hypothesis testing using statistical tools like t-test and z-test for informed decision-making.

Course Objective:

CO1a	To Understand the concept of statistics and analyze statistical data graphically using frequency distributions.
CO1b	To Analyze statistical data using measures of central tendency, dispersion, skewness and Kurtosis.
CO2	Understand the concept of basic terminology of probability and use of Normal distribution to find area under normal curve.
CO3	Apply the concept of correlation & Regression to analyze the underlying relationships between the variables.
CO4	Analyze statistical inference techniques (including statistical estimation and hypothesis testing) in business situations.

COPO Matrix:

CO/PO Matrix							
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1a	3	3	2	2	1	1	0
CO1b	3	3	2	1	1	1	0
CO2	3	2	-	-	1	1	1
CO3	3	2	2	2	2	1	0
CO4	2	2	2	2	2	1	1

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment &Sustainability**
Y	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	Y

Course Pedagogy:

Lecture, Class Assignment, hands on analysis

Course Content:

UNIT 1:
Introduction of statistics: Concept, Scope, Importance and limitations of Statistics. **Frequency Distribution:** Discrete and continuous frequency distribution. **Graphical and Diagrammatic Representation:** Construction of Histogram, Ogive Curves, Bar diagram, frequency polygon.

UNIT 2:
Measures of central tendency: Mean, Median, Mode.
Measures of Dispersion: Concept of dispersion methods of measuring dispersion- Range, Mean deviation, Quartile deviation, Standard Deviation and Coefficient of variation.Concept of Skewness and kurtosis.

UNIT 3:
Probability Theory: Concept and Importance of the probability, Basic terminology, Calculation of probability, Addition theorem, Multiplication theorem, Conditional probability &Baye's Theorem.
Theoretical Probability Distribution: Normal distribution and its application (Area under the normal curve).

UNIT-4:
Correlation: Concept and Importance of Correlation, Types of Correlation, Karl Pearson's correlation coefficient, Spearman's Rank correlation coefficient.
Linear Regression: Meaning and Uses of regression analysis, Regression lines, Regression co-efficient and its properties, Regression equations (a) By using mean, SD and coefficient of correlation and (b) by using method of least square.

UNIT-5:
Testing of Hypotheses: Introduction and types of hypothesis, level of significance Type I and Type II Error. Tests of Significance: Tests for simple hypothesest and Z-statistics.

Suggested Readings:

- Gupta, S. C. (2017).Fundamentals of Statistics. New Delhi: Himalaya Publishing House.
- Beri, G.C. (2009). Business Statistics, 2e. Tata McGraw Hill.
- *Sharma, J. K., Business Statistics, 2e. Pearson Education.*
- *Gupta, S.P. Statistical Methods. S. Chand & Sons, New Delhi.*

Reference Reading:

- *Black, K. Business Statistics for Contemporary Decision Making. Wiley Student Edition.*
- Richard Levin and David Rubin, Statistics for Management, Prentice Hall Of India, New Delhi, 2011,7th Edition
- Sharma J K., Fundamentals of Business Statistics, Second Edition, Vikas Publishing House Private Limited,2013
- *Render, and Stair J.R. Quantitative Analysis for Management, 7e. PHI.*

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Quiz	5
Class Presentation	5
Assignment	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams:

Unit	Marks
1	12
2	12
3	12
4	12
5	12
Final Examination	60
Total	100

COURSE OUTLINE

Environmental science &Sustainability **PAPER CODE: BCA-204 (MDE)**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objective : Developing a strong understanding of ecological principles, environmental issue and sustainable solutions.

Course Outcomes:

CO1a	Comprehend the Fundamentals of Ecology and Environmental Science
CO1b	Understand and Appreciate Biodiversity and Its Protection
CO2	Apply Principles of Sustainable Development
CO3	Conduct Environmental Experiments and Analysis
CO4	Develop and Disseminate Environmental Conservation Messages

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	2	2	1	1
CO1b	1	1	2	2	1
CO2	2	3	2	2	3
CO3	2	2	1	2	3
CO4	1	2	2	1	2

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment &Sustainability**
Y	Y	Y	Y

Employability	**Entrepreneurship**	**Skill Development**
Y	N	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

Unit 1: Study of Environment and Ecology

Defining Environment. Ecosystem – Definition, Components, structure and function, energy flow, food chain, food web, Ecological pyramids and types.

Unit 2: Bio-diversity and its Protection

Introduction- Genetic, species and ecosystem diversity. Value of bio-diversity. India as a nation of mega bio-diversity center, bio-diversity at national and local levels.

Unit 3: **Sustainable Development**

- **Principles of Sustainability:**
    - Sustainable development goals (SDGs)
- **Sustainable Agriculture and Food Systems:**
    - Organic farming, permaculture, and agroforestry
    - Food security and sustainable diets
- **Sustainable Urban Development:**
    - Green buildings and sustainable cities

Unit 4 : Disaster Management, Conservation of Laws for Air and Water Pollution, Wildlife Conservation Laws, Role of IT in environmental protection.

Unit 5: Student need to shoot short films or animations about environmental conservation and sustainability.

Suggested Readings:

- Benny Joseph, "Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
- Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
- ErachBharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.Andy Jones, Michel Pimbert and Janice Jiggins, 2011. Virtuous Circles: Values, Systems, Sustainability. IIED and IUCN CEESP, London.
- Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
- Essentials of Entrepreneur ship and Small Business Management (Sled): Thomas W.
- Zimmerer, and Norman M. Scarborough. PHI
- Entrepreneurship: Strategies and Resources, 3/E: Marc Dollinger: Prentice Hall
- Bringing New Technology to Market- Kathleen R. Allen, Prentice Hall Entrepreneurship in Action, 2/E - Mary Coulter; Prentice Hall

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

will vary as per credits

Unit	**Marks**
1	10
2	10
3	10
4	10
5	10
Case Study	10
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE

Data Structure Lab **PAPER CODE: BCA-205**	**Max. Marks: 50** **Min. Marks: 18** **External : 30** **Internal: 20**

Credits: 02

Course Objective : To make the students to learn to develop solutions of problems by implementing various data structures, searching and sorting algorithms

Course Outcomes:

CO1a	Implement and apply different linear data structure algorithms(stack, queues)
CO1b	Implement the various operations like insertion, deletion and traversing different linked list.
CO2	Demonstrate various operations like traversal, insertion, deletion on tree data structure.
CO3	Demonstrate various operations like traversal, insertion, deletion on graph data structure.
CO4	Implement various searching and sorting algorithms on different data structure.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	1	1	1	2
CO2	3	1	1	1	2
CO3	3	1	1	1	2
CO4	2	1	1	1	2

Course Mapping:

Local	**Regional**	**National**	**Global**
Y/N	Y/N	Y/N	Y/N

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
Y/N	Y/N	Y/N	Y/N

Employability	**Entrepreneurship**	**Skill Development**
Y/N	Y/N	Y/N

Course Pedagogy:

Lecture, hands on analysis

Course Content:

1. Write a program to implement Array operations – Insertion, Deletion, and Display
2. Write a menu driven program to Implement Stack operations (push(), pop(), peek(), display()) using array.
3. Write a menu driven program to Implement Liner queue operations using array. Write functions to
    (a) **Enqueue() –** Adds (or stores) an element to the end of the queue..
    (b) **Dequeue() –** Removal of elements from the queue.
    (c) **Peek() or front()-** Acquires the data element available at the front node of the queue without deleting it.
    (d) rear() – This operation returns the element at the rear end without removing it.
    (e) Display()
4. Write a menu driven program to Implement Circular Queue operations using array. Write functions to
    (a) **Enqueue() –** Adds (or stores) an element to the end of the queue..
    (b) **Dequeue() –** Removal of elements from the queue.
    (c) **Peek() or front()-** Acquires the data element available at the front node of the queue without deleting it.
    (d) **rear() –** This operation returns the element at the rear end without removing it.
    (e) Display()
5. Write a menu driven program to Implement Double Ended Queue (or Deque) operations using array. Write functions to
    (a) **Enqueue() –** Adds (or stores) an element to the end of the queue..
    (b) **Dequeue() –** Removal of elements from the queue.
    (c) **Peek() or front()-** Acquires the data element available at the front node of the queue without deleting it.
    (d) rear() – This operation returns the element at the rear end without removing it.
    (e) Display()
6. Write a menu driven program to Implement Singly Linked List operations. Write functions to
    (a) Insertion: To insert new nodes at specific positions.
        - Inserting at Beginning of the list
        - Inserting at End of the list
        - Inserting at Specific location in the list
    (b) Deletion: To delete nodes from specific positions.
        - Deleting from Beginning of the list
        - Deleting from End of the list
        - Deleting a Specific Node
    (c) Traversing: To traverse all nodes one by one.
    (d) Searching: To search for an element from the linked list.

7. Write a menu driven program to Implement Circular Linked List operations. Write functions to
    (a) Insertion: To insert new nodes at specific positions.
        - Inserting at Beginning of the list
        - Inserting at End of the list
        - Inserting at Specific location in the list
    (b) Deletion: To delete nodes from specific positions.
        - Deleting from Beginning of the list
        - Deleting from End of the list
        - Deleting a Specific Node
    (c) Traversing: To traverse all nodes one by one.
    (d) Searching: To search for an element from the linked list.
8. Write a menu driven program to Implement Doubly Linked List operations. Write functions to
    (a) Insertion: To insert new nodes at specific positions.
        - Inserting at Beginning of the list
        - Inserting at End of the list
        - Inserting at Specific location in the list
    (b) Deletion: To delete nodes from specific positions.
        - Deleting from Beginning of the list
        - Deleting from End of the list
        - Deleting a Specific Node
    (c) Traversing: To traverse all nodes one by one.
    (d) Searching: To search for an element from the linked list.
9. WAP to perform following operation on BST:
    (a) Insert a Node
    (b) Delete a Node
    (c) Search a Node
    (d) Traversing BST using (Inorder, Preorder, Postorder)
    (e) Find Max Node
    (f) Find Min Node
    (g) Count Internal Node
    (h) Count External Node
    (i) Count Total Node.
10. WAP to perform following operation on Graph:
    (a) Insert a Node
    (b) Insert a Edge
    (c) Search a Node
    (d) Traversing(BFS, DFS)
11. Write a program to Implement linear search.
12. Write a program to Implement binary search.
13. Write a program to Implement Selection Sort.
14. Write a program to Implement Bubble Sort.
15. Write a program to Implement merge Sort.

Course Evaluation Criteria:

Instruments	Marks
Assignment 1	5
Assignment 2	5
Assignment 3	5
Viva	5
Total Marks- Internal Examination	**20**

Marks Distribution Scheme for final exams: (For 4 Credit Course) *

will vary as per credits

Unit	Marks
External Viva	30
Total Marks- End Examination	**30**

Total (Internal Assessment + External Assessment)	**50**

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COURSE OUTLINE

Database Management System Lab **PAPER CODE: BCA 206**	**Max. Marks: 50** **Min. Marks: 18** **External 30** **Internal: 20**

Credits: 04

Course Objective : To make the student to learn writing SQL queries.

Course Outcomes:

CO1	Design relational databases that meet specific application requirement.
CO2	Write the SQL statement for creating databases in RDBMS
CO3	Write SQL statements for insert, update, and delete data from databases
CO4	Write SQL statements for fetching desired data from databases

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	2	2	-	3
CO2	1	1	1	-	3
CO3	1	1	1	-	3
CO4	1	1	1	-	3

Course Mapping:

Local	**Regional**	**National**	**Global**
No	No	Yes	Yes

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
Yes	No	No	No

Employability	**Entrepreneurship**	**Skill Development**
Yes	No	Yes

Course Pedagogy:
Lecture, Case study, hands on Practical

Course Content:
Practical Exercises:
Create and use the following database schema to answer the given queries.
Employee Schema

Field	Type	NULL KEY	DEFAULT
Eno	Char(3)	NO PRI	NIL
Ename	Varchar(5 O)	NO	NIL
Job_type	Varchar(5 0)	NO	NIL
Manager	Char(3)	Yes F K	NIL
Hire_date	Date	NO	NIL
Dno	Integer	YES PK	NIL
Commission	Decimal(10,2)	YES	NIL
Salary	Decimal(7,2)	NO	NIL

DEPARTMENT Schema

Field	Type	NULL KEY	DEFAULT
Dno	Integer	NO PRI NULL	
Dname	Varchar(SO)	NO PRI NULL	
Location	Varchar(SO)	Yes	New Delhi

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
3. Query to display the Employee Name and Salary of all the employees earning more than $2850.
4. Query to display Employee Name and Department Number for the Employee No: 7900.
5. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
6. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
7. Query to display Name and Hire Date of every Employee who was hired in 1981.
8. Query to display Name and Job of all employees who don't have a current Manager.
9. Query to display the Name, Salary and Commission for all the employees who earn commission.
10. Sort the data in descending order of Salary and Commission.
11. Query to display Name of all the employees where the third letter of their name is 'A'.
12. Query to display Name of all employees either have two 'R's or have two "A's in their name and are either in Dept No = 30 or their Manger's Employee No. = 7788.
13. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
14. Query to display the Current Date.
15. Query to display Name. Hire Date and Salary Review Date which is the lst Monday after six months of employment.
16. Query to display Name and calculate the number of months between today and the date each employee was hired.

17. Query to display the following for each employee <E-Name> earns <Salary> monthly but wants < 3 " Current Salary >. Label the Column as Dream Salary.
18. Query to display Name with the 1st letter capitalized and all other letter lowercase and length of their name of all the employees whose name starts with 'J', 'A' and 'M'.
19. Query to display Name, Hire Date and Day of the week on which the employee started.
20. Query to display Name, Department Name and Department No for all the employees.
21. Query to display Unique Listing of all Jobs that are in Department # 30.
22. Query to display Name, Dept Name of all employees who have an 'A' in their name.
23. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
24. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Emploees' Name who do not have a Manager.
25. Query to display Name. Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
26. Query to display the Highest. Lowest. Sum and Average Salaries of all the employees
27. Query to display the number of employees performing the same Job type functions.
28. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
29. Query to display Name and Hire Date for all employees in the same dept. as Blake.
30. Query to display the Employee No. And Name for all employees who earn more than the average salary.

Suggested Readings:

1. **Chun, J Wesley, Core Python Programming, Second Edition, Pearson, 2007 Reprint 2010**
2. **Barry, Paul, Head First Python, 2nd Edition, O Rielly, 2010**
3. **Lutz, Mark, Learning Python, 4th Edition, O Rielly, 2009**

Course Evaluation Criteria:

Instruments	**Marks**
Assignment 1	5
Assignment 2	5
Assignment 3	5
Viva	5
Total	20

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

***will vary as per credits**

Unit	**Marks**
External Viva	30
Total Marks End Examination	30

COURSE OUTLINE

INTRODUCTION TO OPERATING SYSTEM **PAPER CODE: BCA 301**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives:

This course is designed to provide students with a strong foundation in the fundamentals of operating systems. It aims to develop an understanding of instruction execution, processor registers, and inter-component communication within a computer system. Students will learn how the operating system manages processes and memory, handles synchronization issues, and resolves deadlocks using various algorithms. The course also covers different memory management techniques implemented by modern operating systems.

Course Outcomes:

CO1a	To learn the fundamentals of OS, gain the knowledge on the basics of instruction execution, processor registers and how components of system communicate with each other.
CO1b	To learn the concept of process and how OS manages processors and memory.
CO2	To gain knowledge about the mechanisms of OS for synchronizing processes and understanding various problems of synchronization.
CO3	To learn the concept of deadlocks and various algorithms for handling deadlocks.
CO4	To understand various memory management techniques implemented by OS.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	-	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	2	2	2	-	3
CO4	2	2	3	-	3

Course Mapping:

Local	**Regional**	**National**	**Global**
			Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y		

Course Pedagogy: ***Lecture, Case study, hands on analysis***

Course Contents:

Unit-I

Introduction: Computer System: Overview, Basic Components, Operating System: Introduction, Services, Functions, Structure, Types of Operating Systems, Interrupts & System Calls

Unit-II

Process Management: Process Concepts, Process Attributes, Operations on Process, Process Control Block, Process State Models- Two State, Five State, and Seven State. Inter Process Communication(IPC), CPU Scheduling: Need, Objective and Types, Scheduling Algorithms- FCFS, SJF, SJRF, Priority Scheduling, Round Robin Scheduling.

Unit-III

Process Synchronization: The Critical Section Problem, Peterson's Solution, Semaphores, Classical Problems of Synchronization, Monitors, Atomic Transactions.

Unit-IV

Deadlocks: System Model, Deadlock Characterization: Necessary Conditions for Deadlock, Resource Allocation Graph; Method for Handling Deadlocks: Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Unit-V

Memory Management Strategies: Memory Hierarchy, Linking, Loading, Swapping, Memory Allocation: Contiguous and Non Contiguous, Fixed and Variable Partitioning, Virtual Memory, Paging, segmentation, Page Fault, Page replacement algorithms: FIFO, LRU and Optimal.

Suggested Textbooks:

1. Silberschatz, Abraham, Peter Baer Galvin, Greg Gagne (2009). *Operating System Concepts, 8e.* Wiley Publications

2. Stallings, W. (2013). *Operating Systems: Internals and Design Principles,7e.* Pearson Education India

Reference Books:

1. Tanenbaum, Andrew S. (2016). *Modern Operating Systems, 4e.* Pearson Education India

2. Bach, Maurice J. (2015). *Design of the UNIX Operating System, 1e.* Pearson Education India

3. Arpaci-Dusseau, Remzi H. & Andrea C. Arpaci-dusseau (2018). *Operating Systems: Three Easy Pieces.* Amazon Digital Services

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

****will vary as per credits***

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**
Total (Internal Assessment + External Assessment)	**100**

Object Oriented Programming in C++ PAPER CODE: 302	Max. Marks: 100 Min. Marks: 40 External 60 Internal: 40

Credits: 4

Course Objective: To enable students to understand and apply object-oriented programming principles using C++ by exploring concepts such as classes, inheritance, polymorphism, file handling, and exception handling to build robust and modular software applications.

Course Outcomes

CO1a:	Understand basic constructs of C++ Programs and identify potential benefits of Object-oriented programming over other approaches.
CO1b:	Understanding and applying of object oriented programming concept of class, object and their storage to develop solutions of the problems.
CO2:	Understanding the concept of overloading the operator and functions and Applying the concept of Inheritance to solve the real-world problem
CO3:	Understanding the concept of Polymorphism and declaring Pointers and Arrays in Programs.
CO4:	Introduction to Files and Applying the concept of file and exception handing to store and retrieve data.

