PCET's Pimpri Chinchwad University
Learn | Grow | Achieve

Pimpri Chinchwad Education Trust's

Pimpri Chinchwad University

Sate, Maval, Pune - 412106

PCET's Pimpri Chinchwad University
Learn | Grow | Achieve

Curriculum Structure

B.C.A.

(Revised 2024 Pattern)

School of Computer Applications

Effective from Academic Year 2024-25

PCET's Pimpri Chinchwad University
Learn | Grow | Achieve

BCA Curriculum

Preamble:

At Pimpri Chinchwad University, we present the Bachelor of Computer Application (BCA), an Undergraduate Program designed to equip students with a comprehensive understanding of Computer Science and Application. As aspiring professionals in the field of computing, we acknowledge the weight of responsibility that accompanies our education. Upholding the highest standards of integrity, professionalism, and ethical conduct is fundamental to our academic pursuits and beyond. We embrace the imperative of continuous learning and adaptability in an era marked by rapid technological advancement, pledging to proactively seek new knowledge and master emerging technologies.

The BCA program curriculum is designed to provide students with a strong foundation in computer science, programming languages, software engineering, database management systems, and computer networks. The program also includes courses on business management and soft skills to prepare students for a career in the IT industry

Overall, an BCA program aims to provide students with a well-rounded education that prepares them for a successful career in the IT industry and for further academic pursuits.

Vision and Mission of Program:

Vision:
Explore the different horizons in the field of Commerce, Management, and Computer Science Applications.

Mission:
To drive transformation, technology, and innovation through a problem-solving approach and research & development. To provide students with the IT tools to become productive and lifelong learners. To develop resources for an advanced career in Counter Applications, provide a sound academic base with practical business applications.

Program Educational Objectives:

Here are some possible Program Educational Objectives (PEOs) for a Bachelor of Computer Application (BCA) program:

1. To prepare the youth to take up positions as system analysts, system engineers, software engineers, and Programmers.
2. To aim at developing systems thinking, abstract thinking, skills to analyze and synthesize, and skills to apply knowledge through extensive problem-solving sessions, hands-on practice under various hardware/software environments and projects developed.
3. To prepare students with social interaction skills, communication skills, life skills, entrepreneurial skills, and research skills, which are necessary for career growth and for leading a quality life.

Program Outcome

Here are some possible Program Outcomes (POs) for a Bachelor of Computer Application (BCA) program:

1. **Computational Knowledge**: Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.
2. **Problem Analysis:** Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.
3. **Design / Development of Solutions:** Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies.
4. **Conduct Investigations of Complex Computing Problems:** Ability to devise and conduct experiments, interpret data and provide well informed conclusions.
5. **Modern Tool Usage:** Ability to select modern computing tools, skills and techniques necessary for innovative software solutions
6. **Professional Ethics:** Ability to apply and commit professional ethics and cyber regulations in a global economic environment.
7. **Life-long Learning:** Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.
8. **Project Management:** Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.
9. **Communication Efficacy:** Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.
10. **Societal & Environmental Concern:** Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.
11. **Individual & Team Work:** Ability to work as a member or leader in diverse teams in a multidisciplinary environment.
12. **Innovation and Entrepreneurship:** Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

Program Specific Outcomes

On successful completion of the program, the graduates of Bachelor of Computer Application (BCA) program will be able to:

PSO-1: To produce knowledgeable and skilled human resources to pursue a career with necessary skills in the area related to Computer Science and Applications.

PSO-2: To impart knowledge required for planning, designing and building Software Systems.

PSO-3: To explore emerging technologies and provide innovative solutions to real-life applications**.**

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CURRICULUM FRAMEWORK

Sr. No.	Type of course	Abbreviations
1	Major	**MAJ**
2	Elective (Minor Stream/Vocational/Program Specific)	**MIN**
3	Open Electives	**OE**
4	Ability Enhancement Courses	**AEC**
5	Skill Enhancement Courses	**SEC**
6	Vocational Skill Course	**VSC**
7	Summer Internship/ On Job Training	**OJT**
8	Project	**PROJ**
9	Field Project	**FP**
10	Indian Knowledge System	**IKS**
11	Co-Curricular	**CC**
12	Community Engagement Program	**CEP**
13	Value Education Course	**VEC**

Sr. No.	Type of course	No. of Courses	Total Credits	
			No	%
1	Major	34	81	51
2	Elective (Minor Stream/Vocational/Program Specific)	5	10	6
3	Open Electives	4	8	5
4	Ability Enhancement Courses	3	-	-
5	Skill Enhancement Courses	5	13	8
6	Vocational Skill Course	6	15	9
7	Project	2	4	3
8	Field Project	2	26	16
9	Indian Knowledge System	1	-	-
10	Value Education Course (Audit Courses)	8	3	2
Total		**70**	**160**	**100**

CREDIT DISTRIBUTION: SEMESTER WISE

Sr. No.	Type of course	No. of Credits/Semester								Total
		1	2	3	4	5	6	7	8	
1	Major	13	12	13	14	14	3	9	3	**81**
2	Elective (Minor Stream/Vocational/Program Specific)	-	2	2	2	2	2			**10**
3	Open Electives	2	2	2	2					**8**
4	Ability Enhancement Courses									**AC**
5	Skill Enhancement Courses	3	2	3	2			3		**13**
6	Vocational Skill Course	2	2			2	3	3	3	**15**
7	Summer Internship/On Job Training/Project					2		2		**4**
8	Field Project						12		14	**26**
9	Indian Knowledge System									**AC**
10	Value Education Course (Audit Courses)							3		**3**
Total		**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**160**

Course Code Nomenclature

COURSE CODE	COURSE NAME	COURSE TYPE
SEMESTER-I		
UBC101	Programming Concepts Using C Language	MAJM
UBC102	Programming Concepts Using C Language Lab	MAJM
UBC103	Web Technology	MAJM
UBC104	Web Technology Lab	MAJM
UBC105	Fundamental of Computer Architecture	SEC
UBC106	Basics of Mathematics	BSC
ACUHV101	UHV - I: Professional Ethics	AC
ACIKSET101	IKS: Concepts and Application in Science	AC
UBC108A	OPEN ELECTIVE-I: Basic of Computer Network	OE
UBC108B	OPEN ELECTIVE-I: Introduction to Cyber Security	OE
UBCM101	Introduction to IoT	MOOC
UBCM102	Introduction to Digital Electronics	MOOC
SEMESTER-II		
UBC109	Programming using Advanced C	MAJM
UBC110	Programming using Advanced C lab	MAJM
UBC111	Database Management System	MAJM
UBC112	Database Management System Lab	MAJM
UBC114	Software Engineering	VSC
UBC115	Discrete Mathematics	BSC
ACIKSET102	IKS: Concepts and Application in Science	AC
ACUHV101	UHV-I: Professional Ethics	AC
UBC116A	OE-II: Digital Marketing	OE
UBC116B	OE-II: E-Commerce	OE
UBCM103	Software Design and Architecture	MOOC
UBCM104	Introduction to Data Science	MOOC
UCEXBC101	VSC: PHP & MySQL	VSC
UCEXBC102	VSC: Project	VSC

SEMESTER-III		
UBC201	Programming with C++	MAJM
UBC202	Programming with C++ Lab.	MAJM
UBC203	Operating Systems - Linux	MAJM
UBC204	Operating Systems Lab	MAJM
UBC205A	MAJOR ELECTIVE-I: Software Engineering Using UML	MAJE
UBC205B	MAJOR ELECTIVE-I: Business Model Engineering	MAJE
UBC207	Statistical Techniques	BSC
ACUHV201	UHV-II: Understanding Harmony	AC
ACCOI201	COI: Constitution of India	AC
UBC208A	OPEN ELECTIVE-III-Introduction to Google Services	OE
UBC208B	OPEN ELECTIVE-III-Introduction to Ethical Hacking	OE
UBCM105	Introduction to Structured Query Language (SQL)	MOOC
UFL201A	Foreign Language-I: German	AEC
UFL201B	Foreign Language-I: Japanese	AEC
SEMESTER-IV		
UBC209	Advanced Internet Technologies	MAJM
UBC210	Advanced Internet Technologies Lab	MAJM
UBC211	Core Java	MAJM
UBC212	Core Java Lab	MAJM
UBC213A	MAJE-II: Software Project Management	MAJE
UBC213B	MAJE-II: Software Testing	MAJE
ACCOI201	COI: Constitution of India	AC
ACUHV201	UHV-II: Understanding Harmony	AC
UBC214A	OPEN ELECTIVE-IV-Search Engine Optimization	OE
UBC214B	OPEN ELECTIVE-IV-Introduction to WordPress	OE
UBCM107	Introduction to AI	MOOC
UBCM108	Building Web Applications in PHP	MOOC
UFL202A	Foreign Language-II: Japanese	AEC
UFL202B	Foreign Language-II: German	AEC

UDIEXBC201	VSC Advance C++ Programming	VSC
UDIEXBC202	VSC: Project	VSC

SEMESTER-V		
UBC301	Advanced Java Programming	MAJM
UBC302	Advanced Java Programming Lab	MAJM
UBC303	Python Programming	MAJM
UBC304	Python Programming Lab.	MAJM
UBC305A	Major Elective - III-Database Design and Development	MAJE
UBC305B	Major Elective - III- Business Intelligence	MAJE
UBC306	Competitive Mathematics	BSC
UBC307	Mini project Using Java / Python	PROJ
UBCM109	User Interface and User Experience (UI-UX) Design	MOOC
ACALR301	ALR: Aptitude & Logical Reasoning	AC
	Minor IV	MIN
UFL301A	Foreign Language-I: German	AEC
UFL301B	Foreign Language-I: Japanese	AEC
SEMESTER-VI(SCHEME-A)		
UBC308	Design Analysis of Algorithm	MAJM
UBCM110	Research Methodologies and Techniques	MOOC
UBCM111	Cloud Computing Security	MOOC
ACEVS301	EVS: Environmental Studies	AC
UETAD105	Minor V	MIN
UBC309	Industrial Training / Internship / Research Internship	FP
SEMESTER-VI(SCHEME-B)		
UBCM308	Design Analysis of Algorithm	MAJM(MOOC)
UBCM110	Research Methodologies and Techniques	MOOC
UBCM111	Cloud Computing Security	MOOC
ACEVS301	EVS: Environmental Studies	AC
UETAD105	Minor V	MIN
UBC309	Industrial Training / Internship / Research Internship	FP

SEMESTER-VII		
UBC401	Big Data Analytics	MAJM
UBC402	Big Data Analytics Lab	MAJM
UBC403	Mobile Computing	MAJM
UBC404	Mobile Computing Lab	MAJM
UBC405	Current trends and practices in IT	VSEC
UBC406	Data Privacy and Security	VSEC
UBCM112	Blockchain & Cryptography	MOOC
UBCM113	Multimedia Systems	MOOC
UBC407	Mini Project	PROJ
UFL401A	Foreign Language-I: German	AEC
UFL401B	Foreign Language-I: Japanese	AEC
SEMESTER-VIII		
UBCM114	DevOps	MOOC
UBCM115	Full Stack Developer	MOOC
UBC408	Major Project/ Research Project / Internship	FP

PROGRAM STRUCTURE

PIMPRI CHINCHWAD UNIVERSITY, PUNE, MAHARASHTRA
PROGRAM STRUCTURE
SCHOOL OF COMPUTER APPLICATIONS
BACHELOR OF COMPUTER APPLICATIONS (B.C.A.) REVISED 2024 PATTERN
(Effective from the Academic Year (2024 - 2025)
SEMESTER: I

COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME						ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
UBC101	MAJM	Programming Concepts Using C Language	3	-	-	3	3		40	60		100
UBC102	MAJM	Programming Concepts Using C Language Lab	-	1	-	1	2		25		25	50
UBC103	MAJM	Web Technology	3	-	-	3	3		40	60		100
UBC104	MAJM	Web Technology Lab	-	1	-	1	2		25		25	50
UBC105	SEC	Fundamental of Computer Architecture	3	-	-	3	3		40	60		100
UBC106	BSC	Basics of Mathematics	3	-	-	3	3		40	60		100
UBCM101	MOOC	Introduction to IoT	2	-	-	2	2		25	25		50
UBCM102	MOOC	Introduction to Digital Electronics	2	-	-	2	2		25	25		50
ACUHV101 / ACIKSET102	AC	UHV - I: Professional Ethics / IKS: Concepts and Application in Science	2	-	-	-	2		50			50
UBC108	OE	Open Elective – I	2	-	-	2	2		20	30		50
TOTAL			**20**	**2**	**0**	**20**	**24**		**330**	**320**	**50**	**700**
UBC108 Open Elective – I												
UBC108A	OE	Basic of Computer Network	2		-	2	2		20	30		50
UBC108B	OE	Introduction to Cyber Security	2		-	2	2		20	30		50

SEMESTER: II												
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UBC109	MAJM	Programming using Advanced C	3	-	-	3	3	40	60		100
UBC110	MAJM	Programming using Advanced C lab	-	1	-	1	2	25		25	50
UBC111	MAJM	Database Management System	3	-	-	3	3	40	60		100
UBC112	MAJM	Database Management System Lab	-	1	-	1	2	25		25	50
UBC114	VSC	Software Engineering	2	-	-	2	2	20	30		50
UBC115	BSC	Discrete Mathematics	2	-	-	2	2	20	30		50
	MIN	Minor-I	2	-	-	2	2	20	30		50
UBCM103	MOOC	Software Design and Architecture	2	-	-	2	2	25	25		50
UBCM104	MOOC	Introduction to Data Science	2	-	-	2	2	25	25		50
ACIKSBC101 / ACUHV101	AC	IKS: Concepts and Application in Science / UHV - I: Professional Ethics	2	-	-	-	2	50			50
UBC116	OE	Open Elective – II	2	-	-	2	2	20	30		50
TOTAL			**20**	**2**	**0**	**20**	**24**	**310**	**290**	**50**	**650**
UBC116 Open Elective – II											
UBC116A	OE	Digital Marketing	2	-	-	2	2	20	30		50
UBC116B	OE	E-Commerce	2	-	-	2	2	20	30		50

Exit Policy: UG Certificate in BCA: A Students who opt to exit after completion of the first year and have scored the required credits offered by the school in the program structure will be awarded a UG certificate in **BCA**, provided they must earn additional credits during the summer vacation of the first year.

COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UCEXBC101	VSC	PHP & MySQL/MOOC	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**50**	**50**
UCEXBC102	VSC	Project	**-**	**2**	**-**	**2**	**4**	**-**	**-**	**50**	**50**

PROGRAM STRUCTURE

SCHOOL OF COMPUTER APPLICATIONS

BACHELOR OF COMPUTER APPLICATIONS (B.C.A.) REVISED 2024 PATTERN

(Effective from the Academic Year (2024 - 2025)

SEMESTER III

COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME						ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
UBC201	MAJM	Programming with C++	3	-	-	3	3		40	60		100
UBC202	MAJM	Programming with C++ Lab.	-	1	-	1	2		25		25	50
UBC203	MAJM	Operating Systems – Linux	3	-	-	3	3		40	60		100
UBC204	MAJM	Operating Systems Lab	-	1	-	1	2		25		25	50
UBC205	MAJE	Major Elective - I	3	-	-	3	3		40	60		100
UBC207	BSC	Statistical Techniques	2	-	-	2	2		20	30		50
	MIN	Minor II	2	-	-	2	2		20	30		50
UBCM105	MOOC	Introduction to Structured Query Language (SQL)	3	-	-	3	3		50	50		100
ACUHV201 /ACCOI201	AC	UHV-II: Understanding Harmony / COI: Constitution of India	2	-	-	-	2		50			50
UBC208	OE	Open Elective - III	2	-	-	2	2		20	30		50
UFL201	AEC	Foreign Language - I	2	-	-	-	2		50			50
TOTAL			**22**	2	**0**	**20**	**26**		380	320	**50**	**750**
UBC205 Major Elective – I												
UBC205A	MAJE	Software Engineering Using UML	3	-	-	3	3		40	60		100
UBC205B	MAJE	Business Model Engineering	3	-	-	3	3		40	60		100
UBC208 Open Elective – III												
UBC208A	OE	Introduction to Google Services	2	-	-	2	2		20	30		50
UBC208B	OE	Introduction to Ethical Hacking	2	-	-	2	2		20	30		50
UFL201 Foreign Language – I												
UFL201A	AEC	Foreign Language – I: German	2	-	-	-	2		50			50
UFL201B	AEC	Foreign Language – I: Japanese	2	-	-	-	2		50			50

SEMESTER IV											
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UBC209	MAJM	Advanced Internet Technologies	3	-	-	3	3	40	60	-	100
UBC210	MAJM	Advanced Internet Technologies Lab	-	1	-	1	2	25	-	25	50
UBC211	MAJM	Core Java	3	-	-	3	3	40	60		100
UBC212	MAJM	Core Java Lab	-	1	-	1	2	25		25	50
UBC213	MAJE	Major Elective – II	3	-	-	3	3	40	60		100
ACCOI201 / ACUHV201	AC	COI: Constitution of India / UHV-II: Understanding Harmony	2	-	-	-	2	50	-	-	50
	MIN	Minor-III	2	-	-	2	2	20	30	-	50
UBC214	OE	Open Elective - IV	2	-	-	2	2	20	30	-	50
UFL202	AEC	Foreign Language - II	2	-	-	-	2	50		-	50
UBCM107	MOOC	Introduction to AI	2	-	-	2	2	25	25	-	50
UBCM108	MOOC	Building Web Applications in PHP	3	-	-	3	3	50	50	-	100
TOTAL			22	2	0	20	26	385	315	50	750
UBC213 Major Elective – II											
UBC213A	MAJE	Software Project Management	3	-	-	3	3	40	60		100
UBC213B	MAJE	Software Testing	3	-	-	3	3	40	60		100
UBC214 Open Elective – IV											
UBC214A	OE	Search Engine Optimization	2	-	-	2	2	20	30		50
UBC214B	OE	Introduction to WordPress	2	-	-	2	2	20	30		50
UFL202 Foreign Language – II											
UFL202A	AEC	Foreign Language – II: Japanese	2	-	-	-	2	50			50
UFL202B	AEC	Foreign Language – II German	2	-	-	-	2	50			50

Exit Policy: UG Diploma in BCA: A Students who opt to exit after completion of the second year and have scored the required credits offered by the school in the program structure will be awarded a UG certificate in **BCA**, provided they must earn additional credits during the summer vacation of the second year.

COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	Hrs.	CIA	ESA	PR/OR	TOTAL
UDIEXBC201	VSC	Advance C++ Programming /MOOC	**2**	-	-	**2**	**2**	-	-	**50**	**50**
UDIEXBC202	VSC	Project	-	**4**	-	**4**	**8**	50	-	**50**	**100**

SEMESTER V												
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME				
			TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
UBC301	MAJM	Advanced Java Programming	3	-	-	3	3		40	60		100
UBC302	MAJM	Advanced Java Programming Lab	-	1	-	1	2		25		25	50
UBC303	MAJM	Python Programming	3	-	-	3	3		40	60		100
UBC304	MAJM	Python Programming Lab.	-	1	-	1	2		25		25	50
UBC305	MAJE	Major Elective - III	3	-	-	3	3		40	60		100
UBC306	BSC	Competitive Mathematics	3	-	-	3	3		40	60		50
UBC307	PROJ	Mini project Using Java / Python	-	2	-	2	4		25		25	50
UBCM109	MOOC	User Interface and User Experience (UI-UX) Design	2	-	-	2	2		25	25	-	50
ACALR301	AC	ALR: Aptitude & Logical Reasoning	2	-	-	-	2		50	-	-	50
	MIN	Minor IV	2	-	-	2	2		20	30	-	50
UFL301	AEC	Foreign Language - III	2	-	-	-	2		50	-	-	50
TOTAL			**20**	**4**	**0**	**20**	**28**		**380**	**295**	**75**	**750**
UBC305 Major Elective – III												
UBC305A	MAJE	Database Design and Development	3	-	-	3	3		40	60	-	100
UBC305B	MAJE	Business Intelligence	3	-	-	3	3		40	60	-	100

SEMESTER VI SCHEME-A											
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME						ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
UBC308	MAJ	Design Analysis of Algorithm	2	-	-	2	2		20	30		50
UBCM110	MOOC	Research Methodologies and Techniques	2	-	-	2	2		25		25	50
UBCM111	MOOC	Cloud Computing Security	2	-	-	2	2		25		25	50
ACEVS301	AC	EVS: Environmental Studies	2	-	-	-	2		50			50
UETAD105	**MIN**	Minor V	2	-	-	2	2		20	30	-	50
UBC309	FP	Industrial Training / Internship / Research Internship	-	12	-	12	12		250		250	500
TOTAL			**10**	**12**	**0**	**20**	**22**		**390**	**60**	**300**	**750**

SEMESTER VI SCHEME-B											
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME						ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
UBC308	MAJM(MOOC)	Design Analysis of Algorithm	2	-	-	2	2		20	30		50
UBCM110	MOOC	Research Methodologies and Techniques	2	-	-	2	2		25		25	50
UBCM111	MOOC	Cloud Computing Security	2	-	-	2	2		25		25	50
ACEVS301	AC	EVS: Environmental Studies	2	-	-	-	2		50			50
UETAD105	**MIN**	Minor V	2	-	-	2	2		20	30	-	50
UBC309	FP	Industrial Training / Internship / Research Internship	-	12	-	12	12		250		250	500
TOTAL			**10**	**12**	**0**	**20**	**22**		**390**	**60**	**300**	**750**

Note:

1. Scheme A – Regular Students (student should maintain a minimum attendance of 75%)
2. Scheme B – Students with Pre-Placement Offer (students should follow the activity schedule and report accordingly).

SEMESTER VII											
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME						ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS.		CIA	ESA	PR/OR	TOTAL
UBC401	MAJ	Big Data Analytics	3	-	-	3	3		40	60	-	100
UBC402	MAJ	Big Data Analytics Lab	-	2	-	2	4		25	-	25	50
UBC403	MAJ	Mobile Computing	3	-	-	3	3		40	60	-	100
UBC404	MAJ	Mobile Computing Lab	-	2	-	2	4		25	-	25	50
UBC405	VSEC	Current trends and practices in IT	2	-	-	2	2		20	30	-	50
UBC406	VSEC	Data Privacy and Security	2	-	-	2	2		20	30	-	50
UBCM112	MOOC	Blockchain & Cryptography	-	-	-	2	-		25	25	-	50
UBCM113	MOOC	Multimedia Systems				2	-		25	25		50
UBC407	PROJ	Mini Project	-	2	-	2	4		25		25	50
UFL401	AEC	Foreign Language - IV	2	-	-	-	2		50			50
		TOTAL	**12**	**6**	**0**	**20**	**26**		**295**	**230**	**75**	**600**

SEMESTER-VIII											
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UBCM114	MOOC	DevOps	-	-	-	3	-	-	-	-	100
UBCM115	MOOC	Full Stack Developer	-	-	-	3	-	-	-	-	100
UBC408	FP	Major Project/ Research Project / Internship	-	14	-	14	28	250		250	500
TOTAL				14	0	20	28	250		250	700

BCA REVISED 2024 PATTERN COURSE DETAILS

Semester - I

COURSE CURRICULUM

Name of the Program:	**BCA**			**Semester: I**		**Level: UG**	
Course Name	**Programming Concepts Using C Language**			**Course Code/ Course Type**		UBC101/MAJM	
Course Pattern	**2024**			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	-	3	3	40	60	-
Prerequisite: Students should have basic Computer Knowledge							
Course Objectives (CO):				The objectives of Programming Concepts Using C Language are: 1. To remember the knowledge about Computer fundamentals. 2. To understand and trace the execution of programs written in C language. 3. To apply input and output operations using programs in C language. 4. To analyze the concepts and techniques in C Programming language. 5. To Design and create C code for a given problem.			
Course Learning Outcomes (CLO):				Students would be able to: - 1. Identify the basic concepts of the C programming language. 2. Explain the compilation process in C language. 3. Apply knowledge of C programming to create Code for a given problem. 4. Analyse the use of Input Output Operations. 5. Evaluate the C code for a given Problem.			

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Fundamentals of Computers & Problem Solving in C: Fundamentals of Computers, Introduction, History of Computers, Generations of Computers, Classification of Computers, Basic Anatomy of a Computer System, Input Devices, Processor Output Devices, Memory Management, Types of Software, Overview of Operating System, Programming Languages, Translator Programs-Problem Solving Techniques.	**CLO 1**	**9**
UNIT II		
Overview of C: Overview of C, History and Features of C, Structure of a C Program with Examples, Creating and Executing a C Program, Compilation process in C,C Character Set, C tokens, keywords, identifiers, constants and variables, Data types.	**CLO2**	**9**
UNIT III		
Programming Basic Concepts: Declaration and initialization of variables; Symbolic constants, Formatted I/O Functions, printf and scanf, control stings and escape sequences, output specifications with printf functions, Unformatted I/O functions to read and display single character and a string, getchar, putchar, gets and puts functions.	**CLO3**	**9**
UNIT IV		
Input and output with C: Formatted I/O functions, printf and scanf, control stings and escape sequences, output specifications with printf functions, Unformatted I/O functions to read and display single character and a string, getchar, putchar, gets and puts functions.	**CL04**	**9**
UNIT V		
C Operators, Expressions and Control Structures: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment & Decrement operators, Bitwise operators, Conditional operator, Special operators, Operator Precedence and Associativity, Evaluation of arithmetic expressions, Type conversion, Decision making Statements, Simple if, if else, nested if else, else if ladder, Switch Case, goto, break & continue statements, Looping Statements, Entry controlled and exit controlled statements, while, do while, for loops, Nested loops.	**CLO4, CLO5**	**9**
Total		**45**

Learning resources

Textbooks:

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill
2. P. K. Sinha & Priti Sinha: Computer Fundamentals.
3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)

Reference Books:

1. Henry Mullish & Hubert L.Cooper: The Sprit of C, Jaico
2. Ashok N Kamthane: Programming with ANS Iand Turbo C, Pearson
3. V. Rajaraman: Programming in C.

Online Resources/E-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs913
2. https://www.programiz.com/c-programming

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: I	Level: UG
Course Name	Programming Concepts Using C Language Lab	Course Code/ Course Type	UBS102/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical /Oral
-	2	-	1	2	25	-	25

Prerequisite: Basic Computers is required.

Course Objectives (CO):	The objectives of Programming Concepts Using C Language are: - 1. To understand the fundamentals of programming in C Language. 2. To apply solution to problems and implement them in C. 3. To analyse programming components to solve computing problems. 4. To evaluate and debug programs in C language. 5. To Design and create C Programs.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify data type for implementing programs in C language 2. Explain the modular programs involving input output operations. 3. Apply knowledge of decision making and looping constructs. 4. Analyse decision making and looping constructs. 5. Evaluate the C code for a given Problem.

Course Contents/Syllabus: Practical Plan

Activity Number	Assignment/Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1	Familiarization with the Programming Environment. Introduction to Programming, Writing of Algorithms, Introduction to Drawing flow Charts /Preparation of Flowchart/ Steps for Writing Code in C/ Turbo C	Week 1/ Turn 1/Turn 2	To understand the basic fundamentals of C Programming. **1.1** First Basic Program-Writing a Single Statement. **1.2** Writing a Program to print your Basic details Multi statements.	CLO1	4
2	Using Turbo C and Fundamentals of Programming Language	Week 2 Turn 1/Turn 2	To understand the basic fundamentals of C Programming 1.1 To perform simple Input-Output Operations. 1.2 To add two numbers.	CLO1	4
3	Assignment on use of data types, simple operators (expressions)	Week 3 Turn1/ Turn 2	To understand the basic fundamentals of C Programming. 1.1 WAP to perform simple arithmetic operations in C(Addition, Subtraction, Multiplication, Division, Modulus)	CLO1	4
4	Debugging and Single-Stepping of Programs	Week 4/ Turn 1/Turn 2	To understand the basic fundamentals of C Programming. 1.1 WAP to find the area and perimeter of the circle. 1.2 WAP to find area and perimeter of rectangle	CLO1	4
5	Formatted I/O functions – printf and scanf	Week 5/ Turn 1/Turn 2	To perform the various, I/O functions. 1.1 Given the values of three variable entered by user, write a program to	CLO2	4

			compute and display the value of x, where x=a/(b-c).		
6	Read and display single character and a string	Week 6/ Turn 1/Turn 2	To apply the operations on character and string. 1.1 Write a C program to read a single character as input 1.2 To read sentences as input from the user 1.3 Read and Display ASCII values . 1.4 Read multiple inputs from the user.	CLO2	4
7	Assignment on decision making statements (if and if else)	Week 7/ Turn 1/Turn 2	Solve the Programming problems. 1.1 To find whether a given number is positive or not. 1.2 WAP to find the greatest of two numbers. 1.3. WAP to find the greatest of three numbers using nested if/else if statements only.	CLO3	4
8	Assignment on decision making statements-nested if	Week 8/ Turn 1/Turn 2	Solve the Programming problems. 1.1 Program for analysis of people of certain age groups who are eligible for getting a suitable job if their condition and norms get satisfied using nested if statement. 1.2 Program to find which number is greater among the considered number and then how the execution happens with the help of nested if statement if the flow gets successful then it is counted as normal flow.	CLO3	4
9	Assignment on decision making statements (switch case)	Week 9/ Turn 1/Turn 2	Solve the Programming Problems. 1.1 WAP to design a simple calculate using switch case statements. 1.2 WAP to print day of a week using switch case statement	CLO3	4
10	Assignment on use of while loops	Week 10/ Turn 1/Turn 2	Debug the Programs 1.1 WAP to print counting 1 to 10 using while loop 1.2 WAP to print table of any number.	CLO4	4
11	Assignment on writing C programs in a modular way.	Week 11/ Turn 1/Turn 2	1.1 WAP to print the Fibonacci series up to 10 level. 1.2 WAP to find whether the given number is Armstrong or Not. 1.3 WAP to find whether the given number is Palindrome or Not.	CLO4	4
12	Looping related problems	Week 12/ Turn 1/Turn 2	Create the Programs 1.1 WAP to print the Fibonacci series up to 10 level. 1.2 WAP to find whether the given number is Armstrong or Not. 1.3 WAP to find whether the given number is Palindrome or Not. 1.4 WAP to find whether the given number is prime or not. 1.5 WAP to reverse the digits of a given number	CLO5	4
13	Assignment on Conditional operator, Special operators	Week 13/ Turn 1/Turn 2	Create the Programs 1.1 Find the number is positive or negative using the conditional operator. 1.2 Write a program to enter two	CLO5	4

			numbers. Make a comparison between them with the conditional operator. If the first number is greater than the second, perform a division operation otherwise multiplication operation.		
14	Assignment on Operator Precedence	Week 14/ Turn 1/Turn 2	Create the Programs 1.1 Write a program that prints the result of all the operators available in c (including pre/ post increment, bitwise and logical). 1.2 Write a program which will demonstrate all the operations done by using Operator Precedence.	CLO5	4
15	Evaluation of arithmetic expressions; Type conversion	Week 15/ Turn 1/Turn 2	Create the Programs 1.1 Converting any numeric type to any other numeric type. 1.2 Create a program to calculate the percentage of a user's score in relation to the maximum score in a game. 1.3 Use type conversion to make sure that the result of the following example is 1.5, and not just 1.	CLO5	4
Total					**60 hours**

Learning resources

Textbooks:

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill
2. P. K. Sinha & Priti Sinha: Computer Fundamentals.
3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)

Reference Books:

1. Henry Mullish & Hubert L.Cooper: The Sprit of C, Jaico
2. Ashok N Kamthane: Programming with ANS Iand Turbo C, Pearson
3. V. Rajaraman: Programming in C.

Online Resources/E-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs91https://www.programiz.com/c-programming

COURSE CURRICULUM

Name of the Program:	BCA	Semester: I	Level: UG
Course Name	Web Technology	Course Code/ Course Type	UBC103/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	3	40	60	-

Prerequisite: Basic knowledge of computers.

Course Objectives (CO):	The objectives of Web Technology are: 1. To recall different components and technologies of the World Wide Web as a platform. 2. To recognize HTML5 elements and components 3. To apply knowledge of HTML5 and CSS 4. Develop responsive web designs that adapt to various devices, and use JavaScript to enhance user interactivity and create dynamic web applications. 5. To Design and develop websites using fundamental web languages, technologies, and tools.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify basic web development methodologies 2. Understand static web-based application using suitable client-side web technologies 3. Apply Knowledge of foundational understanding of web development concepts for further study 4. Analyze and create responsive layouts that adapt to various devices and screen sizes 5. Evaluate the JavaScript, enabling dynamic content generation, effective event handling, and efficient DOM traversal techniques.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Basics of Internet and Web: Web Basics: Web Browsers, Web Servers, Three Tier Technology and its types, Static and Dynamic Web Page. Client side and Server-side Scripting. Web Protocols: details of HTTP, HTTPS, Web Hosting: Domain name, DNS, URL	**CLO 1**	**9**
UNIT II		
Dietary Assessment tools: Introduction, Document metadata, Basic structure of HTML, Sections, Grouping content, Text-level semantics, Embedded content, Tabular data, Forms, Interactive elements List, Links, Images, Frames	**CLO 2**	**9**
UNIT III		
Page Designing with CSS: Introduction to designing approaches, Table-based designs Table-less designs, Cascading Style Sheet and its properties, Introduction CSS vs CSS3, CSS properties — Text and Fonts, Colors and Backgrounds, The Box Model (dimensions, padding, margin and border) Positioning and Display, Lists, Tables, Media, Converting Image design to HTML (Slicing)	**CLO3**	**9**
UNIT IV		
DHTML: Dynamic HTML, Features of DHTML, Document Object Model, CSSP (Cascading Style Sheet Positioning),JSSS (JavaScript assisted Style Sheet),Layers of Netscape, The ID Attribute, HTML Events.	**CLO4**	**9**
UNIT V		

Java Script: Objects, Methods, Events and Functions, Tags Operators, Data Types, Literals and Type Casting in JavaScript Programming Construct, Array and Dialog Boxes, Relating JavaScript to DHTML, Dynamically Changing Text, Style, Content.	**CLO5**	**9**
Total		**45 hrs.**

Learning resources

Textbooks:

1. Learn HTML for Beginners: The Illustrated Guide to Coding Paperback, Jo Foster
2. HTML: A Beginner's Guide, Fifth Edition: A Beginner's Guide, Fifth Edition: CourseLoad e-book for HTML A BEGINNERS GD 5E, Wendy Willard.

Reference Books:

1. JavaScript for Absolute Beginners (Expert's Voice in Web Development) Paperback, by Terry McNavage (Author)
2. Learn JavaScript Quickly: A Complete Beginner's Guide to Learning JavaScript, Even If You're New to Programming by Code Quickly.

Online Resources/E-Learning Resources

1. https://www.w3schools.com/html/
2. https://www.tutorialspoint.com/html5/index.htmhttps://javascript.info/

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: I	Level: UG
Course Name	Web Technology Lab	Course Code/ Course Type	UBC104/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	2	-	1	2	25	-	25

Prerequisite: Basic Knowledge of Computers are required.

Course Objectives (CO):	The objectives of Web Programming are: 1. To recall different components and technologies of the World Wide Web as a platform. 2. To recognize HTML5 elements and components 3. To apply knowledge of HTML5 and CSS 4. Develop responsive web designs that adapt to various devices, and use JavaScript to enhance user interactivity and create dynamic web applications. 5. To Design and develop websites using fundamental web languages, technologies, and tools.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify basic web development methodologies. 2. Comprehend static web-based application using suitable client-side web technologies 3. Apply knowledge of foundational understanding of web development concepts for further study. 4. Analyze and create responsive layouts that adapt to various devices and screen sizes. 5. Evaluate the JavaScript, enabling dynamic content generation, effective event handling, and efficient DOM traversal techniques.