CO/PO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	3	2	-	3
CO1b	3	3	2	1	3
CO2	2	2	3	1	3
CO3	2	2	3	1	3
CO4	-	-	1	2	3

Course Mapping:

Local	Regional	National	Global
N	N	Y	N

Professional Ethics	Gender	Human Values	Environment &Sustainability
Y	N	Y	N

Employability	Entrepreneurship	Skill Development
Y	Y	Y

Course Pedagogy:
Lecture, Case study, hands on analysis

Course Content:
UNIT 1:
Introduction to OOP: Object-Oriented Programming Concept, Procedural Vs OOP, Advantages & disadvantage of OOP's, application of OOP, Programming paradigm.
Introduction to C++: C++ Variable, Data Type, Operators, Basic I/O, C++ Declarations, C++ Program Structure, Control flow Statements: Control, Looping & Jump Statements.

UNIT 2:
Classes and Objects: Specifying a Class, Creating Objects, Accessing Class members, Defining & Accessing Member Functions within the class, Outside Member Functions, Static data member, Access Specifiers: Private, Protected and Public Members, passing objects to function, Returning objects, Object assignment, inline functions, Friend Function, This pointe.
Constructor & Destructor: Introduction, Constructor, Parameterized constructor, Multiple constructor in a class, Constructor with default argument, Copy constructor, Default Argument, Destructor.

UNIT 3:
Array, Pointers, and references: Array of objects, Pointers to object, Pointer to class members. References: Reference parameter, passing references to objects, returning reference, Independent reference, The Dynamic Allocation operators, initializing allocated memory, Allocating Array, Allocating objects.
Function & operator overloading: Function overloading, Overloading constructor, Operator Overloading: Creating a member operator function, Creating Prefix & Postfix forms of the increment & decrement operation, Overloading the shorthand operation (i.e. +=,-= etc), Operator overloading restrictions, Overloading New & Delete, Overloading [ ], ( ), -, comma operator, Overloading << and >> .

UNIT 4:
Inheritance: Base class Access control, Acc, protected members, protected base class inheritance, Types of Inheritance, Constructors & destructors in Inheritance, when constructor & destructor function are executed, passing parameters to base class constructors, Granting access, Virtual base classes.
Virtual functions & Polymorphism: Virtual function, Pure Virtual functions, Early Vs. late binding

UNIT 5:
Exception Handling: Exceptions, Exception Handling: Try, Catch & throw, define new exception, C++ standard exceptions.
I/O Basics and File Handling: C++ streams, the basic stream classes: C++ predefined streams, Formatted I/O: Formatting using the ios members, using manipulators to format I/O, creating your own manipulators, -File Management: Introduction – File handling, File structure, File handling function, File types, Streams, Text, Binary, File system basics, the file pointer, opening a file, closing a file, Reading and Writing

Suggested Readings:

1. R. Subburaj. Object Oriented Programming With C++. Vikas Publishing House, New Delhi.
2. E. Balguruswamy. C++. TMH Publication.
3. Schildt H. C++ The complete reference. TMH Publication.
4. Stroustrup B. The C++ Programming Language. Addison-Wesley.
esley.

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

will vary as per credits

Unit	**Marks**
1	10
2	10
3	10
4	10
5	10
Case Study	10
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE

MATHEMATICS-III **LINEAR ALGEBRA** **PAPER CODE: 303**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives: This course introduces fundamental concepts of matrices, determinants, and their algebraic properties. It focuses on solving systems of linear equations using analytical and numerical methods.

Students will learn about eigenvalues, eigenvectors, and apply matrix techniques in solving mathematical problems.

Course Objectives:

CO1a	To Understand the concept of Matrices and analyse the matrix operations.
CO1b	To Analyze matrices using determinants, inverse and ranks.
CO2	Learn to solve system of linear equations and application problems requiring them.
CO3	Analyze and Calculate Eigen values & Eigen vectors and practical problem of Cayley Hamilton Theorem.
CO4	To understand and learn various iterative techniques to solve simultaneous linear equations.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	1	2	-	2
CO1b	3	1	2	-	2
CO2	3	1	2	-	2
CO3	3	1	2	-	2
CO4	3	1	2	-	2

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
Y	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	Y

Course Pedagogy:

Lecture, Class Assignment, hands on analysis

Course Content:

UNIT 1:
Elementary of Matrices: Concept of scalar, vector quantities and Matrix, Definition, Representation of Matrix, Types of Matrices, Equality of Matrices, Matrix operations and their properties: Addition, Subtraction, Multiplication. Transpose of a Matrix, Symmetric and Skew Symmetric Matrices, Hermitian and Skew-Hermitian Matrix.

UNIT 2:
Determinant, Properties of Determinant, Singular and Non-singular Matrix, Minors and Co-factors, Adjoint and Inverse of a square Matrix and properties. Expression of complex number in the form of matrix, De Moivre's theorem. Sub matrix of a matrix. Rank & nullity of a matrix, Row equivalence and canonical form, Normal form of a matrix.

UNIT 3:
Solution of Homogeneous and Non-homogeneous system of linear equations, Solution of system of linear equations by Cramer's rule and Inverse of a coefficient matrix method. Augmented Matrix, Solution of Simultaneous equations by elementary transformation, Consistent and inconsistent equations and working method to find the solutions.

UNIT 4:
Eigenvalues and Eigen vectors of a matrix and their properties, Caley-Hamilton theorem (without proof), to find the inverse of anon-singular matrix using Caley-Hamilton theorem.

UNIT 5:
Simultaneous linear equations, Solution of simultaneous linear equations: Gauss elimination method with pivoting, Gauss – Jordan method, Jacobi's iteration method and Gauss – Seidel iteration method.

Suggested Readings:

- D.C. Agarwal (2018).Discrete Mathematics, Shree Sai Prakashan, Meerut.
- Nita H. Shah, Foram A. Thakkar (2000), Matrix and Determinant, CRC Press, Taylor and Francis Group.
- Dr. T. K. Sharma, Dr. Abdul Raouf, Dr. Sunil Kumar Sharma (2021), A Text Book of Matrices, S. Vinesh& Co, S.Dinesh& Co.

Reference Reading:

- *B. Singh and S.K. Pundir (2021), Linear Algebra and Matrices, A Pragati Edition.*
- Gilbert Strang (2023), Introduction to Linear Algebra 4th Edition Hardcover, (Gilbert Strang)
- *Nathaniel Johnston (2021), Introduction to Linear and Matrix Algebra, Springer*

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Quiz	5
Class Presentation	5
Assignment	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams:

Unit	Marks
1	12
2	12
3	12
4	12
5	12
Final Examination	60
Total	100

COURSE OUTLINE

WEB TECHNOLOGIES **PAPER CODE: BCA 304**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objective : To introduce the web technologies concepts for developing web applications.

Course Outcomes:

CO1a	**Apply** knowledge of HTML and CSS to **construct and style basic web pages**.
CO1b	**Analyze** the functionalities of basic client-side scripting with JavaScript
CO2	**Understand** and **Write** the basic syntax and functionalities of PHP code
CO3	**Evaluate** different methods for handling form submissions in PHP (GET vs. POST), **the need for** and **implement user sessions and cookies**
CO4	**Create** a basic application that interacts with a MySQL database using PHP

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	3	1	2	2
CO2	2	2	3	3	3
CO3	3	1	3	2	2
CO4	3	2	1	1	2

Course Mapping:

Local	**Regional**	**National**	**Global**
No	No	Yes	Yes

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
Yes	No	Yes	No

Employability	**Entrepreneurship**	**Skill Development**
Yes	No	Yes

Course Pedagogy:
Lecture, Case study, hands on Practical
Course Content:

UNIT 1 Overview of HTML: Concept of Hypertext, Versions of HTML, Elements of HTML, Formatting Tags, Links, Hyperlinks, Image & Image map, List, Tables, Frames, Forms, Style sheets, Background and Color Controls, Cascading Style Sheets (CSS): CSS Properties, Creating Classes and IDs, Generating External Style Sheets, Types of styles, specifying class within HTML document, Style placement: Inline style, Span & div tags, header styles, Advance CSS properties: Backgrounds, Box properties and Positioning.

UNIT 2 Introduction to scripting: overview of Java Script, advantages, client side java Script, Document Object Model (DOM), capturing user input, writing JavaScript into HTML; Basic JavaScript Techniques: Data types, literals, variables and operators, Java Script arrays, operators, Control Statements and expressions; Java Script Programming Construct: Assignment, data declaration, function call, return, with, delete, method invocation.
JQuery Introduction: What is jQuery, Structure of jQuery, Using jQuery and including .js file to HTML, Type of Selectors, Handling Events with jQuery.

UNIT 3: PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.),scope of PHP, Basic Syntax, PHP variables and constants, Types of data in PHP, PHP Operators, Expressions, scopes of a variable (local, global), Control Statements in PHP, PHP Functions, Arrays in PHP.

UNIT 4: String Manipulation in PHP; Pattern Matching Using regular expressions in PHP; Handling HTML form with PHP: Capturing Form Data, GET and POST form methods, dealing with multi value fields, redirecting a form. PHP sessions and PHP cookies.

UNIT 5: Introducing MySQL: Introduction to PHP MyAdmin, Creating a database in PHP MyAdmin, Connecting with Database using PHP, Insertion, Deletion, Updation and Selection operations with database in PHP.

Suggested Text Books:
Fuller, R. G., & Ulrich, L. A. (2004). HTML in 10 Simple steps or Less. John Wiley & Sons.
Gilmore, W. J. (2010). Beginning PHP and MySQL: from novice to professional. Apress.
Holzner, S. (2007). PHP: the complete reference. Tata McGraw-Hill Education.

Reference Books:
Psinas, M. E. (2008). PHP and MySQL: Create-modify-reuse. John Wiley & Sons.
Nixon, R. (2014). Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5. " O'Reilly Media, Inc.".
Welling, L., & Thompson, L. (2008). PHP and MySQL Web Development, 4e. Addison-Wesley Professsional, 2008.
Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
***will vary as per credits**

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Final Examination	60
Total	100

Object Oriented Programming in C++ Lab PAPER CODE: BCA-306	Max. Marks: 50 External 30 Internal: 20

2 credits

Course Objective: To enable students to understand and apply the principles of C++ programming including operators, control structures, object-oriented concepts, function and operator overloading, inheritance, polymorphism, and file handling for solving real-world problems.

Course Outcomes:

CO1a	Apply basic programming constructs such as variables, operators, and input/output statements to solve simple arithmetic problems.
CO1b	Implement decision-making and loop control structures to design structured and interactive C++ programs.
CO2	Develop object-oriented programs using classes, objects, constructors, destructors, and access specifiers.
CO3	Demonstrate the concept of function overloading, inline functions, and default arguments for code flexibility and reuse.
CO4	Integrate object-oriented and functional programming features to write optimized and modular C++ code for real-life applications.

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	2	2	1	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	3	2	2
CO5	3	3	3	2	3

Practical No.: 1

Objective: To illustrate the use of operators (Arithmatic) and Simple Input Output.

1. Write a program which calculates the salary by given basic salary. Hra is 20 % of basic and da is 40% of basic.

2. Write a program, which converts temperature in degree to Fahrenheit.
3. Write a program which calculates the Bill from given qty. and price and 10% discount.

Practical No.: 2

Objective: To understand and implement Control statements.

1. Write a program to print the following output.

1
1 2
1 2 3
1 2 3 4

2. Write a program which prints the grade of a student according to give percentage.

100 to 70 % HONOURS
69 to 60 % First
59 to 50 % Second
else Fail.

Practical No.: 3

Objective: To Implement the concepts of Classes, Objects, Constructors and Destructors with the use of public and private access specifiers.

1. Create class first with data members book no, book name and member function getdata() and putdata(). Create a class second with data members author name, publisher and members getdata() and showdata(). Derive a class third from first and second with data member no of pages and year of publication. Display all these information using array of objects of third class.

2. In Previous program Define a constructor which initializes basic and netsal to 0 (Zero) also Define a Destructor.

Practical No.: 4

Objective: To Implement Function Overloading, Inline function and the advantages of using them.

1. Write a program which defines three overloaded functions

Sum(int , int)
Sum(int , float)
Sum(int ,float,int)

Calculates the sum of given parameters.

2. Write an Inline function square (float) which prints the square of the given parameter.
3. Write a CPP program to implement Default Arguments.

Practical No.: 5

Objective: To implement Operator Overloading unary and binary operator.

1. Write a program to overload binary operator + which perform following operations.

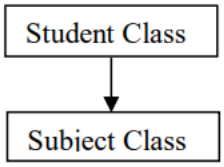
Obj + 100
Obj3 = Obj1+Obj2;

2. Write a program that Concatenates two string by overloading + operator.

Practical No.: 6

Objective: To implement simple and multiple Inheritance.

WAP to calculate students grade using Inheritance show in figure like:

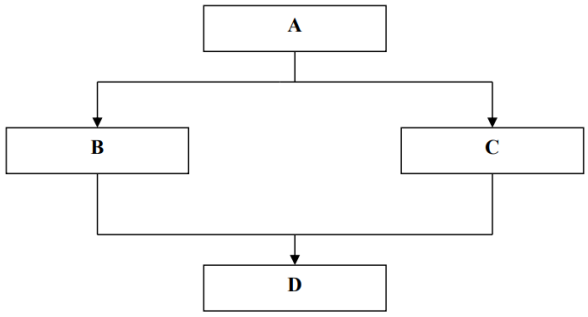


2. WAP to implement Multiple Inheritance by using any example.
3. WAP to implement Hierarchical inheritance.

Practical No.: 7

Objective: Implementation of Pointers Virtual function and Dynamic binding.

1. Create following structure of classes.



Define a variables I in class A. In main assign the value 10 to I using object of D using virtual inheritance.

2. Define a class Media with members title, price. Define two derived classes Book (with member pages ,read(),display()) and Tape (with member runtime ,read() and display(). Declare a pointer type object of class Media .Read the type of media from user and call corresponding functions. Hint: Use dynamic polymorphism.

Practical No.: 8

Objective: To read and write data to File using Files and Streams.

1. Write a program which defines a class Doctor with members name, age, dept, sal. write the data to a file Doctor.dat then read the data from that file and display the data.
2. Write a program which copies the contents of one text file to another text file also counts the number of words and lines present in the destination file.
3. Define a Class Person with members Name, Age, Sal and address and function get() which read these members and a function put() which writes these members to a file Data.dat

COURSEOUTLINE
BCA SEMESTER III

Indian Constitution **PAPERCODE: BCA 307**	**Max.Marks:50** **Min.Marks:18** **External:30** **Internal: 20**

Credits:2

Course Objective : To make the students aware, history, structure and values of the Indian constitution.

Course outcomes :

After the completion of course, students will be able to:

CO1a:UnderstandthetruenatureofIndianFederalStructureandSalientfeaturesofIndianConstitution.
CO1b:Comprehendthestructureoffundamentalrightsguaranteedunder IndianConstitution
CO2:Criticallyappraisethecategoriesoffundamentalrightsandreasonablerestrictions
CO3:Appraisethenatureofdirectiveprinciplesofstatepolicyand FundamentalDuties
CO4:Comparethethree organsofgovernanceoftheState

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	2	3	-	2
CO1b	3	2	3	-	2
CO2	3	2	3	-	2
CO3	3	2	3	-	2
CO4	3	1	3	-	2

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	**Y**	**Y**	**N**

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
Y	**Y**	**Y**	**Y**

Employability	**Entrepreneurship**	**Skill Development**
Y	**N**	**Y**

Course Pedagogy:

Lecture, Case study, Newspapers, Social media content.

Course Content:

UNIT 1: Constitution of India: An Introduction to Fundamental Rights

Definition of Constitution and its Classification, Sources and Framing of the Indian Constitution, Salient features of Indian Constitution, Nature of Indian Federalism, Definition of "State" for Enforcement of Fundamental Rights: Justifiability of Fundamental Rights, Right to Equality (Articles14-18), Fundamental Freedom (Article 19), Right to Life and Personal Liberty (Articles 20-22), Right to Education (Article 21A), Right against Exploitation (Articles23-24), Freedom of Religion and CulturalandEducationalRightsofMinorities(Articles25-30),RighttoConstitutional Remedies (Article 32)

UNIT 2: Directive Principles of State Policy and Fundamental Duties

Nature and Justifiability of the Directive Principles, Detailed Analysis of Directive Principles (Articles 37-51), Inter-Relationship between Fundamental Rights and Directive Principles, Fundamental Duties (Article 51A)

UNIT 3: Constitutional Organs of Governance

Parliament: Composition, Parliamentary Sovereignty, Parliamentary Privileges Executive Power: Power of President and Governor

Judiciary: Jurisdiction of Supreme Court and High Courts, Independence of Judiciary

Suggested Readings:

1. V.N.Shukla,Constitutionof India,EasternBookAgency,2014
2. M.P.Jain,IndianConstitutionalLaw,LexisNexis,2013
3. D.D.Basu,IntroductiontotheIndianConstitutionofIndia,PrenticeHallofIndia Private Ltd., New Delhi, 1994
4. H. M. Seervai, Constitutional Law of India, Universal Law Publishing Co., Reprint,2013
5. Glanville Austin,IndianConstitution-Cornerstone of the Nation,OxfordUniversity Press, 1999
6. P.M.Bakshi,TheConstitutionofIndia,UniversalLawPublishingCo., 2014

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	10
Assignment1	2.5
Assignment2	2.5
Class Participation (Skill Development)	5
Total Marks-Internal Examination	**20**

Unit	**Marks**
1	10
2	10
3	10
Total Marks-External Examination	**30**
Total Marks-Internal + External Examination	**50**

COURSE OUTLINE

PROGRAMMING IN JAVA **PAPER CODE: BCA 401**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objective : To impart knowledge about basic JAVA language syntax and semantics to write JAVA programs.

Course Outcomes:

CO1a	Understanding the basics of java language, and utilize control structures to manage program flow.
CO1b	Design and implement Java classes, demonstrate inheritance and polymorphism, and utilize interfaces for modular design.
CO2	Organize Java code into packages, manipulate strings, and utilize Java collections to store and manipulate data efficiently
CO3	Implement robust error-handling with exception handling mechanisms and understand multithreading in Java.
CO4	Design and develop Graphical User Interfaces (GUIs) using AWT and Swing components, incorporating event-driven programming and layout management.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	2	2	-	-	1
CO1 b	2	2	3	-	-
CO2	1	3	3	-	3
CO3	2	3	3	-	2
CO4	2	3	3	-	3

Course Mapping:

Local	**Regional**	**National**	**Global**
			Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	Y	Y

Course Pedagogy: ***Lecture, Case study, hands on analysis***
Course Contents:

Unit 1: Introduction to Java Programming
Overview of Java versions (Java SE, Java EE, Java ME), Key features of Java, Comparison of Java with C++ , Setting up Java Environment, Introduction to IDEs (Integrated Development Environments), Java Virtual Machine (JVM),Constants & Variables, Data Types and Operators, Control Statements if-else, switch-case, for, while, do-while.

Unit 2: Object-Oriented Programming (OOPs)
Classes and objects, Methods and constructors, Instance and class variables, Inheritance and Polymorphism, Types of inheritance (single, multilevel, hierarchical), Method overriding and dynamic method dispatch, Final variables, methods, and classes, Interfaces and Abstract Classes, Visibility control in Java (public, private, protected).