Course Contents/Syllabus: Practical Plan

Activity Number	Assignment/Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1	Write a HTML program for the demonstration of Lists.	Week 1/ Turn 1 and 2	a. Unordered List b. Ordered List c. Definition List d. Nested List	CLO1	4
2	Write a HTML program for demonstrating Hyperlinks.	Week 2/ Turn 1 and 2	a. Navigation from one page to another. b. Navigation within the page.	CLO1	4
3	Assignment on HTML5 Table Element	Week 3/ Turn 1 and 2	Write a HTML program for time-table using tables.	CLO1	4
4	Create Home Page using HTML5	Week 4/ Turn 1 and 2	Write a HTML program to develop a static Home Page using frames.	CLO1	4
5	Create Registration Page using HTML5	Week 5/ Turn 1 and 2	Write a HTML program to develop a static Registration Form.	CLO2	4
6	Create Login Page using HTML5	Week 6/ Turn 1 and 2	Write a HTML program to develop a static Login Page.	CLO2	4
7	Create Product catalog.	Week 7/ Turn 1 and 2	Write a HTML program to develop a static Web Page for Catalog.	CLO3	4
8	Create CSS	Week 8/ Turn 1 and 2	Write HTML for demonstration of cascading style sheets. a. Embedded stylesheets.	CLO3	4

			b. External stylesheets. c. Inline styles.		
9	Create Login page using Javascript Validation	Week 9/ Turn 1 and 2	Write a javascript program to validate the USER LOGIN page.	CLO3	4
10	Create Registration page using Javascript Validation	Week 10/ Turn 1 and 2	Write a javascript program for validating REGISTRATION FORM	CLO4	4
11	Event Handling	Week 11/ Turn 1 and 2	Background Color Change	CLO4	4
12	Event Handling	Week 12/ Turn 1 and 2	calendar for the month and year by combo box [APL]	CLO5	4
13	Event Handling	Week 13/ Turn 1 and 2	OnMouseover event	CLO5	4
14	Event Handling	Week 14/ Turn 1 and 2	OnMouseover using objects	CLO5	4
15	Application	Week 15/ Turn 1 and 2	Online Exam [APL]	CLO5	4
Total					**60 Hrs**

Learning resources

Textbooks:

1. Learn HTML for Beginners: The Illustrated Guide to Coding Paperback, Jo Foster
2. HTML: A Beginner's Guide, Fifth Edition: A Beginner's Guide, Fifth Edition: CourseLoad ebook for HTML A BEGINNERS GD 5E, Wendy Willard.

Reference Books:

1. JavaScript for Absolute Beginners (Expert's Voice in Web Development) Paperback, by Terry McNavage (Author)
2. Learn JavaScript Quickly: A Complete Beginner's Guide to Learning JavaScript, Even If You're New to Programming by Code Quickly.

Online Resources/E-Learning Resources

1. https://www.w3schools.com/html/
2. https://www.tutorialspoint.com/html5/index.htm
3. https://javascript.info/

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: I	Level: UG
Course Name	Fundamentals of Computer Architecture	Course Code/ Course Type	UBC105/SEC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	

Prerequisite: Basic Knowledge of Computers.

Course Objectives (CO):	The objectives of Introduction to Cyber Security are: 1. To remember network basics and familiarize on the security of network protocols. 2. To understand the field of digital security and concepts of access control mechanisms. 3. To apply keywords and jargons involved in securing browsers. 4. To examine the need of cyber-attacks and data privacy. 5. To analyze the significance of security methods in the cyber domain.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify the digital security measures taken to protect device from threats 2. Explain the access control mechanism and understand how to protect servers. 3. Explain the importance of network basics and security of network protocols. 4. Analyze the cyber-attacks, learn data privacy issues and preventive measures. 5. Discuss the various attacks in the web interface.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Basic Structure of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development, Machine Instruction and Programs, Instruction and Instruction Sequencing, Register Transfer Notation, Assembly Language Notation, Basic Instruction Types.	**CLO1**	**9**
UNIT II		
Addressing Modes: Basic Input/output Operations, The role of Stacks and Queues in computer programming equation, Component of Instructions, Logic Instructions, shift and Rotate Instructions, Type of Instructions, Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations.	**CLO2**	**9**
UNIT III		
Digital Security: Basics of digital security, protecting personal computers and devices, protecting devices from Virus and Malware, Identity, Authentication and Authorization, need for strong credentials, keeping credentials secure, protecting servers using physical and logical security, World Wide Web (www), the Internet and the HTTP protocol, security of browser to web server interaction.	**CLO3**	**9**
UNIT IV		
Cyber Attacks: Introduction to cyber-attacks, application security(design, development and testing),operations security, monitoring, identifying threats and remediating them, Principles of data security, Confidentiality, Integrity and Availability, Data Privacy, Data breaches, preventing attacks and breaches with security controls, Compliance standards, Computer Ethics.	**CLO4**	**9**
UNIT V		

Cybercrime and Cyber law: Classification of cybercrimes, Common cybercrimes, cybercrime targeting computers and mobiles, cybercrime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi,Reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offenses, Organizations dealing with Cybercrime and Cyber security in India, Case studies.	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Cybersecurity For Dummies by Joseph Steinberg
2. Big Breaches: Cybersecurity Lessons for Everyone by Neil Daswani, Moudy Elbayadi

Reference Books:

1. Cybersecurity: The Beginner's Guide by Dr. Erdal Ozkaya
2. Confident Cybersecurity: How to Get Started in Cybersecurity and Futureproof Your Career by Dr. Jessica Barker

Online Resources/E-Learning Resources

1. The Complete Cyber Security Course: Hackers Exposed --- https://www.udemy.com/course
2. Foundations of Cybersecurity----- https://www.coursera.org/

COURSE CURRICULUM

Name of the Program:	BCA			Semester: I		Level: UG	
Course Name	Basic Mathematics			Course Code/ Course Type		UBS106/BSC	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	3	40	60	-
Prerequisite: Basics of Mathematics							
Course Objectives (CO):	The objectives of Basic Mathematics are: 1. To memorize the Matrices and its operations. 2. Classify the trigonometric functions. 3. To execute various operations on analytical geometry. 4. To compare the various forms of differential calculus. 5. To evaluate the different forms of calculus.						
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify the matrices and the operations associated with it. 2. Explain the various trigonometric functions. 3. Apply knowledge of geometry to various real-life situations. 4. To examine the differential calculus with respect to different forms. 5. To execute gamma functions and its properties.						

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Matrices: Matrices, Types of matrices, Elementary properties of matrices, inverse matrices, Rank of a matrix, Symmetric, Skew symmetric and Orthogonal matrices, system of linear equations, Gauss elimination method and Gauss Jordan method.	**CLO 1**	**9**
UNIT II		
Trigonometry: Introduction, Trigonometric ratios, Transformations, Identities, Inverse trigonometric functions (only elementary topics)	**CLO 2**	**9**
UNIT III		
Analytical Geometry: Scalar product, vector product, angle between two vectors, shortest distance between two lines, conditions for two lines to intersect, point of intersection, collinearity of three points (self- study topics),Direction ratios, direction cosines of a line passing through two points, equation of a line in space, angle between two lines, shortest distance between two lines, plane, equation of a plane in normal form.	**CLO3**	**9**
UNIT IV		
Differential Calculus: Limit continuity, differentiability, Roll's Theorem, Mean value theorems (Cauchy's and Lagrange's), Power series, expansions of functions in Taylor's and Maclaurin's forms, indeterminate forms and L Hospital's rule.	**CLO4**	**9**
UNIT V		
Integral Calculus: Integral as limit of sum, Fundamental theorem of calculus, indefinite integrals, Methods of Integration, Substitution method, Integration by parts and by partial fraction technique, Beta Gamma functions and their properties.	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Hugh Neill, Trigonometry: A complete Introduction, John Murray Learning, 2018.
2. George B. Thomas and Ross L. Finney, Calculus and Analytical Geometry, Addison- Wesley, 9th Edn, 1998.

Reference Books:

1. Erwin Krayzie, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2010.

Online Resources/E-Learning Resources

1. https://bs-ug.iisc.ac.in/UG-Math.pdf
2. https://mathinova.com/

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COUSE CURRICULUM

Name of the Program:	BCA	Semester: I	Level: UG
Course Name	UHV-I: Professional Ethics	Course Code/ Course Type	ACUHV101/AC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	0	0	0	2	50	-	-

Pre-Requisite: UHV-I

Course Objectives (CO):	The objectives of Universal Human Value- Professional Ethics are: 1. To make the students understand the importance of ethical behaviour. 2. To expose the students to the ethical practices to be followed in profession. 3. To sensitize the students to become responsible persons who will uphold ethics in profession when they pursue their career. 4. To make students understand Psychological and Philosophical approaches. 5. To make students understand social responsibility and corporate Sustainability.
Course Learning Outcomes (CLO):	Students would be able to: 1. Equip themselves with an understanding of moral, professional and personal values. 2. Understand the need of ethics in shaping their profession The learners will hone their decision-making skills. 3. Refine their business ethics based on psychological and philosophical perspective. 4. Assess the need for a balance between ecology, and economy. 5. Equip themselves with a better understanding of themselves and the society they live in and the responsibilities they shoulder in creating a sustainable world.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Individual and Professional Ethics: Introduction to Professional Ethics, Morals, Values and Ethics – Personal and Professional- Sensé of Professional Ethics – Code of Ethics by NSPE-Making decisions with ethical dimensions–definition–roadmap to ethical decision making–common standards– internal obstacles – bias – empathy.	**CLO 1**	**5**
UNIT II		
Business Ethics: Philosophical approaches to Business Ethics – ethical reasoning – ethical issues in business - Social Responsibility of Business- conflict of interest–cultural relativism-Ethical Leadership-Resisting un-ethical authority and domination-Global Business Ethics	**CLO 2**	**5**
UNIT III		
Psychological Approaches: Ethical Theories-Psychological and Philosophical Approaches-Myths about Morality-conflict of interest in psychological perspective - Courage-Integrity – ethical dilemma – Emotional Intelligence (Mahabharata- Iskcon Publications)	**CLO 3**	**5**
UNIT IV		
Workplace Ethics: Ethics in changing domains of Research–academic integrity–intellectual honesty-Role of Engineers and Managers-Ethical issues in Diverse workplace – competition – free will- Confidentiality – employee rights – Intellectual property rights – discrimination	**CLO 4**	**5**

UNIT V		
Safety, Responsibilities and Rights: Ecology, and Economy-Risk benefit analysis and reducing risk SDGs–Corporate social responsibility and Corporate Sustainability - CSR in India - Sustainability Case Studies.	**CLO 5**	**5**
Total Hours		**30**

Learning resources

Textbooks:

1. Subramanian. R. Professional Ethics, Oxford Publication,2013.
2. Nagarasan. R. S. Professional Ethics and Human Values. New Age International Publications, 2006.

Reference Book:

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014

Online Resources/E-Learning Resources

1. https://www.nspe.org/resources/ethics/code-ethics
2. https://www.toolshero.com/tag/ethical-decision-making/
3. https://pagecentertraining.psu.edu/public-relations-ethics/introduction-to-public-relations ethics/lesson-1/ethical-theories
4. https://peer.asee.org/case-studies-in-engineering-ethics.pdf

CIA Guidelines

Online Quiz (Based on MCQ) 20 marks
Activity (with short Report Submission) - 20 Marks
Academic Sincerity - 10 marks
Few of the suggested activities are Assignments, Debates, Poster presentations, Model making, Group Presentation, Field visits and Group Discussions.
Few of suggested topics related to UHV1- Professional Ethics are:

Debate Topics

1. Ethical Approach versus Realistic Approach
2. Individual and Social Approach
3. Dilemma between heart and Mind

Activity

1. Analyze the wastage (Electricity or any other) at work place? How you managed.

Assignment

1. Analyze the code of ethics at work place.
2. If you fulfil the duties, rights will automatically fall in place. Justify the statement

References:

1. https://uhv.org.in/
2. https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf

COURSE CURRICULUM

Name of the Program:	BCA	Semester: I	Level: UG
Course Name	Concepts and Application in Science	Course Code/ Course Type	ACIKSET101
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	50	-	-

Prerequisite: None

Course Objectives (CO):	The objectives of Concepts and Application in Science are: 1. To remember Indian Knowledge Systems: Origin, Evolution and Ontological Approach 2. To understand Indian Knowledge Approaches. 3. To apply Sciences of Life and Mind. 4. To examine Indian Knowledge System Torchbearers – Ancient and Modern 5. To analyze Self-Knowledge for Personal Effectiveness.
Course Learning Outcomes (CLO):	Students would be able: - 1. Identify and appreciate the rich heritage that resides in our traditions. 2. Explain the mind/voice dynamic in Indian knowledge systems. 3. Explain the practices that will prepare one for the inner-journey to discover the Self. 4. Analyze the need and importance of Sanskrit in getting to the roots of the philosophical concepts. 5. Analyze the various functions in Indian knowledge systems.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Indian Knowledge System and Vedic Corpus: Introduction to IKS, Need for IKS, Historicity of IKS,Salient aspects of IKS,IKS in ancient India and in modern India. Introduction to Vedas, Four Vedas, Sub-classification of Vedas, Messages in Vedas, Basics of Nirukta and Chandas.	**CLO1**	**6**
UNIT II		
Wisdom through the Ages: Puranas, Ithihasas, Nitishastras, Subhasitas, Linguistics, Components of a language, Panini's work on Sanskrit grammar, Phonetics in Sanskrit, Role of Sanskrit in natural language processing, Framework for establishing valid knowledge.	**CLO2**	**6**
UNIT III		
Number Systems and Units of Measurement: Salient features of the Indian numeral system, Importance of decimal representation, The discovery of zero and its importance, Unique approaches to represent numbers, Unique aspects of Indian Mathematics, Great mathematicians and their significant contributions in the area of arithmetic, algebra, geometry, trigonometry, combinatorial problems in Chandaḥ-sastra of Pingala.	**CLO3**	**6**
UNIT IV		
Knowledge Framework and classifications: Indian scheme of knowledge, The knowledge triangle,Prameya, A vaiśeṣikan approach to physical reality, Dravyas, The constituents of the physical reality	**CLO4**	**6**
UNIT V		
Science and Technology in the Vedic Age and Post-Vedic Records. **Knowledge:** Framework and Classification, Astronomy Encryption Method used in ancient India, Introduction to Yantra Shastra, Vaimanik Shashtra, Agriculture Technologies	**CLO5**	**6**
Total hours		**30**

Learning resources

Activity 1: Comparative Analysis of Traditional and Modern Scientific Methods
Activity 2: Presentation on Indian scientific texts such as the Phonetics in Sanskrit, Astronomy Encryption Method used in ancient India

Learning resources

Textbooks:

1. Health Science: Concepts and Applications, Authors: Jacquelyn Rhine Marshall and Sue C. Roe
2. Introduction to Indian Knowledge Systems: Concepts and Applications by Prof. B Mahadevan

Reference Books:

1. Introduction to Indian Knowledge System: Concepts and Applications by Pallavi Ghosh

Online Resources/E-Learning Resources

2. https://onlinecourses.swayam2.ac.in/

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COURSE CURRICULUM

Name of the Program:		**BCA**		**Semester: I**		**Level: UG**	
Course Name		**Basic of Computer Network**		**Course Code/ Course Type**		UBC108A/OE	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hrs.**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
2	-	-	2	2	20	30	-
Prerequisite: Basic Knowledge of Computer Networks.							
Course Objectives (CO):		The objectives of Introduction to IoT are: 1. To understand various computer networks and technologies behind networks. 2. To study TCP/IP protocol suite, IP addressing schemes and link layer communication 3. To study routing concept along with Routing protocols. 4. To study application layer protocols 5. To understand basics of cryptography and socket programming.					
Course Learning Outcomes (CLO):		Students would be able to: 1. Understand the basic concepts of Computer Network, and principle of layering. 2. Apply the error detection and correction techniques used in data transmission. 3. Apply IP addressing schemes and sub netting. 4. Understand the concept of routing protocols, Application layer protocols and Network Security. 5. Apply the socket programming basics to create a simple chat application.					

Course Contents/Syllabus:

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Introduction to Data Communication and Computer Networks Internet basics and network components. [Transmission Media-Guided, Unguided, Network Devices] Various types of Networks (only overview) Connection Oriented N/Ws Vs Connectionless N/Ws, Ethernet- Ethernet standards ZigBee, WiFi, Access Technique -CSMA-CD, Negotiation technique Overview, Wireless Network, Unified Communication	**CLO1**	**6**
UNIT II		
Principle of Layering concept: Need for layering, ISO-OSI 7 Layer Model, TCP/IP model, OSI Model vs TCP/IP mode, Data Encapsulation	**CLO2**	**6**
UNIT III		
Link Layer Communication: Error detection and correction techniques, Framing and its types, Flow and error control, HDLC protocol, P2P Protocol	**CLO3**	**6**
UNIT IV		
IP Addressing: Internet Protocol and IPv4 Packet format, Addressing, Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses, IP Address- Network Part and Host Part, Network Masks, Network Addresses and, Broadcast Addresses, Loop Back Address, TCP and UDP Connections, TCP Performance in wireless network	**CLO4**	**6**
UNIT V		
Application Layer Protocols: DHCP – DHCP Client, DHCP server, DHCP scope, DNS – Resolution process, Resource Records, DNS protocol structure, HTTP – WWW architecture, HTTP: Request and Response Message, Email protocols – SMTP, POP3, IMAP4 & MIME, FTP, Telnet	**CLO5**	**6**
Total		**30 hrs.**

Learning resources

Textbooks:

1. Data and Computer Communication 8th Edition – William Stallings
2. Internetworking Technology Handbook CISCO System

Reference Books:

1. Data Communication and Networking Behroz A.Forouzan, TMH, 4th Edition
2. Computer Networks and Internets with Internet Applications Douglas Comer

Online Resources/E-Learning Resources

1. https://docs.oracle.com.javase/tutorial/networkingindex.html
2. https://docs.oracle.com/javase/tutorial/networking/overview/networking.html

COURSE CURRICULUM

Name of the Program:	BCA	Semester: I	Level: UG
Course Name	Introduction to Cyber Security	Course Code/ Course Type	UBC108B/OE
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	

Prerequisite: Basic Knowledge of Computers & Electronics

Course Objectives (CO):	The objectives of Introduction to Cyber Security are: 1. To remember network basics and familiarize on the security of network protocols. 2. To understand the field of digital security and concepts of access control mechanisms. 3. To apply keywords and jargons involved in securing browsers. 4. To examine the need of cyber-attacks and data privacy. 5. To analyze the significance of security methods in the cyber domain.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify the digital security measures taken to protect device from threats 2. Explain the access control mechanism and understand how to protect servers. 3. Explain the importance of network basics and security of network protocols. 4. Analyze the cyber-attacks, learn data privacy issues and preventive measures. 5. Analyze the various attacks in the web interface.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Cyber security: 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 Cyber Security, Issues and challenges of cyber security.	**CLO1**	**6**
UNIT II		
Networking: Networking basics (home network and large-scale business networks), Networking protocols, Security of protocols, Sample application hosted on-premises.	**CLO2**	**6**
UNIT III		
Digital Security: Basics of Digital security, Protecting personal computers and devices, Protecting devices from Virus and Malware, Identity, Authentication and Authorization, Need for strong credentials, Keeping credentials secure, Protecting servers using physical and logical security, World Wide Web (www),The Internet and the HTTP protocol, Security of browser to web server interaction.	**CLO3**	**6**
UNIT IV		
Cyber Attacks: Introduction, Application security(design, development and testing),Operations Security, Monitoring, identifying threats and remediating them, Principles of data security, Confidentiality, Integrity and Availability, Data Privacy, Data breaches, Preventing attacks and breaches with security Controls, Compliance standards, Computer Ethics.	**CLO4**	**6**
UNIT V		
Cybercrime and Cyber law: Classification of cybercrimes, Common cybercrimes cybercrime targeting computers and mobiles, Cybercrime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks,	**CLO5**	**6**

Cybercriminals modus operandi, Reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offenses, Organizations dealing with Cybercrime and Cyber security in India, Case studies.		
Total hours		**30 hrs.**

Learning resources

Textbooks:

1. Cybersecurity For Dummies by Joseph Steinberg
2. Big Breaches: Cybersecurity Lessons for Everyone by Neil Daswani, Moudy Elbayadi

Reference Books:

1. Cybersecurity: The Beginner's Guide by Dr. Erdal Ozkaya
2. Confident Cybersecurity: How to Get Started in Cybersecurity and Futureproof Your Career by Dr. Jessica Barker

Online Resources/E-Learning Resources

1. The Complete Cyber Security Course: Hackers Exposed --- https://www.udemy.com/course
2. Foundations of Cybersecurity----- https://www.coursera.org/

BCA REVISED 2024 PATTERN COURSE DETAILS Semester - II

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: II	Level: UG
Course Name	Programming using Advanced C	Course Code/ Course Type	UBC109/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Prerequisite: Students should have basic C Programming.

Course Objectives (CO):	The objectives of Programming using Advanced C are: 1. To remember the knowledge about Functions and its types. 2. To understand and trace the execution of pointers in C language. 3. To apply preprocessor operations using programs in C language. 4. To analyze the concepts and techniques associated with structures in C Programming language. 5. To Design and create file handling operations.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify the basic concepts of functions. 2. Explain the reason why pointers are available in C language. 3. Apply knowledge of preprocessor directives to create Code for a given problem. 4. Analyze the use of structures. 5. Evaluate the various file handling operations.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
User-Defined Functions: User-Defined Functions, Need and Elements of User-Defined Functions, Return Values and their types, Function Calls, Category of Functions, Nesting of Functions, Recursion, Passing Arrays and Strings to Functions, The Scope, Visibility and Lifetime of Variables.	**CLO1**	**9**
UNIT II		
Pointers & File Management: Introduction, Understanding pointers, Accessing the address of a variable, Declaration and Initialization of pointer Variable, Accessing a variable through its pointer Chain of pointers, Pointer Expressions, Pointer Increments and Scale factor, Pointers and Arrays, Pointers and Strings.	**CLO2**	**9**
UNIT III		
Preprocessor: Concept, Format of preprocessor directives, File inclusion directives (#include), Macro substitution directives (#define), nested macros, parameterized macros, Macros versus functions, #error / #pragma #directives,Conditional compilation (#if/#ifdef/#else/#elif/#endif), Predefined macros (_DATE_ / _TIME_ /_FILE_ /_LINE_/ _STDC_)	**CLO3**	**9**
UNIT IV		
Structures: Concept, Declaration,Definition,initialization,Accessing structure members(.Operator),Array of structures, Pointers to structures, Declaring pointer to structure, Accessing structure members via pointer to structure, Structures & functions, Passing each member of structure as a separate argument, Passing structure by value/address, Nested structures, typedef & structures	**CLO4**	**9**
UNIT V		
File Handling: Concept of streams, need, Types of files, Operations on text & binary files, Random access file, library functions for file handling – fopen, fclose, fgetc, fseek, fgets, fputc etc	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill
2. P. K. Sinha & Priti Sinha: Computer Fundamentals.
3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)

Reference Books:

1. Henry Mullish & Hubert L.Cooper: The Sprit of C, Jaico
2. Ashok N Kamthane: Programming with ANS Iand Turbo C, Pearson
3. V. Rajaraman: Programming in C.

Online Resources/E-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs91/
2. https://www.gnu.org/software/gnu-c-manual/gnu-c-manual.pdf

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: II	Level: UG
Course Name	Programming using Advanced C Lab	Course Code/ Course Type	UBC110/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme

Assessment Scheme

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25

Prerequisite: Basic Knowledge of C Programming is required.