Unit 3: Packages, Strings, and Collections Framework
Packages, In-built packages and using them (java.lang, java.util), Creating and using user-defined packages, Access modifiers (public, private, protected, default),Working with Strings- String, StringBuffer, and StringBuilder classes, Manipulating strings (concatenation, substring, methods).

Unit 4: Exception Handling and Multithreading
Exception Handling, Types of exceptions (checked, unchecked), Handling exceptions (try-catch-finally, throw, throws), Exception hierarchy and custom exceptions, Multithreading, Java thread model and thread life cycle, Creating threads.

Unit 5: GUI Programming with AWT and Swing:
AWT (Abstract Window Toolkit), Basic GUI components (Frame, Button, Label), Event handling in AWT (ActionListener, MouseListener), Java Swing Swing components (JFrame, JPanel, JButton, JTextField), Layout managers (FlowLayout, BorderLayout, GridLayout), Differences between AWT and Swing.

Suggested Readings:

1. Schildt, H. (2017). Java- The Complete Reference Tenth Edition. McGraw Hill Education
2. Balaguruswamy, E. (2019). Programming with Java Sixth Edition. McGraw-Hill Publications
3. Sierra, Kathy & Bert Bates (2009). Head First Java. O'Reilly Publications
4. Horstmann, Cay S. & Gary Cornell (2007). Core Java, Volume I—Fundamentals. Prentice Hall Publications
5. Horstmann, Cay S. (2017). Core Java Volume II - Advanced Features. Pearson Education

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
will vary as per credits

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE

Analysis and Design of Algorithm **PAPER CODE: BCA 402**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives:

1.To introduce the foundational concepts of algorithm analysis, including time and space complexity, and equip students with the ability to evaluate algorithm efficiency using asymptotic notations.

2.To develop the ability to design, implement, and analyze algorithms using standard techniques such as Divide and Conquer, Greedy Method, Dynamic Programming, Backtracking, and Branch and Bound.

Course Outcomes:

CO1a	Understand the fundamental concepts of Algorithm and Analysis of algorithms in terms of time and space complexity.
CO1b	Understand and analyze the divide and conquer technique of algorithm design.
CO2	Understand and analyze the Greedy method technique of algorithm design.
CO3	Understand and analyze the Dynamic Programming technique of algorithm design.
CO4	Understand and analyze the Backtracking and Branch and Bound technique of algorithm design.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	2	2	-	2	-
CO1 b	2	2	-	2	-
CO2	2	3	-	3	2
CO3	2	3	-	3	2
CO4	2	3	1	2	3

Course Mapping:

Local	**Regional**	**National**	**Global**
			Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y		

Course Pedagogy: ***Lecture, Case study, hands on analysis***
Course Contents:

Unit-I
Introduction: Algorithm, Pseudo-code, Program, Performance Analysis- Time complexity asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation and Space complexity, Randomized Algorithm, Elementary data structure: stack and queue, tree, dictionaries, priority queue, sets and disjoint-set and graphs

Unit-II
Divide and Conquer: general method, binary search, merge sort and quick sort, AND-OR Graphs

Unit-III
Greedy Method: general method, knapsack problem, job sequencing with deadlines, Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm, Single source shortest path problem.

Unit-IV
Dynamic Programming: general method,0/1 knapsack method, all pairs shortest path problem, Traveling salesman problem, Traversal and Search Techniques: Techniques for binary trees, Techniques for graph
Unit-V
Backtracking: general method, 8-Queens problem, Graph Coloring, **Branch and Bound**: General Method, FIFO branch bound and least cost branch bound
List of program

1. Program to implement Binary Search using Divide and Conquer
2. Program to implement Quick sort
3. Program to implement Merge sort using Divide and Conquer
4. Program to implement Knapsack problem using Greedy method
5. Program to implement Prim's algorithm using Greedy method
6. Program to implement Kruskal's algorithm using Greedy method
7. Program to implement Graph Traversal: Breadth First Traversal
8. Program to implement Graph Traversal: Depth First Traversal
9. Program to implement 8-Queen's problem using Backtracking
10. Program to implement All Pairs Shortest Path Using Dynamic Programming

TEXT BOOKS:

1. Ellis Horowitz, SatrajSahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.

REFERENCE BOOKS:

1. R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai (2006), Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.
2. Allen Weiss (2009), Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.
3. Aho, Ullman, Hopcroft (2009), Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

will vary as per credits

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

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BCA IV SEMESTER

MATHEMATICS-IV CALCULUS PAPER CODE: 403	Max. Marks: 100 Min. Marks: 40 External 60 Internal: 40

Credits: 04

Course Objectives: This course aims to develop a strong understanding of functions, limits, continuity, and differentiability. It equips students with techniques of differentiation, integration, and series expansion for mathematical analysis.
Students will also learn to solve first-order differential equations relevant to real-world applications.

Course Outcomes:

CO1a	Understand concepts of limit, continuity and differentiability of a function.
CO1b	Learn the basic concept of differentiation and various theorem based on differentiation.
CO2	Understand the key concept of successive differentiation and apply them to solve various Problems.
CO3	Evaluate the integration of various types of function.
CO4	Learn the basic concept of differential equation and apply various methods to solve differential equation of first order and first degree.

CO-PO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	2	-	-	2
CO1b	3	2	-	-	1
CO2	3	2	-	-	1
CO3	3	2	-	-	1
CO4	3	2	-	-	2

Course Mapping:

Local	Regional	National	Global
Y	Y	Y	Y

Professional Ethics	Gender	Human Values	Environment &Sustainability
N	N	N	N

Employability	Entrepreneurship	Skill Development
Y	N	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

Unit-I

Function: Definition and Types of functions.**Limits:** Definition, working rule for finding out the limit, fundamental properties of limits.**Continuity:** Definition, Points of Discontinuity, Classification of Discontinuity, Problems based on Continuity and Discontinuity. **Differentiability:** Condition for Differentiability and problems.

Unit-II

Differentiation: Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem. Indeterminate form.

Unit III-

Successive Differentiation: Problem based on Successive differentiation. Leibnitz Theorem, Taylor's & Maclaurin's series. Maxima & Minima of function of one variable.

Unit–IV

Integration: Integration of simple function, Methods of Integration Substitution, by Parts. Integration of rational and irrational algebraic function and transcendental function.

UNIT-V

Differential Equations of First Order and First Degree: Separation of variables,Homogeneous Differential Equations, Reducible to Homogeneous Differential Equations, Linear Differential Equations, Reducible to Linear Differential(Bernoulli's) Equations & Exact Differential Equations.

Suggested Readings:

1. Agrawal, D.C. Mathematics-II Calculus. Shree Sai Prakashan, Meerut
2. Apostol, Tom M. One-Variable Calculus with an Introduction to Linear Algebra, Vol (1), 2e. Wiley Eastern.
3. Raisinghania, M. D. Ordinary and Partial Differential Equations. S. Chand & Company Ltd.
4. Agrawal, D.C.: Differential Equation. Shree Sai Prakashan, Meerut

Reference Books

1. Stewart, J. Calculus with Early Transcendental Functions, 7e. Cengage Learning India
2. Hallett H. Calculus – Single and Multivariable, 6e. John-Wiley and Sons.

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

****will vary as per credits***

Unit	Marks
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

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COURSE OUTLINE

Python Programming PAPER CODE: BCA 404	Max. Marks: 100 Min. Marks: 40 External 60 Internal: 40

Credits: 04

Course Objective : To make the students familiar with the programming paradigms brought in by python programming language along with a focus on file handling and regular expressions.

Course Outcomes:

CO1a	Interpret the fundamental Python syntax and semantics
CO1b	Apply Control statements to control the flow of program in python.
CO2	Determine the methods to create and manipulate Python programs by utilizing thedata structures like lists, dictionaries, tuples ,and sets
CO3	Express proficiency in the handling of strings and functions
CO4	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	1	1	2	2
CO2	2	2	3	1	3
CO3	3	1	3	2	2
CO4	3	2	1	1	2

Course Mapping:

Local	Regional	National	Global
No	No	Yes	Yes

Professional Ethics	Gender	Human Values	Environment & Sustainability
Yes	No	Yes	No

Employability	Entrepreneurship	Skill Development
Yes	No	Yes

Course Pedagogy:
Lecture, Case study, hands on Practical

Course Content:

UNIT 1 History & Features of Python; Introduction to Python: Python Interpreter, Python shell, Indentation. Atoms: Identifiers and keywords, Literals; Variables & Data Types: Numeric types, Sequence types, Mapping types, Set types, Boolean type, Binary types; Operators: Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, precedence of operators; Comments in Python

UNIT 2 Input and Output Statements; Conditional statements: conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: while, for, nested loop, state iteration in python, break, continue, pass; String Manipulation: Accessing string, Basic operations, String slices, String functions and methods

UNIT 3: Python Collections: Lists: Accessing List, List Operations, Working with Lists, List Functions & Methods; Tuples: Accessing Tuples, Tuple Operations, Working with Tuples, Tuple Functions & Methods; Dictionaries: Accessing Values in dictionaries, Dictionary Operations, Working with Dictionary, Dictionary Properties, Dictionary Functions & Methods; Sets: Working with Set & Frozen Set

UNIT 4: Functions: Defining & Calling a function, Types of functions, Default Arguments, Why Default Arguments?, Default Function Object Argument Example, Variable-length Arguments, Non-keyword Variable Arguments (Tuple), Keyword Variable Arguments (Dictionary), Anonymous functions, Global & Local variables Exception handling: Exception classes hierarchy, try, except, finally, Raising an exception, user defined exceptions

UNIT 5: Object Oriented Programming in Python; Regular Expressions; Importing & Exploring Data using Python Modules: Introduction of numpy module, numpy operations, Working with Arrays using numpy; Introduction of pandas module, pandas operations

Suggested Readings:

1. **Chun, J Wesley, Core Python Programming, Second Edition, Pearson, 2007 Reprint 2010**
2. **Barry, Paul, Head First Python, 2nd Edition, O Rielly, 2010**
3. **Lutz, Mark, Learning Python, 4th Edition, O Rielly, 2009**

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
***will vary as per credits**

Unit	Marks
1	12
2	12
3	12
4	12
5	12
Final Examination	60
Total	100

Programming in Java Lab PAPER CODE: BCA – 405	Max. Marks: 50 External 30 Internal: 20 Min. Marks :18

2 credits

Lab Assignment: Java Programming Exercises

Practical 1. Setup and Environment

a. Write a Java program to print "Hello World!" to the console.
b. Ensure JDK is correctly installed and configured in your IDE.

Practical 2. Variables, Data Types, and Operators

a. Write a program to calculate the area of a rectangle given its length and width.
b. Implement a temperature converter program that converts Celsius to Fahrenheit.

Practical 3. Control Statements

a. Create a program that checks whether a given number is even or odd using if-else statements.
b. Implement a calculator program using switch-case statements for basic arithmetic operations.

Practical 4. Create a class Student with attributes such as name, age, and grade. Write methods to set and get these attributes and demonstrate object creation.

Practical 5. Inheritance and Polymorphism

a. Define a base class Shape with methods to calculate area and perimeter.
b. Create derived classes Rectangle and Circle that inherit from Shape and override these methods.

Practical 6. Interfaces and Abstract Classes

a. Define an interface Drawable with a method draw() and implement it in classes like Circle, Rectangle, etc.
b. Create an abstract class Vehicle with abstract methods like start() and stop(), and implement it in derived classes Car and Motorcycle.

Practical 7. Packages and Access Modifiers

a. Create a package com.mycompany.utils and move the Rectangle and Circle classes into it.
b. Demonstrate usage of access modifiers (public, private, protected, default) across classes.

Practical 8. Working with Strings

a. Write a program to reverse a given string using StringBuffer or StringBuilder.
b. Implement a program to count occurrences of a specific word in a sentence using String methods.

Practical 9. Collections Framework

a. Create a program to manage a list of student names using ArrayList.
b. Implement a program using HashMap to store student IDs and names, and perform basic operations like adding, retrieving, and iterating.

Practical 10. Exception Handling

a. Write a program to handle ArithmeticException and NullPointerException.
b. Create a custom exception InvalidAgeException and use it in a program to validate age.

Practical 11. AWT Basics

a. Develop a simple GUI application using Frame, Button, and Label to perform basic operations (e.g., calculator).

Practical 12. Java Swing

a. Create a more advanced GUI application using JFrame, JPanel, JButton, and JTextField.
b. Use different layout managers (FlowLayout, BorderLayout, GridLayout) to organize components.

COURSE OUTLINE

BCASEMESTER IV

ENTREPRENEURSHIP DEVELOPMENT **PAPER CODE: 408**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objective : To introduced the concepts of entrepreneurship, business planning and the role of entrepreneurs in economic development.

Course Outcomes:

CO1a	Analyze the distinctions between entrepreneurs, entrepreneurs, and managers and their roles in entrepreneurship development
CO1b	**Evaluate** the necessity and objectives of EDPs and their impact on the Indian economy.
CO2	**Create** a funding strategy for a startup, incorporating various sources and government incentives.
CO3	**Evaluate** the roles of various institutions in supporting small business enterprises in India.
CO4	**Develop** a comprehensive business plan that leverages emerging technologies and professional networks.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	2	1	3
CO1b	1	3	2	1	3
CO2	2	3	3	2	3
CO3	2	3	2	1	3
CO4	3	3	3	3	3

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment &Sustainability**
Y	Y	Y	Y

Employability	**Entrepreneurship**	**Skill Development**
Y	N	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

Unit 1 Fundamentals of Entrepreneurship

Meaning and Definitions of Entrepreneur, Entrepreneurial Competencies. Evolution of Entrepreneurship in India Concept of Entrepreneur, Difference between Entrepreneur and Entrepreneurs, Difference between Entrepreneur and Manager.

Unit 2 -Theories of Entrepreneurship

EDP: Its Meaning, Objectives; Mechanics of setting of new enterprises – size and location. Search for business idea, sources of ideas, idea processing, input requirements.

Unit 3-Preparing for the new venture launch

Startup financing: Sources of funding (bootstrapping, angel investors, venture capital, etc. Sources of Investment - Role of Central Government and State Government in promoting Entrepreneurship

Unit 4-Institutional Financial Support

Institutions supporting the Business enterprises: District Industries Centres (DICs) ,Industrial Development Corporation (IDC) ,Small Scale Industries Development Corporations (SSIDCs) Small Industries Service Institute (SISI) ,Industries Development Bank of India (SIDBI) in India.

Unit 5: Business Planning and Emerging Trends in Entrepreneurship

- Writing and presenting a business plan and its components
- Emerging technologies and opportunities
- Analysis of successful and failed startups
- Understanding the importance of Building a professional network

Reference Books:

1. *Norman M. Scarborough & Jeffery R. Cornwall, Essentials of Entrepreneurship and Small Business Management, 9th Edition, Prentice Hall, 2018.*
2. Howard Frederick, Allan O'Connor, & Donald F. Kuratko, Entrepreneurship: Theory, Process and Practice, 4th Edition, Cengage Leaming, 2016
3. Steven Fisher, Ja-nae' Duane, The Startup Equation -A Visual Guidebook for Building Your Startup, Indian Edition, Mc Graw Hill Education India Pvt. Ltd, 2016.
4. Barringer, Bruce R. (2015) Preparing Effective Business Plans : An Entrepreneurial Approach. Second edition, Pearson Education.
5. Baron, R. A. (2014). Essentials of Entrepreneurship: Evidence and Practice. Edward Elgar Publishing
6. Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, Cengage Learning, 2016.
7. AnjanRaichaudhuri, Managing New Ventures Concepts and Cases, Prentice Hall International, 2010.
8. R. Bhowmik& M. Bhowmik, Entrepreneurship, New Age International, 2007.
9. Donald F Kuratko, Jeffrey S. Hornsby, New Venture Management: The Entrepreneur's Road Map, 2e, Routledge, 2017.

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Assignment 1	5
Assignment 2	5
Assignment 3	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

will vary as per credits

Unit	Marks
1	10
2	10
3	10
4	10
5	10
Case Study	10
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

Programming in Advance Java PAPER CODE: BCA 501	Max. Marks: 100 Min. Marks: 40 External 60 Internal: 40

Credits: 3

Course Objective : This course is designed with intent to acquaint the students with tools and techniques for creating a dynamic web application.

Course outcomes

CO1a: To know the concept of Java Programming.
CO1b: To understand how to use programming in day to day applications.
CO2: To develop programming logic.
CO3: Working with ms excel functions and formulas and statistical functions.
CO4: Hands on ms power point presentation slide with its features.

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	3	3	3
CO1b	3	2	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2

Course Mapping:

Local	Regional	National	Global
Y	N	Y	Y

Professional Ethics	Gender	Human Values	Environment &Sustainability
Y	N	Y	N

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

UNIT 1: **JDBC** The design of JDBC, Basic JDBC program Concept, Drivers, Architecture of JDBC, Making the Connection, Statement ,ResultSet , PreparedStatement, CollableStatement, Executing SQL commands, Executing queries.

UNIT 2: **Networking** The java.net package, Connection oriented transmission – Stream Socket Class, Creating a Socket to a remote host on a port (creating TCP client and server), Simple Socket Program Example.

UNIT 3: **Servlet and JSP** Introduction, How It differ from CGI, Types of servlet, Life cycle of servlet, Execution process of Servlet Application, Session Tracking, Cookie class, Servlet-Jdbc.

JSP Introduction to JSP, Components of JSP Directives, Tags, Scripting Elements, Execution process of JSP Application, Building a simple application using JSP, JSP with Database

UNIT 4: **Multithreading** Introduction to Thread, Life cycle of thread, Thread Creation - By using Thread Class - By Using Runnable interface, Priorities and Synchronization, Inter thread communication, Implementation of Thread with Applet

UNIT 5: **Java Beans and RMI** Java Beans, What is bean, Advantages, Using Bean Development kit(BDK), Introduction to jar and manifest files, The java beans API.

Remote Method Invocation Introduction to remote object RMI architecture, Stubs and skeleton, Registry, Setting up RMI, Using RMI with applet

Suggested Readings:

1. The Complete Reference – JAVA Herbert Schildt
2. Core java –II By Cay S. Horstmann and Gary Cornell
3. Compete Reference J2EE – Jim Keogh

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
***will vary as per credits**

Unit	Marks
1	10
2	10
3	10
4	10
5	10
Case Study	10
Final Examination	60
Total	100

COURSE OUTLINE
BCA V SEMESTER

Software Engineering **PAPER CODE: 502**	**Max. Marks: 75** **Min. Marks: 35** **External: 45** **Internal: 30**

Credits: 03

Course Objectives: The course objectives of Software Engineering Program are to produce graduates who, within three years after graduation, they are able to:-

1. Be employed in industry, government, or entrepreneurial endeavors to demonstrate professional advancement through significant technical achievements and expanded leadership responsibility.
2. Demonstrate the ability to work effectively as a team member and/or leader in an ever changing professional environment.
3. Progress through advanced degree or certificate programs in computing, science, engineering, business, and other professionally related fields.