Course Objectives (CO):	The objectives of Programming using Advanced C 1. Define the fundamentals of programming in C Language. 2. Illustrate the use of Functions, recursion and Arrays. 3. Classify the different operations on Strings, Arrays. 4. Analyze the use of Pointers in various scenarios. 5. Evaluate the significance of Structures and File Handling.
Course Learning Outcomes (CLO):	Students would be able to: 1. Define the implementation of programs in C language. 2. Explain the different types of programs based on functions, recursion and arrays. 3. Apply knowledge of Arrays, Strings for data manipulation. 4. Analyze the concept of pointers for implementing programs. 5. Design the use of structures for displaying elements.

Course Contents/Syllabus: Practical Plan

Activity Number	Assignment/Practical /Activity Title	Week Number/Turn	Details	CLO	Hours
1	Familiarization with the C Programming Environment.	Week 1/ Turn 1 and 2	1. Finding maximum and minimum of a given set of numbers. 2. Finding roots of quadratic equation.	CLO1	4
2	Assignment on Functions	Week 2/ Turn 1 and 2	1. Check Prime or Armstrong Number Using User-defined Function. 2. Factorial of a Number Using Recursion	CLO1	4
3	Programs Based on Function Call by value,	Week 3/ Turn 1 and 2	1. Swapping numbers using Function Call by Value.	CLO1, CLO2	4
4	Recursion	Week 4/ Turn 1 and 2	1. Recursion: factorial, Fibonacci, GCD	CLO1, CLO2	4
5	Arrays	Week 5/ Turn 1 and 2	1. Calculate Average 2. Access elements out of its bound	CLO2	4
6	Arrays	Week 6/ Turn 1 and 2	1. Matrix addition and multiplication using arrays	CLO2, CLO3	4
7	Strings	Week 7/ Turn 1 and 2	1. Functions for string manipulations	CLO3	4
8	Structures and unions	Week 8/ Turn 1 and 2	1. Programs on structures and unions.	CLO3	4
9	Preprocessor directives	Week 9/ Turn 1 and 2	1. Using #define preprocessor 2. Using #if, #elif and #else Directive	CLO3	4
10	Pointers	Week 10/	1. Swapping two variables	CLO4	4

		Turn 1 and 2	2. Compare strings using pointer 3. Find largest element in array		
11	Pointers	Week 11/ Turn 1 and 2	1. Program to swap two numbers using pointers. 2. Program to change the value of constant integer using pointers.	CLO4, CLO5	4
12	Structures	Week 12/ Turn 1 and 2	1. Create structure & display elements. 2. Program to Add Two Distances (in inch-feet system) using Structures.	CLO5	4
13	Structures	Week 13/ Turn 1 and 2	1. Menu driven program for employee structure. 2. Program to Store Information of a Student Using Structure.	CLO5	4
14	File Handling	Week 14/ Turn 1 and 2	1. Reading and writing to a text file. 2. size of data to be written in the disk	CLO5	4
15	File Handling(Getting data using fseek())	Week 15/ Turn 1 and 2	1. Move the file pointer to different locations inside a file.	CLO5	4

Learning resources

Textbooks:

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill
2. P. K. Sinha & Priti Sinha: Computer Fundamentals.
3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)

Reference Books:

1. Henry Mullish & Hubert L.Cooper: The Sprit of C, Jaico
2. Ashok N Kamthane: Programming with ANS Iand Turbo C, Pearson
3. V. Rajaraman: Programming in C.

Online Resources/E-Learning Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs913
2. https://www.programiz.com/c-programming

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: II	Level: UG
Course Name	Database Management System	Course Code/ Course Type	UBC111/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	

Prerequisite: Students should have a basic concept of set theory.

Course Objectives (CO):	The objectives of Database Management System are: 1. To remember the basic concepts of database management systems. 2. To understand and relational databases, relational algebra and its various operations. 3. To apply normalization techniques to normalize the database 4. To analyze the concepts of transaction management. 5. To Design Concurrency Control mechanism for effective transactions.
Course Learning Outcomes (CLO):	Students would be able to 1. Identify the basic concepts of database management systems. 2. Explain the use of relational databases and relational algebra. 3. Apply knowledge of normalization to design an effective database. 4. Analyze the use of transactions. 5. Evaluate the various Concurrency Control mechanisms.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
Unit 1		
Introduction to Database Management System: Overview of Concepts and Conceptual Database Design, Database Administrator and Database Users, Characteristics of the Database, Database Systems, Concepts and Architecture, Data Models, Schemes & Instances, DBMS Architecture & Data Independence, Database Languages & Interfaces, Overview of Hierarchical, Network & Relational Database Management Systems, Data Modeling using Entity-Relationship Model, Strong and Weak Entity Sets, Generalization, Specialization, and Aggregation	**CLO1**	**9**
Unit 2		
Introduction to Relational Model & ER Model: Relational Model, Languages & Systems: Relational Model Concepts, Relational Model Constraints, Translating your ER Model into Relational Model, Relational Algebra, SQL,A Relational Database Language, Data Definition in SQL, View and Queries in SQL, Specifying Constraints and Indexes in SQL, Practicing SQL commands. ***Cases based on ER Model should be covered**	**CLO2**	**9**
Unit 3		
Normalization: Relational Database Design: Functional Dependencies & Normalization for Relational Databases, Functional Dependencies, Normal Forms (1NF, 2NF, 3NF), Lossless Join and Dependency Preserving Decomposition, Multivalued Dependency, Join dependency. ***Cases based on Normalization.**	**CLO3**	**9**
Unit 4		
Transaction Management: Transaction Management: Transaction Concept and its States, ACID properties, Implementation of Atomicity and Durability, Serial ability, Recoverability, Schedules, Implementation of Isolation.	**CLO4**	**9**
Unit 5		
Concurrency Control: Concurrency Control, 2PL, Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols. Examples Based on Concurrency Control and Lock based Protocols.	**CLO5**	**9**

Total		**45 Hrs**

Books and References:

Text Books

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition. (Part of UNIT-I, UNIT-II, UNIT-III, UNIT-V)
2. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGraw Hill Education (India) Private Limited l, 6th edition. (Part of UNIT-I, UNIT-IV)

Reference Books

1) Database systems, 6th edition, Ramez Elmasri, Shamkant B.Navathe, Pearson Education.
2) Database Systems Design, Implementation, and Management, Peter Rob & Carlos Coronel, 7th Ed.
3) Fundamentals of Database Systems, ElmasriNavrate, Pearson Education

NPTEL Web Course:

1. https://onlinecourses.nptel.ac.in/noc18_cs15/preview
2. http://nptel.ac.in/courses/106106093/
3. http://nptel.ac.in/courses/106106095/

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: II	Level: UG
Course Name	Database Management System Lab	Course Code/ Course Type	UBC112/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme / **Assessment Scheme**

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25

Prerequisite: Basic Knowledge of set theory is required.

Course Objectives (CO):	The objectives of Database Management System Lab 1. Describe the fundamentals and Components of SQL. 2. Illustrate the use of Select Statement, Operator and its operations. 3. Classify the different types of Logical Conditions with suitable examples. 4. Analyze the use of Functions and their operations. 5. Evaluate the significance of Joins, their types and subqueries.
Course Learning Outcomes (CLO):	Students would be able to: 1. Define the implementation of basic Components of SQL. 2. Explain the different types of operators and their variants. 3. Apply knowledge of Rules of Precedence to Perform operations in SQL. 4. Analyze the various forms of Joins. 5. Make use of Various Constraints and Locks on the database.

Course Contents/Syllabus: Practical Plan

Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Familiarization with SQL.	Week 1/ Turn 1 and 2	Components of SQL with Examples and Syntax.DDL	CLO1	4
2	DML	Week 2/ Turn 1 and 2	Data Manipulation Language (DML) Commands	CLO1	4
3	DCL	Week 3/ Turn 1 and 2	DCL Commands	CLO1	4
4	Select Statements	Week 4/ Turn 1 and 2	Basic Select Statements Arithmetic Expressions	CLO2	4
5	Operator And its Operations	Week 5/ Turn 1 and 2	Operations based on Operator Precedence. Concatenation Operator Literal Character Strings	CLO2	4
6	Limiting the Rows Selected	Week 6/ Turn 1 and 2	Using the WHERE Clause Character Strings and Dates Comparison Conditions	CLO2, CLO3	4
7	Wild Card Characters	Week 7/ Turn 1 and 2	Using the LIKE Condition Using the NULL Conditions	CLO3	4

8	Logical Conditions	Week 8/ Turn 1 and 2	AND OR NOT	CLO3	4
9	Rules of Precedence Functions	Week 9/ Turn 1 and 2	Examples based on Rules of Precedence.	CLO3	4
10	Functions	Week 10/ Turn 1 and 2	Single Row Functions and its types Multiple Row Functions.	CLO4	4
11	Functions	Week 11/ Turn 1 and 2	Arithmetic Operations on Date Functions Conversion Functions	CLO4, CLO5	4
12	Functions Displaying Data from Multiple Tables	Week 12/ Turn 1 and 2	General Functions Joins and itsTypes	CLO5	4
13	Types of Joins	Week 13/ Turn 1 and 2	Joining Tables Using Oracle Syntax Joining Tables Using SQL: 1999 Syntax Retrieving Records with Natural Joins	CLO5	4
14	Aggregate Functions Subqueries	Week 14/ Turn 1 and 2	Types of Group Functions Group Functions and Null Values GROUP BY Clause HAVING Clause Single-Row Subqueries Executing Single-Row Subqueries. HAVING Clause with Subqueries	CLO5	4
15	Locking Objects Constraints	Week 15/ Turn 1 and 2	Two lock modes: Exclusive: Locks out other users Share: Allows other users to access Including Constraints	CLO5	4
Total					**60 hrs.**

Learning resources

Textbooks:

1. SQL QuickStart Guide: The Simplified Beginner's Guide to Managing, Analyzing, and Manipulating Data With SQL
2. SQL All-in-One For Dummies

Reference Books:

1. SQL: The Ultimate Beginners Guide
2. Practical SQL, 2nd Edition: A Beginner's Guide to Storytelling with Data

Online Resources/E-Learning Resources

1. https://learnsql.com/
2. https://www.w3schools.com/sql/

COURSE CURRICULUM

Name of the Program:	BCA	Semester: II	Level: UG
Course Name	Software Engineering	Course Code/Course Type	UBC114 /VSC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	-

Prerequisite: ER Modeling

Course Objectives (CO):	The objectives of Operating Systems Fundamentals are: 1. To learn and understand the principles of System Engineering. 2. To learn and understand the principles of Software Engineering. 3. To gain the knowledge of Software Development Life Cycle and methodology. 4. To impart various software requirement techniques. 5. To demonstrate the different system analysis and design engineering.
Course Learning Outcomes (CLO):	Students would be able to: 1. Compare and contrast various Software Engineering models. 2. Decide on an appropriate process model for developing a software project. 3. Classify software applications and Identify unique features of various domains. 4. Prepare System Requirement Specification (SRS) for the given problem. 5. Design and analyze Data Flow diagrams.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to System Engineering: Definition,Basic Components,Elements of the system, System Components, Types of System.	CLO 1	6
UNIT II		
Introduction to Software Engineering: Definition of Software, Characteristics of Software, Software Application Domain, Definition of Software Engineering, Need for software Engineering, Mc Call's Quality factors, The Software Process, Software Engineering Practice.	CLO 2	6
UNIT III		
Software Development Life Cycle (SDLC) and Methodologies: Introduction, Activities of SDLC, A Generic Process Model, Prescriptive Process models- Waterfall Model, Incremental Process Models, Evolutionary process Models (Prototyping and Spiral Model), Concurrent Models, Types	CLO3	6
UNIT IV		
Requirement Engineering: Introduction, Requirement Engineering Tasks, Establishing Groundwork for understanding of Software Requirement, Requirement Gathering, Feasibility study, Fact Finding Techniques.	CLO4	6
UNIT V		
Analysis and Design Engineering: Decision Tree and Decision Table, Data Flow Diagrams (DFD), Data Dictionary, Elements of DD, Advantages of DD, Input and Output Design, Entity Relationship Diagram (ERD), Case Studies on above topics**.**	CLO5	6
Total Hours		30

Learning resources

Textbooks:

1. Rajib Mall, "Fundamentals of Software Engineering", PHI 2018, 5th Edition.

Reference Books:

1. Roger S. Pressman, "Software Engineering - A Practitioner's Approach", McGraw Hill 2010, 7th Edition.
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishing House 2011, 3rd Edition.