Course Outcomes: On successful completion of this course, the students will be able to:-

	PO1	PO2	PO3	PO4	PO5
CO1a: Able to apply SE Life cycle models, Planning, analysis, design, construction and deployment.	2	3	3	3	2
CO1b: Working in one or more application domains.	2	2	2	3	3
CO2:Work individually and in team develop and Deploy the quality software.	3	3	2	3	3
CO3: Apply correct theories, models and software techniques.	2	3	3	3	3
CO4: Software Metrics, tools and techniques for SE practice.	3	3	2	3	3

Course Mapping:

Local	Regional	National	Global
Y	Y	Y	Y

Professional Ethics	Gender	Human Values	Environment &Sustainability
N	N	N	N

Employability	Entrepreneurship	Skill Development
Y	N	Y

Course Pedagogy:
Lecture, Case study, hands on analysis.
Course Contents:

Unit-I
Introduction: Evolving Role of Software, Software characteristics, Software Designing Processes: Software Engineering, Software Process and Characteristics, Need of Software Development Life Cycle Models, Waterfall, Prototype, Spiral Model, RAD Model.

Unit-II
Software Requirement Analysis and Specification: Requirement Elicitation Technique: Interview, Form Analysis, SRS and its Characteristics. Software Project Planning: Issues involved in Software Estimation, Size Estimation like lines of code and Function point method, Cost Estimation Model: COCOMO, Risk Management.

Unit-III
Software Project Management Process: Feasibility Study, Project Planning, Project Execution, Project Termination. System Models: Data-flow models, Semantic data models, Object models, Inheritance models, Object aggregation, Service usage models, Data Dictionaries. Basics Software Design: Design Process, Design Fundamentals, Software Design Levels: Architectural Design, High Level design, detail design, Design Notations, Specification and Modularization, Design Structure Chart, Pseudo Codes, Flow charts, Coupling and Cohesion measures.

Unit-IV
Design Strategies: Function Oriented Design, Object Oriented Design, Basic concept of object- oriented analysis & Design. Traditional paradigm versus object oriented paradigm, software design approaches: Top-Down and Bottom-Up Design. Object-oriented design: Object aggregation; Service Usage; Object Interface Design: Design progress, Function oriented design: Data –flow design; Structural Decomposition: Detailed design.

Unit-V
Software Metrics: Software measurements What & Why, Token Count, Halstead Software Science Measures, Design Metrics, software testing, Test cases. Software Maintenance: Types of software Maintenance, Software maintenance model, Concept of Software Re- engineering & Software Reverse engineering - Definition, purposes and objectives. Introduction to UML class diagram, object diagram, use case diagram, sequence diagram.

Suggested Text Books:

1. Software Engineering – A practitioner's approach"- R.S. Pressman, 5th Ed., Mc Graw Hill Int.
2. Software Engineering (Principle & Practices Waman S. Jawadekar), TMH.
3. An Integrated approach to software Engineering, - Pankaj Jalote, Narosa Publication.
4. Software Engineering – Shari Lawrence, Pfleeger. Pearson edu.

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	15
Quiz	3
Class Presentation	3
Innovative Assignment	3
Class Participation (Skill Development)	6
Total Marks- Internal Examination	**30**

Marks Distribution Scheme for final exams: (For 3 Credit Course)*

will vary as per credits

Unit	**Marks**
1	09
2	09
3	09
4	09
5	09
Total Marks- End Examination	**45**

Total (Internal Assessment + External Assessment)	**30 + 45 = 75**

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COURSE OUTLINE

ORACLE **PAPER CODE: BCA 503**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objective : To enhance the knowledge and understanding of database analysis and design.

Course Outcomes:

CO1a	Understand the concepts of Oracle RDBMS Architecture and Role of DBA to solve the real-world problem of Data and Storage.
CO1b	Understand and apply the concept Database creation and manipulation of Data to communicate.
CO2	Apply the concept of joining the tables to visualize data and provide controlled access to the data.
CO3	Understand and apply the PL SQL block to perform data base Communication.
CO4	Understand and apply the concept of compiled statement using function, Procedure and Exception handing to make the database solution more robust.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	3	1	2	2
CO2	2	2	3	3	3
CO3	3	1	3	2	2
CO4	3	2	1	1	2

Course Mapping:

Local	**Regional**	**National**	**Global**
No	No	Yes	Yes

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
Yes	No	Yes	No

Employability	**Entrepreneurship**	**Skill Development**
Yes	No	Yes

Course Pedagogy:

Lecture, Case study, hands on Practical

Course Content:

UNIT- I

RDBMS COMPONENTS – Kernel, Data Dictionary, Client-Server Architecture, Oracle Architecture, Oracle files and processes, Role of DBA

UNIT- II

Introduction: SQL*Plus and SQL, Data types in Oracle, DDL Statements, Computations on Table Data, Oracle Dual Table, Oracle Functions, Data Constraints, Grouping Data from Tables, Manipulating Dates, Pattern matching, Range Searching, Study of the clauses: Union, Intersect, Minus clause.

UNIT- III

Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins), subqueries Creating views, Renaming the Column of a view. Updation, Selection, destroying views, Permission on the objects created by the user, GRANT statement, Object privileges, Referencing a table belonging to another user, Revoking the permission given, Sequences, indexes, Advanced date- time Functions

UNIT- IV

Data Control Language (DCL), Data Security, Grant and Revoke, PL/SQL, Variables and type declarations, Loop structure, PL/SQL Blocks, Cursor/ Cursor loops, Types of stored PL/SQL Blocks, Exceptions

UNIT- V

Procedures & Functions - Concept, creation, execution, advantages, syntax, deletion, Triggers - Concept. use, how to apply database triggers, type of triggers, syntax, deleting, import, export.

Suggested Readings:

Main Text Books

1. SQL,PL/SQL The programming - Lang. of Oracle Ivan Bayross - BPB
2. Oracle Database 12c The Complete Reference (Oracle Press) by Bob Bryla , Kevin Loney – Oracle Press

Reference Books:

1. Oracle Database 12c SQL – Jason Price – Oracle Press
2. Oracle Database 12c PL/SQL Programming by McLaughlin – Oracle Press

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

***will vary as per credits**

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Final Examination	60
Total	100

Programming in Advance Java LAB PAPER CODE: BCA 504	Max. Marks: 50 Min. Marks: 18 External 30 Internal: 20

Credits: 2

Course Objective : To make hands on various java programs.

Course outcomes

CO1a: To know the concept of Java Programming.
CO1b: To understand how to use programming in day to day applications.
CO2: To develop programming logic.
CO3: Working with ms excel functions and formulas and statistical functions.
CO4: Hands on ms power point presentation slide with its features.

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	3	3	3	3
CO1b	3	2	2	3	2
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2

Course Mapping:

Local	Regional	National	Global
Y	N	Y	Y

Professional Ethics	Gender	Human Values	Environment &Sustainability
Y	N	Y	N

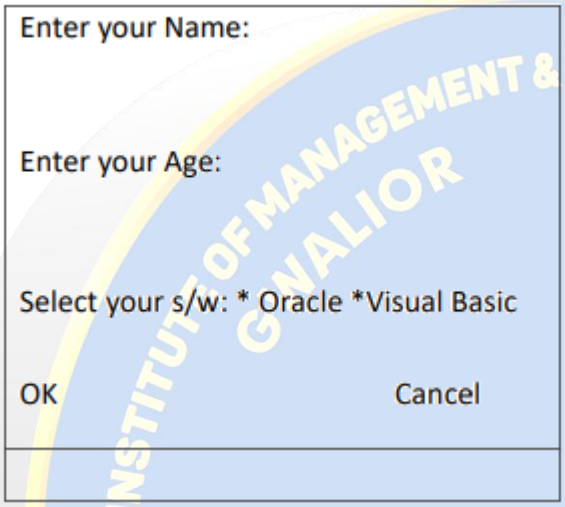
Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

1. **Write an Applet which will play two sound notes in a sequence continuously use the play () methods available in the applet class and the methods in the Audio clip interface.**
2. **Create a Japplet using swing control, which will create the layout shown below and handle necessary events.**

FORMAT



3. **Use JDBC connectivity and create Table, insert and update data.**
4. **Write a program in Java to implement a Client/Server application using RMI.**
5. **Write a program in Java to create a Cookie and set the expiry time of the same.**
6. **Write a program in Java to create Servlet to count the number of visitors to a web page.**
7. **Write a program in Java to create a form and validate a password using Servlet.**
8. **Develop a Java Bean to demonstrate the use of the same.**
9. **Write a program in Java to convert an image in RGB to a Grayscale image.**
10. **Develop Chat Server using Java.**

COURSE OUTLINE
BCA V Sem

Oracle Lab **PAPER CODE: BCA - 505**	**Max. Marks: 50** **Min. Marks: 18** **External 25** **Internal: 25**

Credits: 02

Course Objectives: Equipping students with the practical skills to design develop and manage databases using Oracle technoloies.

CO1a	Understand the concept of Oracle Architecture and role of DBA
CO1b	Understand and implement SQL Query to perform DDL, DML and DCL command
CO2	Apply basic concepts Single and Multiple row function using SQL Query
CO3	Develop SQL query to implement pattern matching and joins
CO4	Develop PL/SQL block to create Stored Procedure, Function and Trigger.

PO-CO-PSO Matrix:

Course Outcomes	PO1	PO2	PO3	PO4	PO5
CO1a	2	3	2	2	2
CO1b	2	2	2	2	3
CO2	2	3	2	3	2
CO3	2	3	2	3	2
CO4	2	3	3	3	3

Course Mapping:

Local	Regional	National	Global
Y	Y	Y	Y

Professional Ethics	Gender	Human Values	Environment & Sustainability
Y	Y	Y	N

Employability	Entrepreneurship	Skill Development
Y	Y	Y

Course Pedagogy:

Example, Hands on Practical lab

Course Content:

DDL Statements

1. **Create a table:**
    - Create a table named students with columns roll_no, name, department, and marks.
    - Set appropriate data types and constraints (e.g., roll_no as primary key, marks as not null).
2. **Alter the table:**
    - Add a new column email to the students table.
    - Modify the marks column to allow null values.
    - Drop the department column.
3. **Rename the table:**
    - Rename the students table to student_details.
4. **Drop the table:**
    - Drop the student_details table.

Oracle DUAL Table

1. **Display current date and time:**
    - Use the SYSDATE function to display the current date and time.
2. **Format the date:**
    - Use TO_CHAR to format the current date as "DD-MON-YYYY".

Data Constraints

1. **Create a table with constraints:**
    - Create a table named employees with columns emp_id, first_name, last_name, salary, and dept_id.
    - Set emp_id as the primary key, salary as not null, and dept_id as a foreign key referencing a departments table.
2. **Insert data with constraints:**
    - Try to insert data that violates the constraints (e.g., duplicate primary key, null value for a not null column).
    - Observe the error messages.

Single-Row and Multiple-Row Functions

1. **String manipulation:**
    - Use UPPER, LOWER, INITCAP, LENGTH, and SUBSTR to manipulate strings from the employees table.

2. **Numeric calculations:**
    - Use ROUND, TRUNC, and arithmetic operators to calculate salary increments and bonuses.
3. **Date and time:**
    - Use SYSDATE, EXTRACT, and TO_CHAR to extract and format date and time information.
4. **Aggregate functions:**
    - Calculate the average salary, maximum salary, and minimum salary for each department.
    - Count the number of employees in each department.

Grouping Data

1. **Group by department:**
    - Group employees by department and calculate the average salary for each department.
2. **Filter groups:**
    - Use the HAVING clause to filter departments with an average salary greater than a certain amount.

Pattern Matching

1. **Find employees with names starting with 'A':**
    - Use the LIKE operator with the % wildcard to find employees whose first name starts with 'A'.
2. **Find employees with 'an' in their last name:**
    - Use the LIKE operator with the _ wildcard to find employees whose last name contains 'an'.

Clauses (Union, Intersect, Minus)

1. **Combine result sets:**
    - Use UNION to combine the result sets of two queries, one selecting employee names and another selecting department names.
2. **Find common employees:**
    - Use INTERSECT to find employees who are in both the 'IT' and 'HR' departments.
3. **Find employees not in a specific department:**
    - Use MINUS to find employees who are not in the 'Finance' department.

SQL Joins

1. Equi Join:

- Create two tables: departments and employees.
- Write a query to display employee names and department names using an equi join.

2. Self Join:

- Create table employees with a manager_id column referencing the emp_id of another employee.

- Write a query to display employee names and their manager's names using a self join.

3. Inner Join:

- Use the INNER JOIN keyword to join two tables based on a common column.
- Write a query to display employee details and their department details using an inner join.

4. Outer Joins:

- Use LEFT OUTER JOIN, RIGHT OUTER JOIN, and FULL OUTER JOIN to join tables and include rows from one table that may not have matches in the other.
- Write queries to demonstrate the use of each type of outer join.

Subqueries

1. Scalar Subquery:

- Write a query to find employees whose salary is greater than the average salary.

2. Correlated Subquery:

- Write a query to find employees who earn more than their manager.

3. Non-Correlated Subquery:

- Write a query to find departments with more than 10 employees.

Creating Views

1. Simple View:

- Create a view to display employee names, salaries, and department names.

2. Complex View:

- Create a view to display the top 5 highest-paid employees in each department.

3. Using Views in Queries:

- Write queries to retrieve data from the created views.

Data Manipulation

1. Inserting Data:

- Insert multiple rows of data into the employees table.

2. Updating Data:

- Update the salary of an employee.

3. Deleting Data:

- Delete an employee from the employees table.

Granting and Revoking Privileges

1. Granting Privileges:

- Grant SELECT, INSERT, UPDATE, and DELETE privileges on the employees table to a user.

2. Revoking Privileges:

- Revoke the DELETE privilege from the user.

Sequences

1. Creating a Sequence:

- Create a sequence to generate unique employee IDs.

2. Using a Sequence in an Insert Statement:

- Insert a new employee record, using the sequence to generate the emp_id.

Indexes

1. Creating an Index:

- Create an index on the last_name column of the employees table to improve query performance.

2. Dropping an Index:

- Drop the index created in the previous step.

Additional Exercises:

- Combine multiple joins to retrieve complex data.
- Use subqueries to filter data and calculate aggregates.
- Create views to simplify complex queries and improve performance.
- Practice data manipulation operations to maintain data integrity.
- Experiment with different privilege levels and user roles.
- Analyze the impact of indexes on query performance.

Data Security (Grant and Revoke)

1. **Create a user:**
2. **Grant privileges to the user:**
3. **Revoke privileges from the user:**
4. **Grant object privileges:**
5. **Revoke object privileges:**

PL/SQL Block and Variable Declaration

1. **Simple PL/SQL block:**
2. **PL/SQL block with conditional statements:**

3. **PL/SQL Loops (While and For) Implement**
    1. **While loop:**
    2. **For loop:**

PL/SQL Cursors (Implicit and Explicit)

1. **Implicit cursor:**
2. **Explicit cursor:**

Types of Stored PL/SQL Blocks and Exception Handling

1. **Anonymous PL/SQL block:**
    - Executed once and discarded.
    - Used for simple tasks and testing.
2. **Stored procedure:**
    - Named PL/SQL block that can be executed multiple times.
    - Used for complex procedures and reusable code.
3. **Stored function:**
    - Named PL/SQL block that returns a value.
    - Used for calculations and data retrieval.

Exception Handling:

Additional Exercises:

- Create a PL/SQL block to calculate the factorial of a number using a loop.
- Write a PL/SQL function to check if a given number is prime.
- Create a stored procedure to insert a new employee record into the employees table.
- Implement error handling in a PL/SQL block to gracefully handle exceptions.
- Use cursor for loops to iterate over the results of a query.

Suggested Readings:

1. SQL,PL/SQL The programming - Lang. of Oracle Ivan Bayross - BPB
2. Oracle Database The Complete Reference (Oracle Press) by Bob Bryla , Kevin Loney –Oracle Press

Reference Books:

1. Oracle Database SQL – Jason Price – Oracle Press

2. Oracle Database PL/SQL Programming by McLaughlin – Oracle Press

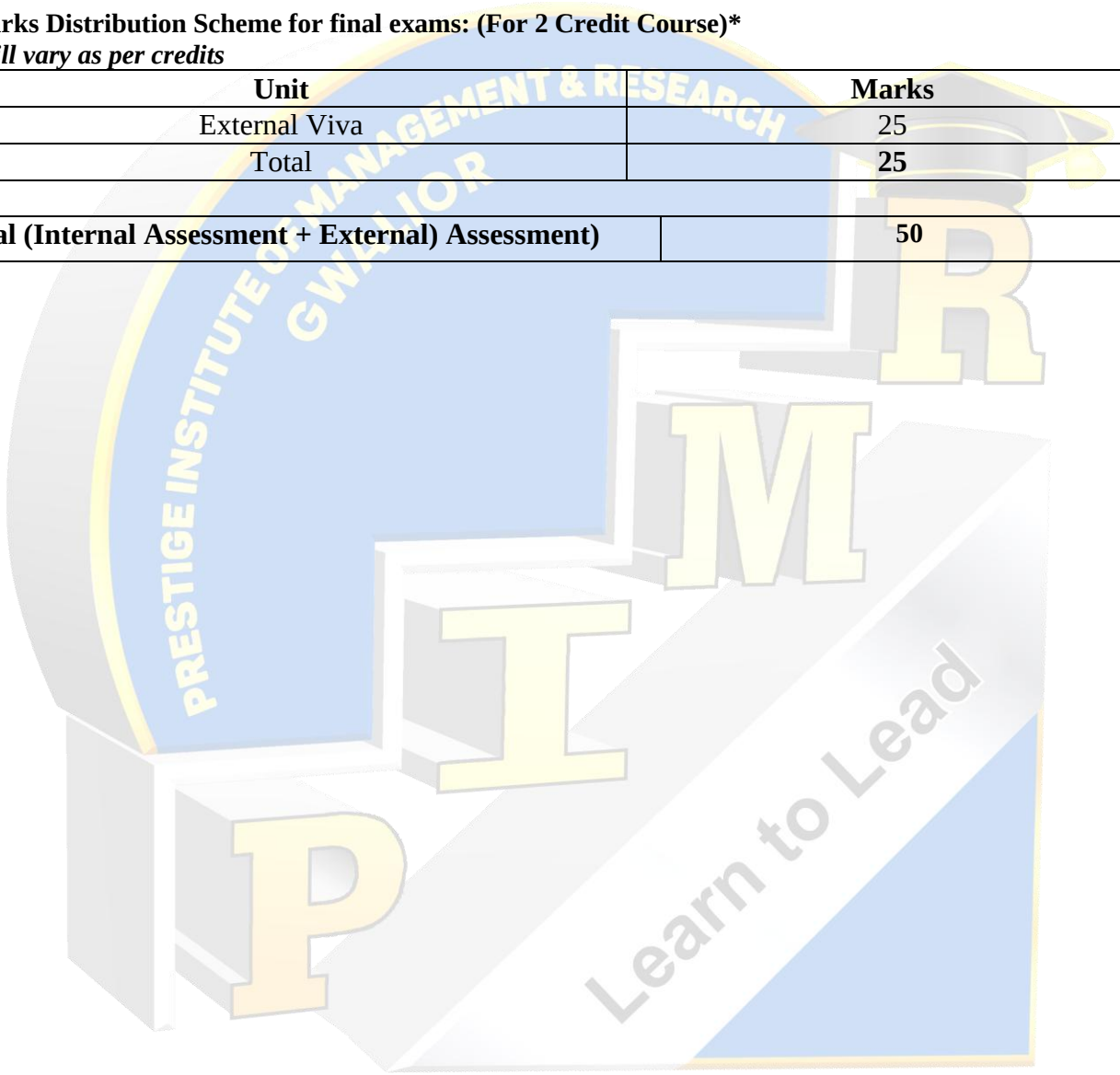
Course Evaluation Criteria:

Instruments	Marks
File	6
Assignment 1	6
Assignment 2	8
Assignment 3	5
Total Marks- Internal Examination	**25**

Marks Distribution Scheme for final exams: (For 2 Credit Course)*
will vary as per credits

Unit	Marks
External Viva	25
Total	**25**

Total (Internal Assessment + External) Assessment)	**50**



COURSE OUTLINE

Computer Networks **PAPER CODE: BCA-601**	**Max. Marks: 75** **Min. Marks: 30** **External 45** **Internal: 30**

Credits: 03

Course Objective : To build and understanding of the fundamental concepts of computer networking.

Course Outcomes:

CO1a	Define and understand basic working of computer network and its components
CO1b	Understand the various Network Devices and Transmission Impairments
CO2	Understand the basic concept of OSI and TCP reference model and TCP/IP Protocols
CO3	Define Multiplexing, Multiple Access Protocols and understand the concept of Routing.
CO4	Identify and adapt the basic concept of IEEE standards protocols and network Security Concepts for communications.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	-	1	1	2	2
CO1b	2	3	1	2	2
CO2	2	3	2	3	3
CO3	2	2	2	3	2
CO4	2	2	3	3	3

Course Mapping:

Local	**Regional**	**National**	**Global**
N	N	N	Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y		

Course Pedagogy:
Lecture
Course Content:

Unit-I
Networking: Needs and Advantages, Network, Types- Client, Server and Peers, introduction to various types of servers, client/server architecture.
Data communication, communication system, Signal and Data, Analog and Digital Signals
Transmission Media types: Wired & Wireless transmission (Twisted-Pair cables, Coaxial cables, Fiber Optics. Radio Transmission, Microwave Transmission, Bluetooth, Infrared, Wi-Fi, Satellite and Virtual LAN.
Classification of Networks: LAN, MAN, WAN Network Topology: Bus, Star, Ring, Star bus, Star ring, Mesh – Features, Advantages and disadvantages of each type.

Unit-II
Network Devices: Modem, Repeater, NIC, Network adapters, Connectors, Transceiver, Switch, Hub – Active, Passive and Intelligent, Bridge-Local, Remote, Wireless, Routers-Static and Dynamic, Switches, Routers and Gateways, NOS.
Real World Networks: Ethernet, Fast Ethernet, Token Rings, FDDI, ATM.
Transmission impairments: attenuation and attenuation distortion, delay distortion, noise.

Unit-III
Introduction to Network, OSI reference model, TCP/IP reference model.
TCP/IP protocols: IP, ARP, RARP, ICMP, TCP, UDP TCP/IP Services Protocols: DHCP, DNS, FTP, TFTP, SMTP, TELNET, and NFS.
WWW, URL, e-mail, HTTP, Subnet & subnet mask.

Unit-IV
Multiplexing: FDM, TDM, CDM and WDM
Multiple Access Protocols: ALOHA, CSMA/CD;
Switching: circuit, Packet, and message switching
Routing : routing methods, routing protocols: distance vector, link state, path vector Transmission impairments, flow control and error control
IP Addressing, Subnets, Supernets, IPv6.

Unit-V
IEEE standards 1002.3 and Ethernet
Network Security: Network security issues, approaches to network security, hacking. Firewalls: types of firewall technology- network level and application level, IP packets filter screening routers, limitations of firewalls.
Overview of Encryption and Decryption – Cryptography, Public/Private key encryption, Digital Signature and Digital Certificates technology

Suggested Readings:

1. Tanenbaum A. Computer Networks. Prentice Hall- publisher.
2. Forouzan. Data Communication & Networking. Mc Graw Hill Publisher.
3. Stallins W. Data & Computer Communications. PHI- Publisher

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	15
Quiz	3
Class Presentation	3
Innovative Assignment	3
Class Participation (Skill Development)	6
Total	30

Marks Distribution Scheme for final exams: (For 3 Credit Course)*

***will vary as per credits**

Unit	Marks
1	9
2	9
3	9
4	9
5	9
Total	45

Total (Internal Assessment + External Assessment)	**75**

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COURSE OUTLINE

Computer Graphics and Multimedia **PAPER CODE: BCA – 602**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objective: To enable students to understand fundamental concepts of computer graphics, geometric transformations, clipping techniques, and multimedia systems, and to apply drawing algorithms and graphical operations for designing and implementing interactive graphic applications.

Course Outcomes:

CO1a	Understand the working of different display devices and input devices.
CO1b	Implement line drawing, circle drawing and area fill algorithm.
CO2	Implement different clipping algorithm.
CO3	Understand and apply 2D geometric Transformation.
CO4	Describe the concept of multimedia.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	1	2	1	1	2
CO1b	3	2	2	2	1
CO2	3	2	2	1	1
CO3	2	2	1	1	1
CO4	1	1	1	2	2

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	N

Course Pedagogy:
Lecture, hands on analysis
Course Content:

UNIT 1:
Basics of Graphics Systems Applications, Display Devices: Video Displays, Raster- Scan Displays, Random Scan Displays, DVST, Flat- Panel Displays. Input Devices: Keyboards, Mouse, Trackball, and Space Ball, Joysticks, Digitizers, Image Scanner, Touch Panel, Light Pens, Voice Systems etc.

UNIT 2:
Line Drawing Algorithms: DDA Algorithm, Bresenham's line Algorithm. Bresenham's Circle drawing algorithm, Mid-Point Circle Algorithm, Scan-line Polygon Fill Algorithm, Inside-Outside test, Boundary Fill algorithm, Flood-Fill algorithm. Pixel, Pixel addressing, Antialiasing.

UNIT 3:
Clipping: COHEN-SUTHERLAND Line Clipping Algorithm, Line Clipping Using Non Rectangular Clip Windows, Polygon Clipping, Text Clipping.

UNIT 4:
Two-dimensional Geometric Transformation: Translation, Rotation, Scaling, Reflection, Shear, Matrix representation and Homogeneous coordinates. Composite transformation: Translations, Rotations, Scaling, General Pivot-Point Rotation and Scaling.

UNIT 5:
Introduction to Multimedia: Review of Multimedia, Multimedia Applications, Multimedia Systems Architecture, Multimedia Hardware, Multimedia Software, Representation and Operations on Various Multimedia Data Types: Text, Images, Graphics, Video and Audio, Introduction to Multimedia Authoring.

Suggested Readings:

1. Gomes, J., & Velho, L. (1997). *Image processing for computer graphics*. Springer Science & Business Media.
2. Hearn, D., & Baker, M. P. (2004). *Computer graphics with OpenGL*. Upper Saddle River, NJ: Pearson Prentice Hall.
3. Rogers, D. F., &Earnshaw, R. (Eds.). (2001). *Computer graphics techniques: Theory and practice*. Springer Science & Business Media.

Reference Books:

1. Rajaraman, A. *Computer Graphics with Multimedia*. Narosa Publication.
2. Newman, W. S., & Sproul, R. S. (1981). *Principles of interactive computer graphics*. McGraw-Hill International.

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
***will vary as per credits**

Unit	**Marks**
1	10
2	10
3	10
4	10
5	10
Case Study	10
Final Examination	60
Total	100

COURSE OUTLINE

Software Testing **PAPER CODE: BCA 603**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives:

This course aims to provide students with a comprehensive understanding of the fundamental concepts and techniques of software testing. It covers planning and execution of test projects, test case design, defect management, and reporting. Students will explore advanced topics such as object-oriented and component-based testing, along with integration, regression, and system testing strategies. The course also emphasizes practical approaches to test automation and equips learners with the skills to analyze and address real-world software testing challenges.

Course Outcomes:

CO1a	Understand the fundamental concepts of software testing
CO1b	To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report
CO2	Understand advanced software testing topics, such as object -oriented software testing methods, and component -based software testing issues, challenges, and solutions
CO3	Understand how to effectively use insights to software testing issues and solutions in software unit test; integration, regression, and system testing.
CO4	To be proficient in analyzing and understand software test automation problems and solutions

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	2	2	3	-	3
CO1 b	2	2	3	-	3
CO2	2	2	3	-	3
CO3	2	2	3	-	3
CO4	2	2	3	-	3

Course Mapping:

Local	**Regional**	**National**	**Global**
			Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y		

Course Pedagogy: ***Lecture, Case study, hands on analysis***

Course Contents:

Unit-I

Introduction: Testing as an Engineering Activity, Testing as a process, testing axioms, basic Definitions Software Testing Principles, The Tester's Role in a software Development organization, The Defect Repository and Test Design, Developer/Tester Support for Developing a Defect Repository. Defect Prevention Strategies.

Unit-II

Testing Life Cycle, Test Levels, Software Verification Techniques, Software Validation Techniques, Verification and Validation in the Software Development Life Cycle. Types of testing: System Testing, Acceptance testing, Performance testing, Regression testing, Smoke testing, User acceptance testing, Test Case Design, Test Case Design Strategies.

Unit-III

Static Testing, Dynamic testing, Black Box Testing, Black Testing Techniques: Random Testing, Requirements based testing, Boundary Value Analysis, Decision tables, Equivalence class partitioning, State-based testing, Cause-effect graphing, Error guessing, Compatibility Testing

Unit-IV

White Box Testing, Test Adequacy Criteria, static testing vs. structural testing, code functional testing, Coverage and Control flow Graphs. Covering Code Logic, Paths. Levels Of Testing: Unit testing, integration testing, system testing, Need for Levels of Testing, Test harness.

Unit-V

Introduction to automatic testing & tools: Drawback of manual testing, Benefits of automatic testing, demerits of automatic testing, Automated Testing Tools – Functional Testing - Rational Functional Tester – Selenium – Cucumber - JUnit, Performance Testing Tools - Rational Performance Tester – HP Load Runner, Test Management Tools - Quality Center, Performance Center.

TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing ' Principles and Practices', Pearson education.
2. RenuRajani, Pradeep Oak, Software Testing - Effective Methods, Tools and Techniques, TataMcGraw Hill.

REFERENCE BOOKS:

1. Boris Beizer, Software Testing Techniques, Second Edition, Dreamtech.
2. Elfriede Dustin, Effective Software Testing, First Edition, Pearson Education.

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

****will vary as per credits***

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**
Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE

Introduction To AI and ML **PAPER CODE: BCA 604**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives:

1. To introduce students to the foundational principles of Artificial Intelligence and problem-solving through search algorithms, enabling them to understand AI systems and apply classical search techniques to real-world problems.
2. To provide conceptual and practical understanding of core Machine Learning algorithms, including linear and logistic regression, along with techniques for model evaluation, feature selection, and regularization.
3. To develop the ability to explore and apply basic neural network architectures, enhancing students' capacity for independent learning and implementation of AI models using modern learning algorithms and optimization techniques.

Course Outcomes:

CO1a	Explain the fundamental concepts of Artificial Intelligence (AI)
CO1b	Apply problem-solving techniques using search algorithms.
CO2	Develop and implement basic Machine Learning models.
CO3	Understand and develop logistic regression and linear regression based models
CO4	Demonstrate independent learning skills by exploring Neural Networks in AI

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	2	1	1	1	2
CO1b	2	1	1	2	2
CO2	2	2	3	1	3
CO3	3	1	3	2	2
CO4	3	2	1	1	2

Course Mapping:

Local	Regional	National	Global
No	No	Yes	Yes

Professional Ethics	Gender	Human Values	Environment & Sustainability
Yes	No	Yes	No

Employability	Entrepreneurship	Skill Development
Yes	No	Yes

Course Pedagogy:

Lecture, Case study, hands on Practical

Course Content:

UNIT 1 **Introduction To AI:** Introduction to Artificial Intelligence, Historical Backdrop, what is Intelligence, The bottom line. Defining the problem as state space search, production system and their types, characteristics of problem and production system.

UNIT 2 **State Space Search**: Generate and test, Simple search, Depth First Search (DFS), Breadth First Search (BFS), Comparison of BFS and DFS, Quality of solution, Depth Bounded DFS (DBDFS), Depth First Iterative Deepening(DFID). **Heuristic Search**: Heuristic Functions, Best First Search, Hill Climbing, Local Maxima, Solution Space Search, Variable Neighbourhood Descent, Beam Search, Tabu Search, Peak to Peak Methods.

UNIT 3: **Introduction to ML:**
Concept of Machine Learning, Applications of Machine Learning, Types of Machine Learning, Key Elements of Machine Learning. Overview of different tasks: classification, regression, clustering.

UNIT 4: **Linear Regression:** Prediction using Linear Regression, Gradient Descent, Polynomial Regression, Feature Scaling /Selection,
Logistic Regression: Classification using Logistic Regression,
Regression with one and multiple variable,
Regularization: Introduction, Concept of Overfitting and underfitting, Bias & Variance. **Regularization Technique:** L1 & L2

UNIT 5: **Neural Networks**:
Learning: Introduction to learning, Neural Networks: Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Backpropagation Algorithm, Learning rate and its significance.

Suggested Readings:

1. Patterson, Dan W. (2007). Introduction to AI and ES. Pearson Education
2. Rich, Elaine & Kevin Knight. Artificial Intelligence. Tata McGraw Hill
3. Russel, Stuart & Peter Norvig (2007). AI- A Modern Approac, 2e. Pearson Education
4. EthemAlpaydin, "Introduction to Machine Learning" 2nd Edition, The MIT Press, 2009.
5. Tom M. Mitchell, "Machine Learning", First Edition by Tata McGraw-Hill Education 2013.
6. Christopher M. Bishop, "Pattern Recognition and Machine Learning" by Springer, 2007.

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Final Exam	60
Total	100

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

***will vary as per credits**

Unit	Marks
1	12
2	12
3	12
4	12
5	12
Final Examination	60
Total	100

COURSE OUTLINE

GENERATIVE AI **PAPER CODE: BCA 606**	**Max. Marks: 50** **Min. Marks: 18** **External 30** **Internal: 20**

Credits: 02

Course Objectives:

The objective of this course is to introduce students to the fundamentals of Generative Artificial Intelligence and equip them with practical knowledge of AI tools used for generating text, images, videos, audio, and code. The course aims to develop students' proficiency in using text-based AI tools like ChatGPT and Bard for content creation and chatbot development; image and video generation tools such as DALL·E, Midjourney, and Synthesia; and audio tools like Eleven Labs, Murf AI, and AIVA for voiceovers and music.

Course Outcomes:

CO1a	Understand the fundamentals of Generative AI and explore various AI tools used for text, image, video, audio, and code generation.
CO1b	Apply and evaluate text-based AI tools (e.g., Chat GPT, Bard, Jasper AI) for content creation, chatbot development, and summarization.
CO2	Analyze and utilize AI-powered tools like DALL·E, Mid journey, and Synthesia for creating images, animations, and deep fake videos.
CO3	Develop and Demonstrate AI-based audio tools such as Eleven Labs, Murf AI, and AIVA to generate synthetic voiceovers, music, and sound effects.
CO4	Develop and automate software solutions using AI-powered coding assistants like GitHub Copilot, Tabnine, and Google AutoML.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	3	2	3	1	2
CO4	2	2	3	2	3

Course Mapping:

Local	Regional	National	Global
			Y

Professional Ethics	Gender	Human Values	Environment & Sustainability
N	N	N	N

Employability	Entrepreneurship	Skill Development
Y	Y	Y

Course Pedagogy: ***Lecture, Case study, hands on analysis***

Course Contents:

Unit 1: Introduction to Generative AI & Tools Landscape, Overview of Generative AI: Definition, History, and Evolution, Types of Generative AI Tools: Text, Image, Video, Audio, Code, Open-Source vs. Commercial AI Tools, Ethical Use of AI Tools: Bias, Copyright, and Misuse Prevention,Hands-on: Exploring Google AI Hub, OpenAI, and Hugging Face

Unit 2: Text Generation Tools & Applications, Large Language Models (LLMs): GPT-4, Gemini, LLaMA, Claude, Text-Based AI Tools: ChatGPT, Bard, Jasper AI, Copy.ai, Use Cases: Content Writing, Chatbots, Summarization, Translation, Prompt Engineering for Better Outputs,Hands-on: Fine-Tuning and Using APIs from OpenAI

Unit 3: Image & Video Generation ToolsAI-Powered Image Generators: DALL·E, Midjourney, Stable DiffusionDeepfake& AI Video Tools: Runway ML, Synthesia, DeepBrain AIAI for Design & Creativity: Canva AI, Adobe Firefly, FotorAIPractical Applications: Marketing, Social Media, Digital ArtHands-on: Generating AI Art and Editing Videos Using AI Tools

Unit 4: Audio & Music Generation Tools, Speech Synthesis & Voice AI: ElevenLabs, Murf AI, Play.ht,AI Music Generators: AIVA, Soundraw, Boomy, Jukebox, Use Cases: Podcasting, Audiobooks, Virtual Assistants, Challenges & Limitations: Licensing, Voice Cloning Ethics, Hands-on: Creating AI-Generated Voiceovers & Music Tracks

Unit 5: Code Generation & Automation Tools, AI for Coding: GitHub Copilot, Codeium, Tabnine, Codex, AI in Low-Code/No-Code Platforms: Google AutoML, Bubble AI, Automating Workflows with AI: Zapier AI, Microsoft Power Automate, AI in Cybersecurity & Bug Detection, Hands-on: Writing Code with AI-Assisted Tools

Suggested Textbooks:

1. **"Generative Deep Learning"** – David Foster
2. **"Hands-On Generative AI with Python and TensorFlow 2"** – Bappa Das &Tanmay Sinha
3. **"The Art of Prompt Engineering with ChatGPT"** – Nathan Hunter
4. **"AI Superpowers: China, Silicon Valley, and the New World Order"** – Kai-Fu Lee
5. **The AI Creator's Handbook"** – Kyle Wiggers

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	10
Quiz	2.5
Class Presentation	2.5
Innovative Assignment	2.5
Class Participation (Skill Development)	2.5
Total Marks- Internal Examination	**20**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
will vary as per credits

Unit	Marks
1	6
2	6
3	6
4	6
5	6
Total Marks- End Examination	**30**

Total (Internal Assessment + External Assessment)	**50**

COURSE OUTLINE

BCA: Semester VI

Computer Graphics and Multimedia Lab **PAPER CODE: BCA-606**	**Max. Marks: 50** **External 30** **Internal: 20**

2 credits

Course Objective: To enable students to implement basic computer graphics algorithms for drawing, filling, 2D transformations, clipping, and mapping using Python/C/C++ programming.