Online Resources/E-Learning Resources

1. https://www.javatpoint.com/software-engineering
2. https://www.scaler.com/topics/software-engineering/

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: II	Level: UG
Course Name	Discrete Mathematics	Course Code/ Course Type	UBC115/BSC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	-

Prerequisite: None

Course Objectives (CO):	The objectives of Discrete Mathematics are: 1. To remember Graph theory and associated concepts. 2. Recognize the mathematical logic of truth tables. 3. To apply set operations in algebraic structures. 4. Classify the different properties of relations. 5. To evaluate the relative frequency.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify the fundamental concepts of graph theory. 2. Explain the use of the truth table in mathematical logic. 3. Complete the operations on sets, 4. Assess the various operations on relations. 5. Justify the use of Probability.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Graph Theory: Introduction, Simple graph, adjacency/ incident/ neighborhood/ degree of a vertex, degree sequence of a graph, first fundamental theorem of graphs, subgraph and induced sub-b graphs, Adjacent matrices and incidence matrices, walk, length of a walk, open and closed walks, trial and path, circuit and cycle, connected graph and disconnected graph.	**CLO1**	**6**
UNIT II		
Mathematical Logic: Introduction, proposition, connectives, truth tables and duality, converse/contrapositive/inverse,tautology,contradiction,contingency,logically equivalent, DNF, CNF, PDNF, PCNF	**CLO2**	**6**
UNIT III		
Algebraic Structures: **Introduction, sets and set operations, functions, relations and their properties & representations of relation by matrix, closure of different types of relations, equivalence relations, primitive recursive function.**	**CLO3**	**6**
UNIT IV		
Relations and Partially Ordering: Introduction, Properties of relations, relation matrix, directed graph, closures of relation, equivalence relations, congruence relation, equivalence classes, equivalence classes and partitions, Partially ordered set, lexicographic ordering, Hesse diagrams, minimal and maximal elements, upper and lower bounds.	**CLO4**	**6**
UNIT V		
Probability and Statistics: Introduction, Classical relative frequency and axiomatic, Definition of probability, Addition rule and conditional probability, multiplication rule and total probability, Bayes' theorem and independence problems, measures of central tendency, measures of dispersion, coefficient of variation.	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2014.
2. Ronald E Walpole, Raymond H Myers, Sharon L Myers, and Keying E Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi-9th edition, 2012.
3. B S Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEdition, 2010.
2. B S Grewal, Numerical methods in engineering and science, 10th Edition, Khanna publishers, 2016.
3. Kishor S Trivedi, "Probability and Statistics with reliability, Queuing and Computer Science Applications", John Wiley & Sons, 2nd edition, 2008.

Online Resources/E-Learning Resources

1. https://www.edx.org/learn/discrete-mathematics
2. https://www.codecademy.com/learn/discrete-math

COURSE CURRICULUM

Name of the Program:	BCA	Semester: II	Level: UG
Course Name	Concepts and Application in Science	Course Code/ Course Type	ACIKSET101
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	50	-	-

Prerequisite: None

Course Objectives (CO):	The objectives of Concepts and Application in Science are: 1. To remember Indian Knowledge Systems: Origin, Evolution and Ontological Approach 2. To understand Indian Knowledge Approaches. 3. To apply Sciences of Life and Mind. 4. To examine Indian Knowledge System Torchbearers – Ancient and Modern 5. To analyze Self-Knowledge for Personal Effectiveness.
Course Learning Outcomes (CLO):	Students would be able to: - 1. Students will be able to identify and appreciate the rich heritage that resides in our traditions. 2. Explain the mind/voice dynamic in Indian knowledge systems. 3. Explain the practices that will prepare one for the inner-journey to discover the Self. 4. Analyze the need and importance of Sanskrit in getting to the roots of the philosophical concepts. 5. Analyze the various functions in Indian knowledge systems.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Indian Knowledge System and Vedic Corpus: Introduction to IKS, Need for IKS, Historicity of IKS, Salient l aspects of IKS, IKS in ancient India and in modern India.Introduction to Vedas, Four Vedas, Sub-classification o of Vedas, Messages in Vedas, Basics of Nirukta and Chandas.	**CLO1**	**6**
UNIT II		
Wisdom through the Ages: Puranas, Ithihasas, Nitishastras, Subhasitas, Linguistics, Components of a language, Panini's work on Sanskrit grammar, Phonetics in Sanskrit, Role of Sanskrit in natural language processing, Framework for establishing valid knowledge.	**CLO2**	**6**
UNIT III		
Number Systems and Units of Measurement: Salient features of the Indian numeral system, Importance of decimal representation, The discovery of zero and its importance, Unique approaches to represent numbers, Unique aspects of Indian Mathematics, Great mathematicians and their significant contributions in the area of arithmetic, algebra, geometry, trigonometry, combinatorial problems in Chandaḥ-sastra of Pingala	**CLO3**	**6**
UNIT IV		
Knowledge Framework and classifications: Indian scheme of knowledge, The knowledge triangle,Prameya,A vaiśeṣikan approach to physical reality, Dravyas,The constituents of the physical reality	**CLO4**	**6**
UNIT V		

Science and Technology in the Vedic Age and Post-Vedic Records. **Knowledge:** Framework and Classification, Astronomy Encryption Method used in ancient India, Introduction to Yantra Shastra,Vaimanik Shashtra, Agriculture Technologies	**CLO5**	**6**
Total hours		**30**

Learning resources

Activity 1: Comparative Analysis of Traditional and Modern Scientific Methods.

Activity 2: Presentation on Indian scientific texts such as the Phonetics in Sanskrit, Astronomy Encryption Method used in ancient India

Textbooks:

1. Health Science: Concepts and Applications, Authors: Jacquelyn Rhine Marshall and Sue C. Roe
2. Introduction to Indian Knowledge Systems: Concepts and Applications by Prof. B Mahadevan

Reference Books:

1. Introduction to Indian Knowledge System: Concepts and Applications by Pallavi Ghosh

Online Resources/E-Learning Resources.

1. https://onlinecourses.swayam2.ac.in/

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COURSE CURRICULUM

Name of the Program:	B.C.A	Semester: II	Level: UG
Course Name	UHV-I: Professional Ethics	Course Code/ Course Type	ACUHV101/AC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	2	50	-	-

Pre-Requisite: UHV-I

Course Objectives (CO):	The objectives of Universal Human Value- Professional Ethics are: 1. To make the students understand the importance of ethical behavior 2. To expose the students to the ethical practices to be followed in profession 3. To sensitize the students to become responsible persons who will uphold ethics in profession when they pursue their career 4. To make students understand Psychological and Philosophical approaches 5. To make students understand social responsibility and corporate Sustainability
Course Learning Outcomes (CLO):	Students would be able to: 1. Equip themselves with an understanding of moral, professional and personal values. 2. Understand the need of ethics in shaping their profession The learners will hone their decision-making skills. 3. Refine their business ethics based on psychological and philosophical perspective. 4. Assess the need for a balance between ecology, and economy. 5. Equip themselves with a better understanding of themselves and the society they live in and the responsibilities they shoulder in creating a sustainable world.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Individual and Professional Ethics: Introduction to Professional Ethics, Morals, Values and Ethics – Personal and Professional- Sensé of Professional Ethics – Code of Ethics by NSPE-Making decisions with ethical dimensions–definition–roadmap to ethical decision making–common standards– internal obstacles – bias – empathy.	**CLO 1**	**8**
UNIT II		
Business Ethics: Philosophical approaches to Business Ethics – ethical reasoning – ethical issues in business - Social Responsibility of Business- conflict of interest–cultural relativism-Ethical Leadership-Resisting un-ethical authority and domination-Global Business Ethics	**CLO 2**	**5**
UNIT III		
Psychological Approaches: Ethical Theories-Psychological and Philosophical Approaches-Myths about Morality-conflict of interest in psychological perspective - Courage-Integrity – ethical dilemma – Emotional Intelligence (Mahabharata- Iskcon Publications)	**CLO 3**	**5**
UNIT IV		
Workplace Ethics: Ethics in changing domains of Research–academic integrity–intellectual honesty-Role of Engineers and Managers-Ethical issues in Diverse workplace – competition – free will- Confidentiality – employee rights – Intellectual property rights – discrimination	**CLO 4**	**5**
UNIT V		
Safety, Responsibilities and Rights: Ecology, and Economy-Risk benefit analysis and reducing risk SDGs–Corporate social responsibility and Corporate Sustainability - CSR in India - Sustainability Case Studies	**CLO 5**	**7**
Total Hours		**30**

Learning resources

Textbooks:

1. Subramanian. R. *Professional Ethics*, Oxford Publication,2013.
2. Nagarasan. R. S. *Professional Ethics and Human Values*. New Age International Publications, 2006.

Reference Book:

1. Mike W Martin and Roland Schinzinger, *Ethics in Engineering*,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014

Online Resources/E-Learning Resources

1. https://www.nspe.org/resources/ethics/code-ethicss
2. https://www.toolshero.com/tag/ethical-decision-making/
3. https://pagecentertraining.psu.edu/public-relations-ethics/introduction-to-public-relations-ethics/lesson-1/ethical-theories/
4. https://peer.asee.org/case-studies-in-engineering-ethics.pdf

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks
Activity (with short Report Submission) - 20 Marks
Academic Sincerity - 10 marks
Few of the suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.
Few of suggested topics related to UHV1- Professional Ethics are:

Debate Topics
• Ethical Approach versus Realistic Approach
• Individual and Social Approach
• Dilemma between heart and Mind

Activity
• Analyze the wastage (Electricity or any other) at work place? How you managed.

Assignment
• Analyze the code of ethics at work place
• If you fulfil the duties, rights will automatically fall in place. Justify the statement

References:
1. https://uhv.org.in/
2. https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf

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COURSE CURRICULUM

Name of the Program:	BCA			Semester: II		Level: UG	
Course Name	Digital Marketing			Course Code/ Course Type		UBC116A/OE	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	-
Prerequisite: Students should have basic Knowledge of Computer Networks.							
Course Objectives (CO):	The objectives of Introduction to Digital Marketing are: 1. To Recognize the need of Digital Marketing. 2. Illustrate the different design elements of Website Design. 3. Identify the importance of Keyword Research and content research for search optimization. 4. Classify the types of algorithms used in marketing. 5. Discuss the varied forms of Social media marketing.						
Course Learning Outcomes (CLO):	Students would be able to: 1. List out the current scenarios of usage for digital marketing. 2. Explain the various functionalities for designing elements in the website. 3. Demonstrate the techniques associated with search engine optimization. 4. Analyze algorithms used for creating campaigns in digital marketing. 5. Discuss how targeting demographics is done through social media.						