Course Outcomes:

CO1a	***Understand*** **the fundamentals of graphics programming and implement basic drawing algorithms such as point plotting, DDA, and Bresenham's line algorithm.**
CO1b	***Apply*** **circle drawing and region filling algorithms like Midpoint Circle, Flood Fill, and Boundary Fill to render 2D shapes**
CO2	***Implement*** **two-dimensional geometric transformations including translation, scaling, rotation, reflection, and shearing using matrix operations.**
CO3	***Analyse*** **and implement line clipping using Cohen–Sutherland algorithm for viewport boundary constraints.**
CO4	***Demonstrate*** **the concept of window-to-viewport transformation for displaying objects in different viewing contexts.**

CO-PO-PSO Matrix:

CO/PO Matrix							
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1a	**3**	**2**	**3**	**1**	**1**	**3**	**2**
CO1b	**3**	**3**	**3**	**1**	**1**	**3**	**3**
CO2	**3**	**3**	**3**	**1**	**2**	**3**	**3**
CO3	**2**	**3**	**3**	**1**	**1**	**3**	**3**
CO4	**2**	**3**	**3**	**1**	**2**	**3**	**3**

Course Mapping:

Local	Regional	National	Global
N	**N**	**N**	**Y**

Professional Ethics	Gender	Human Values	Environment & Sustainability
N	**N**	**N**	**N**

Employability	Entrepreneurship	Skill Development
Y	**Y**	**Y**

Course Pedagogy:

Practical, hands-on analysis

Course Content:

1. A Program to draw a point on Screen.

2. A program to draw a line using Digital Differential Analyzer (DDA) Algorithm(M<1)

3. A program to draw a line using Digital Differential Analyzer (DDA) Algorithm(>1)

4. A program to draw a line using Bresenham's Line Algorithm (BLA).

5. A program to draw a circle using MidPoint Circle Algorithm.

6. A program to fill different types of geometric shapes using Flood Fill.Algo.

7. A program to fill different types of geometric shapes using Boundary Fill Algo.

8. A program to perform 2D Transformations such as translation.

9. A program to perform 2D Transformations such as Scaling (with origin and a point).

10. A program to perform 2D Transformations such as rotation (with origin and a point).

11. A program to perform 2D Transformations such as reflection.

12. A program to perform 2D Transformations such as sharing.

13. A program to implement Cohen–Sutherland 2D clipping.

14. A program to perform window–viewport mapping.

COURSE OUTLINE
BCA VIII SEMESTER

DATA MINING **PAPER CODE: 701**	**Max. Marks: 100** **Min. Marks: 40** **External: 60** **Internal: 40**

Credits: 04

Course Objectives

- To provide students with the fundamentals and essentials of Data Mining.
- To provide students a sound foundation of Data Mining so that they are able to start using and adopting Data Mining services and tools in their real life scenarios.
- To enable students exploring some important Data Mining driven commercial applications.
- To expose the students to frontier areas of Data Mining, while providing sufficient foundations to enable further study and research.

Course Outcomes

Upon successful completion of this course, students will be able to –

CO1a: Explain the core concepts of the Data Mining paradigm.
CO1b: Analyze this paradigm,Techniques in Data Mining.
CO2: Data Mining technologies, Deployment Models etc.
CO3: Understand Data visualization,Full and partial uses cases.
CO4: Analyze various Data Mining techniques and apply them to solve problems.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	1	2	1	2
CO1 b	2	2	2	-	3
CO2	2	2	3	1	3
CO3	2	2	3	-	3
CO4	2	3	3	1	2

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment &Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	Y

Course Pedagogy:
Lecture, Case study, hands on analysis
Course Contents:

Unit-I
Basic Data Mining Tasks – Data Mining Versus Knowledge Discovery in Data Bases – Data Mining Issues – Data Mining Matrices – Social Implications of Data Mining – Data Mining from Data Base Perspective.

Unit-II
Data Mining Techniques – a Statistical Perspective on data mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithms.

Unit-III
Classification: Introduction – Statistical – Based Algorithms – Distance Based Algorithms – Decision.

Unit-IV
Clustering Tree – Based Algorithms – Neural Network Based Algorithms – Rule Based Algorithms – Combining Techniques: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms. Partitioned Algorithms.

Unit-V
Association Rules: Introduction - Large Item Sets – Basic Algorithms – Parallel & Distributed Algorithms – Comparing Approaches – Incremental Rules – Advanced Association Rules Techniques – Measuring the Quality of Rules.

TextBooks

1. Jiawei Han &MichelineKamber, "*Data Mining Concepts & Techniques*", 2011, 3rd Edition.

REFERENCE BOOK:

1. Margaret H.Dunbam, "*Data Mining Introductory and Advanced Topics*", Pearson Education 2003.

WEB REFERENCES:

- NPTEL & MOOC courses titled Data Mining
- https://nptel.ac.in/courses/106105174/

Course Evaluation Criteria:

Instruments	Marks
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
****will vary as per credits***

Unit	Marks
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE

BCA SEMESTER VII

Research Methodology PAPER CODE: 702	Max. Marks: 100 Min. Marks: 40 External 60 Internal: 40

Credits: 4

Course Objectives:

1.To familiarize students with the fundamental principles, types, and processes of research, including formulation of research problems, development of hypotheses, and review of literature with academic integrity.

2.To equip students with the ability to design and implement a research framework, including data collection, measurement, and analysis using digital tools and programming platforms such as Excel, SPSS, R, and Python.

3.To develop critical skills in academic writing and research communication, enabling students to conduct literature reviews, apply proper referencing styles, and write structured research papers in line with ethical standards.

Course outcomes

After the completion of course, students will be able to:

CO1a: Understand the concept, types & process of Research.
CO1b: Develop Review of literature and hypothesis.
CO2: Design the blueprint of research.
CO3: Demonstrate the ability to use various digital tools and programming platforms for data collection, organization, and visualization.
CO4: Develop the ability to evaluate existing research literature and effectively write structured research papers.

CO/PO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	3	2	-	3
CO1b	3	3	2	1	3
CO2	2	2	3	1	3
CO3	2	2	3	1	3
CO4	3	2	1	2	3

Course Mapping:

Local	Regional	National	Global
Y	Y	Y	Y

Professional Ethics	Gender	Human Values	Environment & Sustainability
Y	N	N	N

Employability	Entrepreneurship	Skill Development
Y	N	Y

Course Pedagogy:

Lecture, Case study, hands on analysis, Demonstration

Course Content:

UNIT 1: Introduction to Research
Meaning of Research, Objectives of Research, Types of Research, Research Process, Problem Identification & Formulation, Research Ethics and Integrity.

UNIT 2: Review of Literature
Objectives of Review of literature, Process of Review of literature, Literature Review Matrix, Comparative study of literature for the identification of research gaps, Referencing and its formats.

UNIT 3: Research Design and Measurement
Research Design: Concept and Classification of Research design, Data Collection: Tools, Measurement: Concept of measurement, Problems in measurement in research, Implementation and validation, Deployment.

Unit 4: Digital Tools for Research and Data Handling Introduction to digital tools for research: Mendeley, Zotero, Grammarly, Turnitin, Google Scholar. Data collection techniques using online forms, APIs, and digital surveys (e.g., Google Forms, Microsoft Forms). Introduction to data analysis tools: Excel, SPSS, R, Python (basic level) Data organization, cleaning, and preprocessing using spreadsheets or Python libraries (Pandas, NumPy) Data visualization techniques using Excel, Python (Matplotlib/Seaborn), or Power BI. Hands-on tasks: Creating charts, graphs, and dashboards for research data.

Unit 5: Literature Review and Research Writing Purpose and structure of a literature review : Methods to identify, filter, and synthesize relevant literature. Using databases like Scopus, IEEE Xplore, ScienceDirect, and Google Scholar effectively. Referencing styles: APA, IEEE, MLA – basic overview and usage. Using reference managers: Mendeley, Zotero (with practice). Structure of a research paper: Abstract, Introduction, Methodology, Results, Conclusion. Ethical practices in research writing – avoiding plagiarism and proper citation. Hands-on: Writing a brief literature review and formatting references.

Suggested Readings:

- Chapman, C. (2015). R for marketing research and analytics. New York, NY: Springer Science Business Media, LLC.
- Cooper, R.,&Schindler,P.S.(2014).Businessresearchmethods(Twelfthedition).NewYork, NY: McGraw-Hill/Irwin.
- Malhotra, N.K., &Birks,D.F.(2007).MarketingResearch:AnAppliedApproach(3ed).Harlow: Financial
- Times Prentice Hall.
- Poynter, R. (2010). The handbook of online and social media research: tools and techniques for market researchers. New York: Wiley.
- Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). Business research methods. Cengage Learning.

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Case Study	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course) *

will vary as per credits

Unit	**Marks**
1	10
2	10
3	10
4	10
5	10
Case Study	10
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

COURSE OUTLINE
BCA VII Sem

Data Science using Python **PAPER CODE: BCA - 703**	**Max. Marks: 100** **Min. Marks: 35** **External 60** **Internal: 40**

Credits: 04

Course Objectives: To equip students with the skills and knowledge necessary to perform data analysis, build machine learning models using python.

CO1a	Understand the concept of Python and its use in Data Science
CO1b	Understand and implement Basics control flow and string manipulation of Python
CO2	Apply basic concepts Python collections
CO3	Understand and apply basics OOP's concepts and use of numpy and pandas library of Python
CO4	Develop visualization using matplotib library of Python.

PO-CO-PSO Matrix:

PO-CO-PSO Matrix							
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**
CO1a	2	3	2	3	2	3	2
CO1b	2	2	2	2	3	3	3
CO2	2	2	2	3	2	2	2
CO3	2	3	2	2	2	2	3
CO4	2	3	3	3	3	2	3

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
Y	Y	Y	N

Employability	**Entrepreneurship**	**Skill Development**
Y	Y	Y

Course Pedagogy:

Lecture, Application and Example

Course Content:

Unit 1: Basics of Python

Basics of Python including data types, operators, variables, expressions, control structures, conditional statements, looping structure, functions, OOP concepts. Python sequence data structures including String, Array, List, Tuple, Set, and Dictionary and associated operations

Unit2: Data Science and Descriptive Statistics:

Understanding data, its type and data science, Considering the emergence and fundamentals of data science, Data science life cycle, Data analysis (Univariate, bivariate and Multivariate), Data analytics, Data measurement scale, Data descriptive statistics (Measures of central tendency, dispersion/variation, measure of location, Shape and symmetry), Understanding Python's role in data science.

Unit 3: Exploring Python libraries:

Reading from a text file, CSV file, excel file, Streaming, Sampling and uploading data, managing data with relational database (MySQL), Exploring statistics of data using stats package from SciPy, Numerical computing and working with multidimensional array through NumPy, Data manipulation through Pandas, Basic functionalities of machine learning using Scikit-learn, Extracting components from HTML document through beautiful soup.

Unit 4: Probabilistic and Inferential Statistics:

Random variable, basics of probability, Probability mass function, Probability density function, Cumulative distribution function, Discrete probability distribution (Binomial and Poisson), Continuous probability distributions (Normal and Exponential). Sampling and its various techniques, Estimation, point estimation and interval estimation, Standard normal distribution, Central limit theorem, Hypothesis testing through one sample test.

Unit 5: Data Preparation and Visualization

Data loading, Data cleaning, dealing with missing data, removing duplicates, Slicing and Dicing, Filtering, and selecting data, Concatenating and transforming, adding new cases and variables, removing data, Sorting and shuffling, Aggregating data, Handling outliers, Data wrangling, Data Normalization.

Visualizing data through figure, subplot and its properties, graphs, plots in matplotlib, basics of advanced visualizations with Seaborn.

Suggested Readings:

1. **McKinney, W. (2017). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. O'Reilly Media.**
2. **VanderPlas, J. (2016). Python data science handbook: Essential tools for working with data. O'Reilly Media**

Course Evaluation Criteria:

Instruments	Marks
Mid Term	20
Innovative Assignment	5
MCQ	5
Class Participation	10
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 2 Credit Course)*

will vary as per credits

Instruments	Marks
External Written Exam	60
Total	**60**

Total (Internal Assessment + External) Assessment)	**100**

COURSE OUTLINE
BCA VII Sem

CYBER SECURITY & LAW **PAPER CODE:** BCA-704	**Max. Marks: 100** **Min. Marks: 35** **External 60** **Internal: 40**

Credits: 04

Course Outcomes: Understanding cyber security concepts, measures and responding to security incidents.

CO1a	Identify and resolve security issues in networks and computer systems to secure any public or private organization.
CO1b	Understand the concept of Cyberspace and Regulation of cyberspace.
CO2	Apply the branches of law, jurisdictional boundaries, and cybersecurity law enforcement.
CO3	Analyze the concept and impact of E-commerce on business models and strategy.
CO4	Recommend a legal defence against data breaches or cybercrime civil or criminal proceedings.

CO/PO MATRIX

Course Outcomes	PO1	PO2	PO3	PO4	PO5
CO1a	3	3	2	2	2
CO1b	2	3	1	2	3
CO2	2	1	1	3	2
CO3	2	2	2	3	3
CO4	2	1	2	3	2

Unit 1: Introduction to Cyber Security

- Defining Cyberspace and Overview of Computer and Web-technology.
- Architecture of cyberspace, Communication and web technology.
- Internet, World Wide Web, Advent of internet, Internet infrastructure for data transfer and governance.
- Internet society, Regulation of cyberspace.
- Concept of cybersecurity, Issues and challenges of cybersecurity.

Unit 2: Cyber Crime and Cyber Law

- Cybersecurity: Issues and challenges.
- Classification of cyber crimes.
- Common cyber crimes - Cyber crime targeting computers and mobiles, Cyber crime against women and children, Financial frauds, Social engineering attacks, Malware and ransomware attacks, Zero-day and zero-click attacks.

- Cyber criminals' modus operandi.
- Reporting of cyber crimes, Remedial and mitigation measures.
- Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences.
- Organizations dealing with Cyber crime and Cybersecurity in India.
- Case studies.

Unit 3: Social Media Overview and Security

- Introduction to Social Networks and Indian IT Laws.
- Social Media Privacy and Security Issues (IT Act, 2000 & Amendments).
- Legal Provisions for Inappropriate Content (Indian Penal Code & IT Rules, 2021).
- Cybersecurity Risks in Social Media and Preventive Measures.
- Case Studies on Social Media Cybercrimes in India.

Unit 4: E-Commerce and Digital Payments

- Definition and Regulation of E-Commerce under Indian Law.
- Key Components and Security Aspects of E-Commerce.
- Digital Payment Methods, Fraud Prevention, and RBI Guidelines.
- Legal Framework for Digital Payments (IT Act, 2000 & Payment Settlement Act, 2007).
- Case Studies on E-Commerce Fraud and Legal Remedies.

Unit 5: Digital Devices Security, Tools & Technologies for Cyber Security

- Device Security Policies and Legal Provisions under IT Act, 2000.
- Password Management, Firewalls, and Antivirus Security.
- Wi-Fi Security and Best Practices for Secure Digital Transactions.
- Data Protection Laws in India and Compliance Guidelines (DPDP Act, 2023).
- Case Studies on Cybersecurity Breaches and Legal Implications.

Reference Books:

1. K.L. James, The Internet: A User's Guide, 2003, Prentice Hall of India, New Delhi.
2. B. Singh, Network Security and Management, Prentice Hall of India, New Delhi.
3. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing, UP, 2016.
4. Farooq Ahmed, Cyber Law in India, Allahabad Law Agency, 2015.
5. Karnika Seth, Computers, Internet, and New Technology Laws: Comprehensive Reference Work with Special Focus on Developments in India, LexisNexis, Nagpur, 2016.
6. K. Nandan, Law relating to Computer, Internet, and E-Commerce, Universal Law Publishing, UP, 2007.

Course Evaluation Criteria:

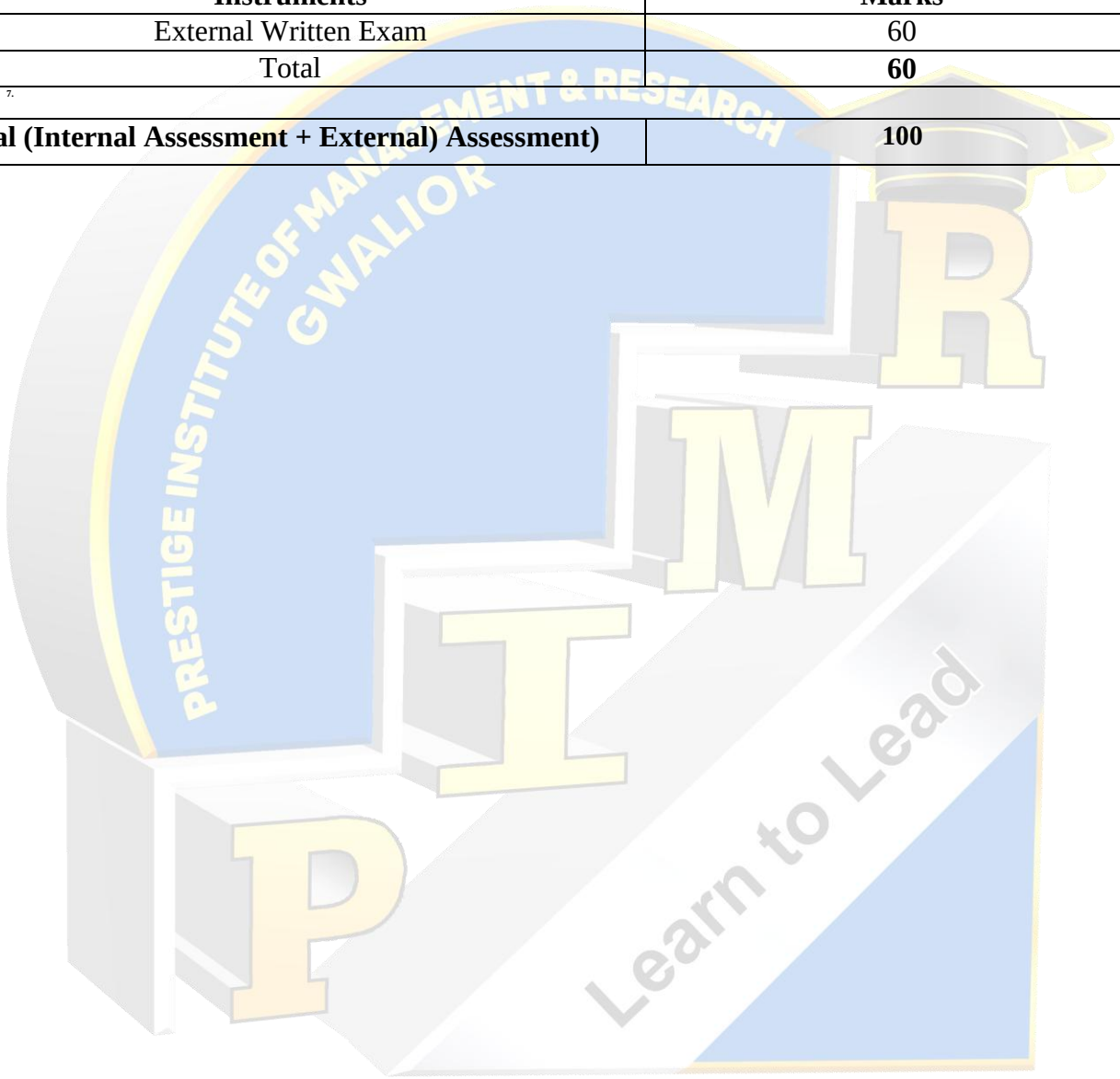
Instruments	Marks
Mid Term	20
Innovative Assignment	5
MCQ	5
Class Participation	10
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 2 Credit Course)*
will vary as per credits

Instruments	Marks
External Written Exam	60
Total	**60**

7.

Total (Internal Assessment + External) Assessment)	**100**



COURSE OUTLINE
BCA VII Sem

Data Science using Python Lab **PAPER CODE: BCA –706**	**Max. Marks: 50** **Min. Marks: 18** **External 25** **Internal: 25**

Credits: 02

Course Objectives: To equip students with practical skills in applying python for data related task.

CO1a	Understand and implement the core concept of Python
CO1b	Explore and Implement the control flow and string manipulation in Python.
CO2	Explore the various uses of Python collection.
CO3	Understand and apply basics OOP's concepts and use of numpy and pandas library of Python
CO4	Creating, Evaluating and analyzing the data through Numpy, Pandas and Matplotlib

PO-CO-PSO Matrix:

Course Outcomes	PO1	PO2	PO3	PO4	PO5
CO1a	2	3	2	2	2
CO1b	2	2	2	2	3
CO2	2	3	2	3	2
CO3	2	3	2	3	2
CO4	2	3	3	3	3

Course Mapping:

Local	Regional	National	Global
Y	Y	Y	Y

Professional Ethics	Gender	Human Values	Environment & Sustainability
Y	Y	Y	N

Employability	Entrepreneurship	Skill Development
Y	Y	Y

Course Pedagogy:
Example, Hands on Practical lab
Course Content:

Fundamentals of Python

1. Set up your Python development environment (installation, configuring an IDE like VS Code or PyCharm).
2. Write basic Python programs, focusing on correct indentation and usage of comments.
3. Declare variables of different data types (integer, float, complex, string, Boolean).
4. Experiment with various arithmetic, relational, logical, assignment, and bitwise operators.
5. Understand and apply operator precedence.

Control Flow and String Manipulation

1. Implement programs using input and output statements (input (), print ()).
2. Develop programs to practice conditional statements: if, if-else, and if-elif-else for decision making.
3. Develop programs using while and for loops, including nested loops.
4. Implement break, continue, and pass statements to control loop execution.
5. Perform various string manipulations: accessing characters, basic operations (concatenation, repetition), slicing, and using built-in string functions and methods.

Python Collections

1. **Lists:** Implement to create, access, and modify lists. Perform list operations and apply common list functions and methods (e.g., append, insert, remove, sort).
2. **Tuples:** Implement to create, access, and work with tuples. Understand tuple immutability and apply tuple operations and methods.
3. **Dictionaries:** Implement to create, access, and manipulate dictionaries. Understand dictionary properties and use dictionary functions and methods (e.g., keys, values, items).
4. **Sets:** Implement to work with sets and frozen sets, performing operations like union, intersection, and difference.

Object-Oriented Programming, Regular Expressions, and Data Modules

1. **Object-Oriented Programming (OOP) in Python:**
   Define classes, create objects, Implement constructors (__init__), methods.
   Understand and demonstrate inheritance (single inheritance).
2. **Regular Expressions:**
   Use the re module for basic pattern matching (e.g., re.search, re.findall).
   Practice common regex patterns for text validation or extraction.

Data Preparation and Data Visualization

1. **Importing & Exploring Data using Python Modules:**
   Numpy: Introduction to the Numpy module. Create and manipulate Numpy arrays (NdArrays).
   Perform basic array operations (arithmetic, slicing, reshaping).
   Pandas: Introduction to the Pandas module. Create and work with Series and DataFrames.
   Perform basic Pandas operations (data loading, selection, filtering, basic data exploration).
2. **Data Visualization**
   Matplotlib: create Basic plots using Matplotlib
   Analyze data using Frequency distributions, Averages, VariabilityNormal curves, Correlation and scatter plots, Correlation coefficient, Regression

Course Evaluation Criteria:

Instruments	Marks
File	6
Assignment 1	6
Assignment 2	8
Assignment 3	5
Total Marks- Internal Examination	**25**

Marks Distribution Scheme for final exams: (For 2 Credit Course)*
will vary as per credits

Unit	Marks
External Viva	25
Total	**25**

Total (Internal Assessment + External) Assessment)	**50**

Data Mining Lab Using Weka PAPER CODE: BCA – 707	Max. Marks: 50 External 30 Internal: 20 Min. Marks :20

2 credits

Course Objective : To equip students with practical skills and theoretical understanding in the field of data mining using weka tool.

Course Outcomes:

CO1a	CO1: Use different features of WEKA tool
CO1b	pre-process the data for mining
CO2	determine association rules
CO3	model various classifiers.
CO4	examine clusters from the available data

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	3	3	3	1	3
CO4	2	2	3	3	3

Course Mapping:

Local	**Regional**	**National**	**Global**
			Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	**N**	**N**	**N**

Employability	**Entrepreneurship**	**Skill Development**
Y	**Y**	**Y**

Course Pedagogy: ***Programs***

Lab Assignment: Programming Exercises

1. Basics of WEKA tool a. investigate the Application interfaces. b. Explore the default datasets.
2. Pre-process a given dataset based on the following: a. Attribute Selection b. Handling Missing Values 3. Pre-process a given dataset based on the following: a. Discretization b. Eliminating Outliers
4. Create a dataset in ARFF (Attribute-Relation File Format) for any given dataset and perform Market-Basket Analysis.
5. Generate Association Rules using the Apriori algorithm.
6. Generate Association Rules using the FP-Growth algorithm.
7. Build a Decision Tree using ID3 algorithm.
8. Demonstrate classification process on a given dataset using Naïve Bayesian Classifier.
9. Demonstrate classification process on a given dataset using Rule based Classifier.
10. Demonstrate classification process on a given dataset using Nearest neighbor Classifier.
11. Build a distance matrix of the given data using various distance measures.
12. Cluster the given dataset by using the k-Means algorithm and visualize the cluster mean values and standard deviation of dataset attributes.
13. Cluster the given dataset using a hierarchical clustering algorithm
14. Cluster the given dataset using the DBSCAN algorithm.
15. Detect anomalies using any clustering algorithm. 16. Implement density based outlier detection.

REFERENCE BOOKS:

1. Pang-Ning Tan,Michael Steinbach, Vipin Kumar, Introduction to Data Mining, 2nd edition, Pearson education, 2018.
2. Jlawei Han & Micheline Kamber, Data Mining, "Concepts and Techniques", 3 rd edition, Morgan Kaufmann Publishers, 2012.
3. Margaret H Dunham, Data Mining Introductory and advanced topics, 6th edition, Pearson Education, 2009 4. Arun K Pujari, Data Mining Techniques, 1st edition, University Press, 2005.
5. GK Gupta, Introduction to Data Mining with Case Studies, 3rd edition, Prentice Hall, 2014.
6. K. P. Soman, ShyamDiwakar, V. Ajay, DataMiningTheoryandPractice,1st edition, PHI,2006. WEB

REFERENCES: 1. www.cs.waikato.ac.nz/ml/weka/downloading.html

Course Evaluation Criteria:

Instruments	**Marks**
Assignment -1	5
Assignment -2	5
Assignment -3	5
Viva	5
Total(Internal assessment)	20

Marks Distribution Scheme for final exams: (For 2 Credit Course)*
***will vary as per credits**

Unit	**Marks**
External Viva	30

Total (Internal Assessment + External Assessment)	**50**

COURSE OUTLINE

MOBILE APPLICATION DEVELOPMENT **PAPER CODE: BCA 801**	**Max. Marks: 100** **Min. Marks: 40** **External 60** **Internal: 40**

Credits: 04

Course Objectives:

This course aims to equip students with a solid understanding of Android architecture and the ability to develop basic to advanced Android applications. Students will learn to design user interfaces using Android UI components, manage activity lifecycles, and apply various data persistence techniques including shared preferences, file handling, and SQLite. The course also focuses on building and managing Android services, implementing multithreading, handling network operations, and utilizing broadcast receivers. Additionally, students will gain hands-on experience with location-based services, animations, media, sensors, and the app publishing process on the Google Play Store.

Course Outcomes:

CO1a	Understanding Android architecture, and developing basic Android applications and demonstrate proficiency in setting up Android development environments,
CO1b	Design and implement user interfaces using various Android UI components and understand the lifecycle of Android activities.
CO2	Apply different data persistence techniques in Android applications, including shared preferences, file handling, SQLite database management, and content providers.
CO3	Develop skills in creating and managing Android services, implementing multithreading for background tasks, and integrating network operations using HTTP and Broadcast Receivers.
CO4	Demonstrate advanced skills in implementing location-based services, animations, media handling, sensor programming, and understanding the process of publishing Android apps to Google Play Store.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	3	3	3	1	3
CO4	2	2	3	3	3

Course Mapping:

Local	**Regional**	**National**	**Global**
			Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	Y	Y

Course Pedagogy: Lecture, Case study, hands on analysis
Course Contents:

Unit I: Introduction to Mobile Application Development

Overview of mobile platforms: Android, iOS, others, Introduction to smartphones and their features, Android platform: history, evolution, and key features, Android architecture overview: Linux kernel, Android Runtime (ART), Libraries, Application Framework, Applications, Development Environment and Android Studio features and installation, project structure, Gradle build system, Emulator setup and configuration, Android Application Basics: XML representation of Android UI components , Android manifest file: structure and importance, Creating a simple application: Hello World example.

Unit II: Android UI Design

GUI Design and Activities Lifecycle, Activities lifecycle: onCreate(), onStart(), onResume(), onPause(), onStop(), onDestroy(), Android v7 Support Library: usage and benefits, Intent concept: Intent object, Intent filters, adding categories, Linking activities using Intents, User Interface Components: Basic Views: TextView, EditText, Button, etc.Picker Views: DatePicker, TimePicker, List View and RecyclerView for displaying lists, Gallery, Image View, Image Switcher for multimedia handling, Options Menu and Context Menu for contextual actions, WebView for embedding web content in apps

Unit III: Data Persistence

Data Persistence Techniques, Shared Preferences: storing key-value pairs, File Handling: reading from and writing to files, Managing structured data using SQLite Database, Content Providers: understanding and creating custom content providers, Using Android built-in content providers (Contacts, Calendar, etc.)

Unit IV: Android Services & Network Environment

Android Services: Introduction to Services: types of services (Local, Remote), Binding services to activities, Communication between service and activity using Handlers and Callbacks, Intent Service for background processing tasks. Multithreading and Network Programming: AsyncTask for performing background operations, Android network programming: HttpUrlConnection for HTTP requests, Connecting to REST-based and SOAP-based Web services, Broadcast Receivers: LocalBroadcastManager, Dynamic Broadcast Receiver, System Broadcasts, Using Telephony Manager for sending SMS and making calls.

Unit V: Advanced Applications

Location-Based Services: Integrating Google Maps API v2 for displaying maps and location-based services. Animations and Graphics: Property Animation, View Animations, and Drawable Animations Creating fluid and interactive UI components. Media and Camera API: Working with video and audio inputs using Media API, Camera API: capturing images and videos. Sensor Programming: Working with Motion sensors, Position sensors, and Environmental sensors, Using sensors to enhance application functionalities. Publishing Android Apps: Guidelines, policies, and procedures for uploading apps to Google Play Store, Ensuring compliance with Google Play policies and app review processes.

Suggested Textbooks:

1. “Head First: Android Development”, Dawn Griffiths, David Griffiths, OReilly, 1st Edition, 2015.
2. Barry Burd, “Android Application Development – All–in–one for Dummies”, 2nd Edition,Wiley India, 2016.
3. “Professional Android™ Sensor Programming”,GregMilette,Adam Stroud, John Wiley and Sons, Inc2012. “Android 6 for Programmers, App Driven approach”, Paul Deital, Harvey Deital, Alexander Wald, Prentice Hall, 2015.
4. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Brian Hardy

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*

***will vary as per credits**

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

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COURSE OUTLINE

BCA VIII SEMESTER CLOUD COMPUTING

Cloud Computing **PAPER CODE: 802**	**Max. Marks: 100** **Min. Marks: 40** **External: 60** **Internal: 40**

Credits: 04

Course Objectives

- To provide students with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To enable students exploring some important cloud computing driven commercial systems and applications.
- To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Course Outcomes

Upon successful completion of this course, students will be able to –

CO1a: Explain the core concepts of the cloud computing paradigm.

CO1b: Analyze this paradigm, networks in Cloud computing, service model.

CO2: Cloud Computing Architecture, Deployment Models and cloud security.

CO3: Understand cloud virtualization, Full virtualization, partial virtualization and cloud economics.

CO4: Analyze various cloud programming models and apply them to solve problems on the cloud.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	1	2	1	2
CO1 b	2	2	2	-	3
CO2	2	2	3	1	3
CO3	2	2	3	-	3
CO4	2	3	3	1	2

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment &Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Contents:

Unit-I

Cloud Computing Overview – Origins of Cloud computing – Cloud components - Essential characteristics On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, Measured service. Cloud scenarios – Benefits: scalability, simplicity, vendors, security. Limitations – Sensitive information - Application development – Security concerns - privacy concern with a third party - security level of third party - security benefits.

Unit-II

Cloud Computing Architecture: Cloud computing stack - Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services. Service Models (XaaS) - Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS).

Unit-III

Cloud Computing Architecture: Deployment Models – Public cloud, Private cloud, hybrid cloud, Community cloud; Cloud security: Infrastructure security, data security and storage, Identity and access Management, Access control.

Unit-IV

Virtualization: Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations; Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services, choosing a Cloud platform for an organization based on application requirements.

Unit-V

Setting up your own Cloud: How to build private cloud using open source tools, understanding various cloud plugins, setting up your own cloud environment- Auto provisioning, custom images, integrating tools like Nagios; Integration of Public and Private cloud. Future Directions: Cloud Domain and scope of work, Cloud Computing Programming Introduction.

Text Books

1. Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications [ISBN: 978-0521137355].
2. Cloud computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenpeter TATA McGraw- Hill , New Delhi – 2010 [ISBN: 0071626948].
3. Dimitris N. Chorafas, Cloud Computing Strategies [ISBN: 1439834539].
4. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.
5. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
6. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski Wile, 2011.
7. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012.

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
***will vary as per credits**

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

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Mobile Application Development Lab PAPER CODE: BCA – 803	Max. Marks: 50 External 30 Internal: 20 Min. Marks :20

2 credits

Course Objectives:

This course is designed to enable students to develop basic Android applications and proficiently set up Android development environments. It focuses on designing user interfaces using Android UI components and understanding the activity lifecycle. Students will implement various data persistence techniques, including shared preferences, file handling, SQLite, and content providers. The course also covers creating and managing Android services, multithreading, network communication via HTTP, and Broadcast Receivers. Additionally, learners will explore location-based services, animations, media and sensor integration, and the process of publishing apps on the Google Play Store.

Course Outcomes:

CO1a	Developing basic Android applications and demonstrate proficiency in setting up Android development environments.
CO1b	Design and implement user interfaces using various Android UI components and understand the lifecycle of Android activities.
CO2	Implement different data persistence techniques in Android applications, including shared preferences, file handling, SQLite database management, and content providers.
CO3	Develop programs in creating and managing Android services, implementing multithreading for background tasks, and integrating network operations using HTTP and Broadcast Receivers.
CO4	Implementing location-based services, animations, media handling, sensor programming, and understanding the process of publishing Android apps to Google Play Store.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1 a	1	2	2	-	2
CO1 b	2	3	2	-	3
CO2	2	3	3	-	2
CO3	3	3	3	1	3
CO4	2	2	3	3	3

Course Mapping:

Local	Regional	National	Global
			Y

Professional Ethics	Gender	Human Values	Environment & Sustainability
N	**N**	**N**	**N**

Employability	Entrepreneurship	Skill Development
Y	**Y**	**Y**

Course Pedagogy: Programs
Lab Assignment: Programming Exercises

Practical 1. Create an Android application using Android Studio that displays "Hello World" on the screen.

Practical 2. Develop a login screen with EditText fields for username and password. Implement validation to ensure both fields are filled before allowing login. Use Toast messages for feedback.

Practical 3. Create a layout with TextView, EditText, Button, and ImageView. Also Write functionality to dynamically update TextView text based on EditText input. Load and display an image from a URL in ImageView using Picasso or Glide.

Practical 4. Develop an Android application with settings to allow users to set preferences (e.g., theme color, language). Store and retrieve user preferences using Shared Preferences. Include a feature to reset preferences to default values.

Practical 5. Design a SQLite database schema for a task management application (Task ID, Task Name, Due Date). Implement CRUD operations (Create, Read, Update, Delete) for tasks using SQLiteOpenHelper and SQLiteDatabase. Display tasks in a RecyclerView with full functionality.

Practical 6. Develop a weather forecast application that fetches data from a RESTful API (e.g., OpenWeatherMap). Implement a background service to periodically fetch and update weather data. Display fetched weather information in a RecyclerView with appropriate error handling.

Practical 7. Refactor the weather forecast application to use Retrofit library for network operations. Enhance error handling and display meaningful messages when API calls fail. Integrate caching using OkHttp Interceptors for efficient network requests.

Practical 8. Create an Android application for setting location-based reminders using Google Maps API. Implement geofencing to trigger reminders when users enter specific geographical areas. Provide a user-friendly interface to manage and display reminders on the map.

Practical 9. Develop a music player application that plays audio files stored locally on the device. Implement playback controls (play, pause, stop, seek) using MediaPlayer or ExoPlayer. Display song metadata dynamically as songs are played.

Suggested Textbooks:

5. “Head First: Android Development”, Dawn Griffiths, David Griffiths, OReilly, 1st Edition, 2015.
6. Barry Burd, “Android Application Development – All–in–one for Dummies”, 2nd Edition,Wiley India, 2016.
7. “Professional Android™ Sensor Programming”,GregMilette,Adam Stroud, John Wiley and Sons, Inc2012. “Android 6 for Programmers, App Driven approach”, Paul Deital, Harvey Deital, Alexander Wald, Prentice Hall, 2015.
8. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Brian Hardy

Course Evaluation Criteria:

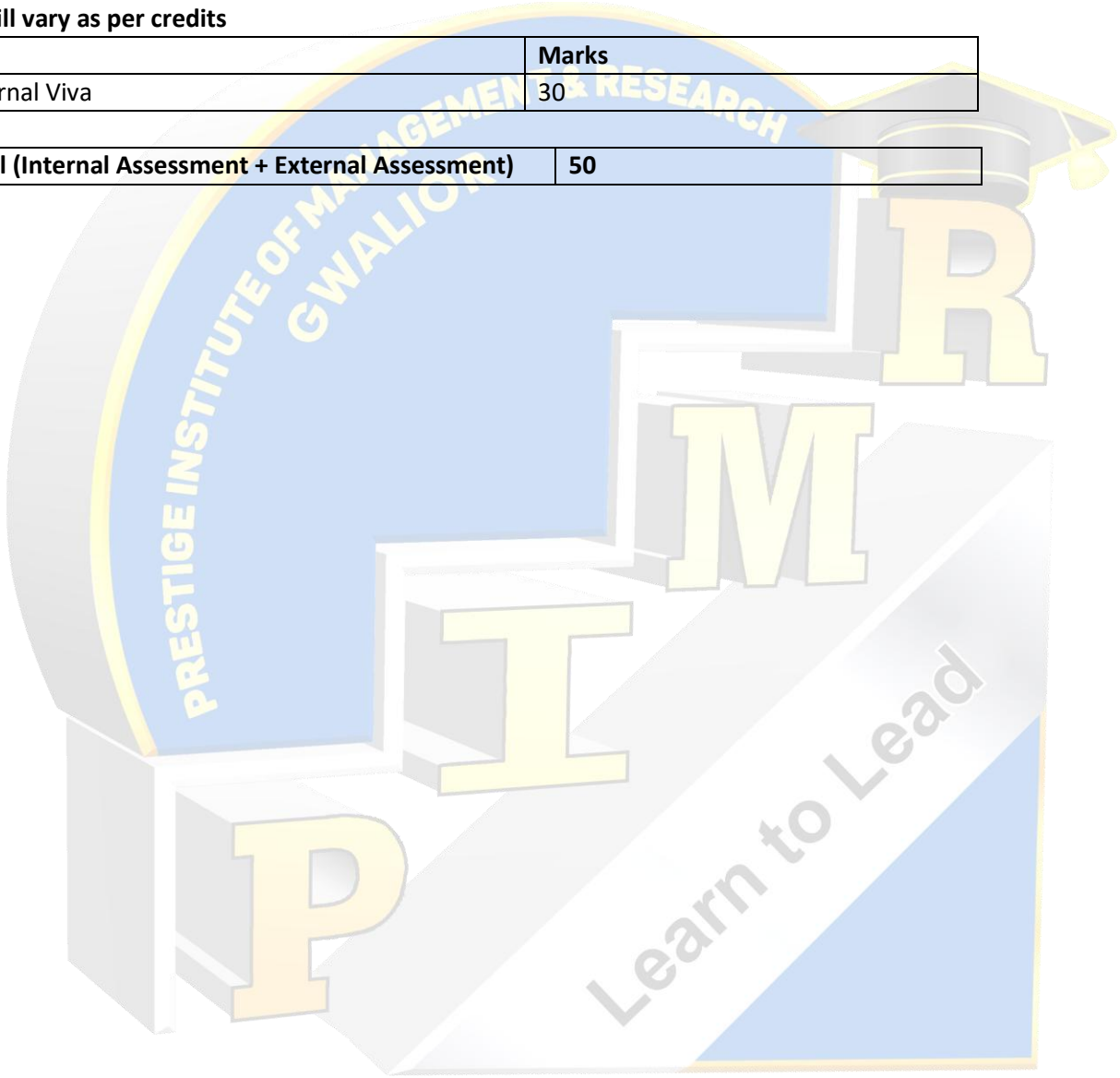
Instruments	Marks
Assignment -1	5
Assignment -2	5
Assignment -3	5
Viva	5
Total(Internal assessment)	20

Marks Distribution Scheme for final exams: (For 2 Credit Course)*

***will vary as per credits**

Unit	Marks
External Viva	30

Total (Internal Assessment + External Assessment)	**50**



COURSE OUTLINE

R PROGRAMMING **PAPERCODE:BCA-804**	**Max.Marks:100** **Min.Marks:40** **External60** **Internal:40**

Credits: 04

Course Objective: To enable students to perform data analysis, visualization, and statistical modeling using R programming, including data manipulation, advanced graphics, and machine learning techniques.

Course Outcomes:

CO1a	Understand the basic concepts of R programming, including its syntax, data types, and structures.
CO1b	Implement data manipulation and transformation techniques using base R and `dplyr` for data preprocessing.
CO2	Develop advanced data visualizations using base R, `ggplot2`, and interactive tools like `plotly` and `shiny`.
CO3	Apply statistical methods such as hypothesis testing, correlation, regression, and ANOVA using R.
CO4	Utilize R programming for advanced data analysis tasks such as machine learning, time series forecasting, and automation.

COPO Matrix:

CO/PO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	5	2	1	1	4
CO1b	2	5	4	1	2
CO2	1	2	5	4	2
CO3	5	4	2	1	2
CO4	2	5	4	1	5

Course Mapping:

Local	**Regional**	**National**	**Global**
Y	Y	Y	Y

Professional Ethics	**Gender**	**Human Values**	**Environment & Sustainability**
N	N	N	N

Employability	**Entrepreneurship**	**Skill Development**
Y	N	N

Course Title: R Programming BCA-804

Unit 1: Introduction to R Programming:

Overview and Evolution of R Programming, Installing and Setting Up R and RStudio, Basic Syntax and Data Types in R (Numeric, Character, Logical, Factor), Variables and Basic Arithmetic Operations, Data Structures in R.

Vectors: - Creation, Indexing, and Operations, Matrices: Formation, Manipulation, and Operations, Lists: Nested Data Structures and Applications, Data Frames: Creating, Accessing, and Modifying

Importing and Exporting Data: -Reading and Writing CSV, Excel, and TXT Files, Working with Web Data and APIs, Connecting R with Databases (SQL Integration)

Unit 2: Data Manipulation and Transformation in R

Data Manipulation with Base R Functions, Introduction to tidyverse and dplyr Package, Data Cleaning and Preprocessing: Handling Missing Values (NA Handling), Removing Duplicates and Outliers, Data Type Conversions, String Manipulations (stringr package)

Data Transformation using dplyr:

Filtering Rows (filter()), Selecting Columns (select()), Transforming Data (mutate()), Sorting Data (arrange()), Grouping and Summarizing (group_by(), summarize()), Merging and Reshaping Data:, Combining Datasets (merge(), rbind(), cbind()), Reshaping Data using tidyr (gather(), spread(), pivot_longer(), pivot_wider())

Unit 3: Data Visualization in R

Introduction to Data Visualization and Importance, Basic Plots with Base R (plot(), barplot(), hist(), boxplot()), Advanced Visualization with ggplot2:Understanding ggplot() Syntax, Creating Bar Charts, Line Charts, and Scatter Plots, Box Plots and Violin Plots for Distribution Analysis, Faceting and Multi-Panel Plots (facet_wrap(), facet_grid())

Customizing Plots:Adding Labels, Titles, and Legends, Modifying Colors, Themes, and BackgroundsAnnotating and Highlighting Key Points, Interactive Visualizations using plotly and shiny

Unit 4: Statistical Analysis in R

Descriptive Statistics and Data Summarization (mean(), median(), sd(), summary()), Probability Distributions in R (dnorm(), rnorm(), pnorm()), Hypothesis Testing and Statistical Inference:t-tests (One-Sample, Two-Sample, Paired), Chi-Square Tests, Wilcoxon and Kruskal-Wallis Tests, Correlation and Regression Analysis:Pearson and Spearman Correlation, Simple and Multiple Linear Regression, Logistic Regression for Classification Problems, Analysis of Variance (ANOVA) and Non-Parametric Tests

Unit 5: Advanced R Programming

Programming Concepts in R:Writing Functions and Custom Scripts, Looping Constructs (for(), while(), repeat()), Conditional Statements (if-else, switch())Introduction to Machine Learning with R:Supervised vs. Unsupervised Learning, Implementing Linear and Logistic Regression, Clustering Techniques (K-Means, Hierarchical).

Reference books:

"The Art of R Programming" by *Norman Matloff*
"R for Data Science" by *Hadley Wickham and Garrett Grolemund*
"Advanced R" by *Hadley Wickham*
"Hands-On Programming with R" by *Garrett Grolemund*

Course Evaluation Criteria:

Instruments	**Marks**
Mid Term Exam	20
Quiz	5
Class Presentation	5
Innovative Assignment	5
Class Participation (Skill Development)	5
Total Marks- Internal Examination	**40**

Marks Distribution Scheme for final exams: (For 4 Credit Course)*
***will vary as per credits**

Unit	**Marks**
1	12
2	12
3	12
4	12
5	12
Total Marks- End Examination	**60**

Total (Internal Assessment + External Assessment)	**100**

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R Programming Lab PAPER CODE: 805	Max. Marks: 50 Min. Marks: 18 External 30 Internal: 20

Credits: 2

Course Outcomes:

CO1a	Read understand and trace the execution of programs written in R language
CO1b	Write the R program for a given algorithm using control statements with input and output.
CO2	Write the modular program for given problem.
CO3	Write the program to solve problem using different packages
CO4	Implement the solutions of real world problem.

COPO Matrix:

CO/PO/PSO Matrix					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1a	3	3	2	1	1
CO1b	3	3	3	1	1
CO2	2	3	3	1	2
CO3	3	3	3	2	2
CO4	3	2	3	2	3

Course Mapping:

Local	Regional	National	Global
			Y

Professional Ethics	Gender	Human Values	Environment & Sustainability
Y	N	N	N

Employability	Entrepreneurship	Skill Development
Y	Y	Y

Course Pedagogy:

Lecture, Case study, hands on analysis

Course Content:

BCA – 805 Programming in R Lab

1. Create three R variables: my_name (character type), my_age (numeric type), and is_student (logical type). Print the value of each variable.
2. Define two numeric variables, a = 25 and b = 4. Write R code to calculate and print their sum, difference, product, and division.
3. Create two string variables, first_name and last_name. Use the paste() function to combine them into a single string full_name and print it.
4. Create a numeric vector containing the marks of a student in 5 subjects: c(85, 92, 78, 65, 88). Calculate and print the total marks, average marks, maximum marks, and minimum marks.
5. Create two numeric vectors, v1 = c(1, 2, 3) and v2 = c(4, 5, 6). Perform element-wise addition and multiplication on these vectors and print the results.
6. Create a character vector with the names of seven days of the week. Write code to print the third day of the week. Then, print the days from Tuesday to Friday.
7. Use the : operator to create a vector of integers from 5 to 15. Separately, use the seq() function to create a vector of even numbers from 2 to 20.
8. Create a 3x4 matrix with elements from 1 to 12, filling the data by row. Print the created matrix.
9. Using the matrix from the previous question, find and print its transpose. Also, print the dimensions (number of rows and columns) of the original matrix using dim().
10. Create a list named employee_details that contains an employee's name ("Arun"), employee ID (101), a vector of projects worked on (c("P1", "P2", "P3")), and their salary (55000).
11. From the employee_details list created earlier, access and print the employee's name using the $ operator and the projects vector using the [[ ]] notation.
12. Create a data frame named student_data with three columns: RollNo (1, 2, 3, 4), Name ("Amit", "Priya", "Rahul", "Sonia"), and Marks (78, 85, 91, 75).
13. For the student_data data frame, use the summary() function to get a statistical overview. Also, use the str() function to view its structure.
14. From the student_data data frame, select and print the details of students who have scored more than 80 marks.
15. Write an R program that takes a number as input and prints whether the number is "Even" or "Odd".
16. Write a for loop that iterates from 1 to 10 and prints the square of each number.
17. Write a program to calculate the factorial of a given number (e.g., 5). The factorial of 5 is $5\times4\times3\times2\times1=120$.
18. Write a user-defined R function named greet that takes a person's name as an argument and prints a greeting message like "Hello, [Name]! Welcome to R."
19. Write a function named circle_area that takes the radius of a circle as input and returns its area. The formula for the area is $\pi r2$. Use the built-in pi constant in R.
20. Create a numeric vector representing the sales of 5 different products: c(150, 230, 180, 210, 190). Create a simple bar plot to visualize these sales figures using the barplot() function.
21. Regression:
    a. Implementing simple and multiple linear regression models.
    b. Analyzing regression results and interpreting coefficients.
22. Classification:
    a. Building classification models using algorithms like K-Nearest Neighbors (KNN).
    b. Implementing Decision Trees.
    c. Exploring Support Vector Machines (SVMs).
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    a. Building classification models using algorithms like K-Nearest Neighbors (KNN).
    b. Implementing Decision Trees.
    c. Exploring Support Vector Machines (SVMs).

Course Evaluation Criteria:

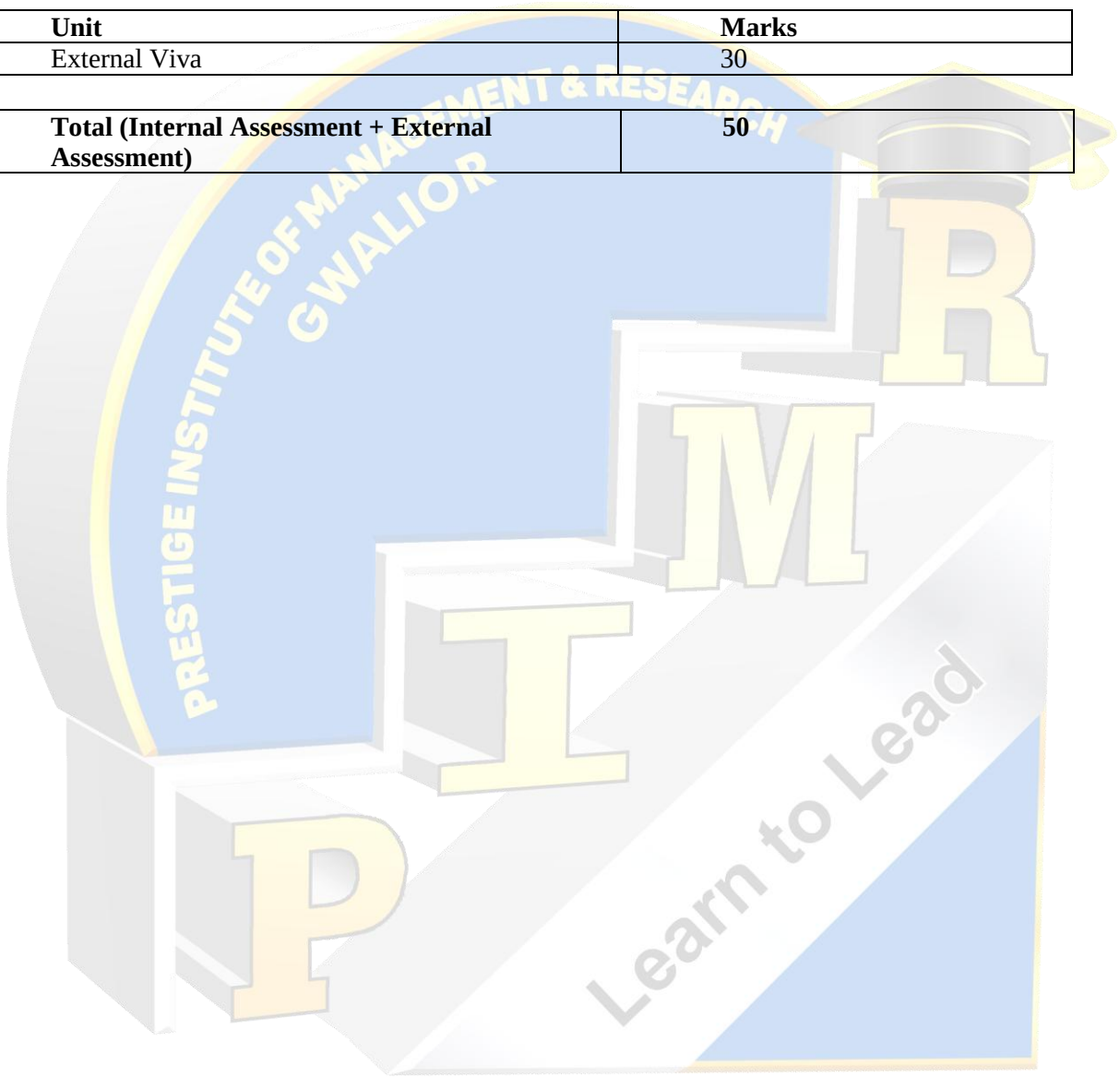
Instruments	Marks
Assignment -1	5
Assignment -2	5
Assignment -3	5
Viva	5
Total(Internal assessment)	20

Marks Distribution Scheme for final exams: (For 2 Credit Course)*

***will vary as per credits**

Unit	Marks
External Viva	30

Total (Internal Assessment + External Assessment)	**50**



BCA - 807 LANGUAGE PART I FRENCH CREDIT:	Max. Marks: 50 External 30 Internal: 20 Min. Marks :20

2 credits

Course Objective

This paper is to make students understand the basics of French languages and its importance on today's time.

Course Outcome (CO) and CO-PO Matrix:

	The subject will enable/help student to/in-	PO1	PO2	PO3	PO4	PO5
CO1A	Comprehend the simple sentences into French to English	0	0	0	0	0
CO1B	Understand about the conjugation of sentences	0	0	1	0	0
CO2	Quoting the French vocabulary and accents	0	0	0	0	0
CO3	Selecting the parts of speech and types of sentences	0	0	0	0	1

UNIT I: Vocabulaire simple lié à l'institut, au collège et aux professions, les nombrescardinaux, les nombresordinaux, les jours de la semaine, les mois de l'année, l'heure, les saisons.

UNIT II: Les noms et leurs genres, les pronoms, les verbespronominaux, les verbes du 1er, 2e et 3e groupe, la conjugaison au présent de l'indicatif, les adjectifsqualificatifs, les phrases interrogatives simples, traduction de phrases simples de l'anglaisvers le français.

UNIT III: Présenterquelqu'un, se présenter, dialogues simples et situations de communication, monami(e), moncours de français, ma ville, un site touristique, les comparatifs et superlatifs, les signesorthographiques, questions de compréhension sur uneleçon de l'unité IV du livre prescrit.

Suggested Readings:

1. Initial (part-I)-Unit 3 and 4 -Sylvie poisson- uinton, Marina Sala.
2. Bonne Route
3. Sans Frontiere- part I

Dictionary: Larousse, Cassels, Oxford, Collins.

Course Evaluation Criteria:

Instruments	Marks
Assignment -1	5
Assignment -2	5
Assignment -3	5
Viva	5
Total(Internal assessment)	20

Marks Distribution Scheme for final exams: (For 2 Credit Course)*
***will vary as per credits**

Unit	Marks
External	30

Total (Internal Assessment + External Assessment)	50

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