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Digital Marketing: Introduction,Importance of digital marketing, Difference between traditional and digital marketing,recent trends and current scenario of the industry, digital marketing as a tool of success for companies.	**CLO1**	**6**
UNIT II		
Website Planning and Creation: Functionality of WordPress,Incorporate different design elements into your website,add content,Install and Activate plugins,Cases.	**CLO2**	**6**
UNIT III		
Search Engine Optimisation: Introduction,Search Engine work,On page SEO,Concepts like content research,keyword research,meta tags,Off page SEO,Cases	**CLO3**	**6**
UNIT IV		
Search Engine Marketing: Introduction,Features of the Google Ads platform and its algorithm,Creating campaigns,Search volume,Google Adwords,Ad Creation	**CLO4**	**6**
UNIT V		
Social Media Marketing: Understanding how SMM works,Targeting Demographics through social media,Metrics like cost per click, cost per view,Cases	**CLO5**	**6**
Total hours		**30**

Learning resources

Textbooks:

1. Digital Marketing: Strategy, Implementation & Practice by Dave Chaffey & Fiona Ellis
2. Digital Marketing for Dummies by Ryan Deiss and Russ Hennesberry

Reference Books:

1. Art of SEO by Eric Enge
2. Permission Marketing by Seth Godin

Online Resources/E-Learning Resources

1. https://www.forbes.com/advisor/business/what-is-digital-marketing/
2. https://neilpatel.com/what-is-digital-marketing/

COURSE CURRICULUM

Name of the Program:	BCA	Semester: II	Level: UG
Course Name	E-Commerce	Course Code/ Course Type	UBS116B/OE
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	

Prerequisite: Students should have basic Knowledge of Computer Network

Course Objectives (CO):	The objectives of Introduction to E-commerce are: 1. To recognize the need of e-commerce. 2. Illustrate the different frameworks of e-commerce. 3. Identify the various types of e-commerce applications. 4. Analyze the types of electronic data security mechanisms used in e-commerce applications. 5. Discuss the e-marketing techniques used.
Course Learning Outcomes (CLO):	Students would be able to: 1. List out the applications of e-commerce. 2. Explain the network services used in e-commerce. 3. Demonstrate the various modes of payments used in e-commerce applications. 4. Analyze the different security and Privacy Implementation. 5. Plan various techniques used for e marketing.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction: E-Commerce, Meaning, Advantages & Limitations, Traditional & Contemporary Model, Impact of E-Commerce on Business Models, Classification of Commerce, B2B, B2C, C2B, C2C, B2E, Applications of Ecommerce, E-Commerce Organization Applications.	**CLO1**	**6**
UNIT II		
Framework of E-Commerce: Application Services, Interface Layers, Secure Messaging, Middleware Services and Network Infrastructure, Site Security Firewalls & Network Security, TCP/IP,HTTP ,Secured HTTP ,SMTP ,SSL.	**CLO2**	**6**
UNIT III		
Consumer Oriented e-commerce Applications: Introduction, Mercantile Process Model, Consumers Perspective and Merchant's Perspective, Electronic Payment Systems, Legal Issues & Digital Currency, E-Cash & E-Cheque, Electronic Fund Transfer(EFT),Advantages and Risks, Digital Token Based E-Payment System.	**CLO3**	**6**
UNIT IV		
Electronic Data Interchange: Introduction, EDI Standards, Types of EDI,EDI Applications in Business, Legal Security and Privacy issues of EDI,EDI Software Implementation	**CLO4**	**6**
UNIT V		
E-Marketing Techniques: Introduction, New Age of Information, Based Marketing, Influence on Marketing, Search Engines & Directory Services, Charting the Online Marketing Process, Chain Letters, Applications of 5P's (Product, Price, Place, Promotion, People).	**CLO5**	**6**
Total hours		**30**

Learning resources

Textbooks:

1. Frontiers of Electronic Commerce: Ravi Kalakota, Andrew B Whinston, Pearson
2. E-Commerce: Tulasi Ram Kandula, HPH.
3. E-Commerce: An Indian Perspective: P.T. Joseph, S.J, PHI

Reference Books:

1. E-Commerce & Mobile Commerce Technologies: Pandey, SaurabhShukla, S. Chand
2. Electronic Commerce: Pete Loshin / John Vacca, Firewall Media
3. E-Commerce, Strategy, Technologies And Applications : David Whiteley, Tata Mcgraw Hill

Online Resources/E-Learning Resources

1. https://www.edx.org/learn/ecommerce
2. https://www.coursera.org/professional-certificates/google-digital-marketing-ecommerce

BCA REVISED 2024 PATTERN
COURSE DETAILS
Semester - III

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COURSE CURRICULUM

Name of the Program:	BCA			Semester: III		Level: UG	
Course Name	Programming with C++			Course Code/ Course Type		UBC201/MAJM	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-
Prerequisite: Basic Understanding of Programming Concepts.							
Course Objectives (CO):				The objectives of Programming with C++ are: 1. To understand basic characteristics of OOP through C++. 2. To understand the skills on various kinds of overloading and inheritance. 3. To Apply and understand the concept of pointers and file handling in C++ together with exception handling mechanism. 4. To learn the knowledge by applying the learned techniques to solve various real-world problems. 5. To develop different application based program using file manipulation			
Course Learning Outcomes (CLO):				Students would be able to: 1. Understand the need and features of OOP and idealize how C++ differs from C. 2. Recall the knowledge on various types of overloading. 3. Apply the suitable inheritance while proposing solution for the given problem 4. Explain pointers and effective memory management. 5. Develop the concept of file handling in C++ and handle exceptions using case study.			

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction : What is object-oriented programming? Why do we need object oriented? Programming characteristics of object-oriented languagesPipeline, Centralizing the Building Server, Monitoring Best Practices, Best Practices for Operations,Output using cout. Directives, Input with cin, Type bool, The setw manipulator, Type conversions	**CLO 1**	**9**
UNIT II		
Operator overloading: Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operator overloading and conversion keywords. Explicit and Mutable.	**CLO 2**	**9**
UNIT III		
Inheritance: Concept of inheritance. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation: Classes within classes, inheritance and program development.	**CLO3**	**9**
UNIT IV		
Pointers & Virtual Function: Addresses and pointers. The address of operator and pointer and arrays. Pointer and Faction pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers. Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information.	**CLO4**	**9**
UNIT V		
Streams And Files: Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in fileI/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, and printer output.	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Debasish Jana, "C++ and Object-Oriented Programming Paradigm" Third Edition, PHI Publishers, 2014.
2. R Rajaram, "Object Oriented Programming and C++", Revised Edition, New Age International, 2007

Reference Books:

1. Shah Yi, Mh Thaker, "Programming In C++", First Edition, USA ISTE, 2002.
2. 2. Stanley B. Lippman, Josée Lajoie and Barbara E. Moo, "C++ Primer", Fifth Edition,O'Reilly, 2013.

Online Resources/E-Learning Resources.

1. https://www.geeksforgeeks.org/c-plus-plus/
2. https://www.tutorialsduniya.com/notes/c-notes/
3. https://ocw.mit.edu/courses/6-096-introduction-to-c-january-iap-2011/pages/lecture-notes/

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COURSE CURRICULUM

Name of the Program:	BCA	Semester : III	Level: UG
Course Name	Programming with C++ Lab	Course Code/ Course Type	UBC202/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme / **Assessment Scheme**

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25

Pre-Requisite: Basic Understanding of Programming.

Course Objectives (CO):	The objectives of Programming with C++ are: 1. To understand basic characteristics of OOP through C++. 2. To understand the skills on various kinds of overloading and inheritance. 3. To Apply and understand the concept of pointers and file handling in C++ together with exception handling mechanism. 4. To learn the knowledge by applying the learned techniques to solve various real-world problems. 5. To develop different application based program using file manipulation
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the need and features of OOP and idealize how C++ differs from C. 2. Recall the knowledge on various types of overloading. 3. Apply the suitable inheritance while proposing solution for the given problem 4. Explain pointers and effective memory management. 5. Develop the concept of file handling in C++ and handle exceptions using case study.

Course Contents/Syllabus: Practical Plan

Sr. No.	Practical Title	Week No.	Details	CLO	Hours
1	Practical 1: Different ways to execute a class /object Programs	Week 1	1. Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array. 2. Given that EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary, and print data members	CLO1	2

2		Week 2/3	Write a program that uses a class where the member functions are defined outside a class 1. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).	CLO1	4
3			Write a program to demonstrate the use of static data members.	CLO1	2
4			Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.	CLO1	2
5	Execute a programs by using Constructors and Destructors	Week 4	Write a program to demonstrate the use of zero argument and parameterized constructors.	CLO2	2
			Write a program to demonstrate the use of zero argument and parameterized constructors.		
7		Week 6	Write a program to demonstrate the use of explicit constructor.	CLO2	2
8			Write a program to demonstrate the use of dynamic constructor.	CLO2	2
9		Week 7	Write a C++ program to allocate memory using new operator.	CLO2	2
10	Execute a programs by Operator Overloading	Week 8/9	Write a program to demonstrate the overloading of increment and decrement operators.	CLO3	4
11	Execute a programs by using inheritance	Week 9/10	Write a program to demonstrate the multilevel inheritance. . Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)	CLO3	4
			Write C++ programs that illustrate how the following forms of inheritance are supported: a)Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance		
12	Execute a programs by using Exception Handling	Week 11/12	Write a C++ Program to illustrate template class 35-41	CLO4	4
			Write a Program to illustrate member function templates		
			Write a Program for Exception Handling Divide by zero		
			Write a Program to rethrow an Exception		
13	Pointers & Virtual Function	Week 13/14	Write a C++ program to create an array of pointers. Invoke functions using array objects.	CLO5	4
			Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.		
14		Week 15	ite a C++ program illustrating user defined string processing functions using pointers (string length, string copy, string concatenation) Write C++ program that implement Bubble sort, to sort a given list of integers in ascending order	CLO5	2
Total					**30 hrs.**

Learning resources

Textbooks:

1. Debasish Jana, "C++ and Object-Oriented Programming Paradigm" Third Edition, PHIPublishers, 2014.
2. R Rajaram, "Object Oriented Programming and C++", Revised Edition, New Age International, 2007

Reference Books:

1. Shah Yi, Mh Thaker, "Programming In C++", First Edition, USA ISTE, 2002.
2. 2. Stanley B. Lippman, Josée Lajoie and Barbara E. Moo, "C++ Primer", Fifth Edition,O'Reilly, 2013.

Online Resources/E-Learning Resources.

1. https://www.geeksforgeeks.org/c-plus-plus/
2. https://www.tutorialsduniya.com/notes/c-notes/
3. https://ocw.mit.edu/courses/6-096-introduction-to-c-january-iap-2011/pages/lecture-notes/

COURSE CURRICULUM

Name of the Program:	BCA	Semester: III	Level: UG
Course Name	Operating Systems - Linux	Course Code/ Course Type	UBC203 / MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Prerequisite: Basic Understanding of Programming Concepts, basic hardware knowledge

Course Objectives (CO):	The objectives of operating System -Linux are: 1. To encompass process management, synchronization strategies, memory management, file systems, device management, and virtualization. 2. To understand basic to encompass process management, synchronization strategies, memory management, file systems, device management, and virtualization. 3. To familiarize the operations performed by OS as a resource Manager 4. To impart various scheduling policies of OS and to teach the different memory management techniques. 5. To evaluate, introduce the concepts and features of real-time operating systems as well as virtualization.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the fundamental operating system abstractions, including processes, threads, semaphores, and file systems. 2. Apply the implement scheduling, devising and addressing synchronization issues 3. Comprehend the concept of gain an understanding of memory management tasks. 4. Develop real-time working prototypes of different small-scale and medium-scale embedded systems 5. Comprehend the basics of virtualization and differentiate types of virtualizations.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Operating Systems, Process and Scheduling: Computer Organization and Architecture - OS definition , OS history , OS Operations, OS design issues - Operating systems structures - Library files - Systems calls , Interrupts - Kernel approaches , Building and booting an OS.Process states , State transitions with suspend and resume - Process control block - Context-switching - Processes operations - Process scheduling - CPU scheduling: Non-preemptive, preemptive - Multi-queue scheduling - Multilevel feedback queue scheduling.	**CLO 1**	**9**
UNIT II		
Synchronization: IPC: Shred memory, message passing - Race condition , Critical section problem - Peterson's solution , Bakery Algorithm - Mutex locks - Semaphores , Classical synchronization problems , Monitors - Thread synchronization , Multithreading Models, Deadlocks , Resource allocation graphs , Deadlock: prevention, avoidance, detection and recovery	**CLO 2**	**9**
UNIT III		
Memory Management: Address binding, Fragmentation - Pinning Memory , Paging , Structure of the page table , Swapping - Segmentation - Demand Paging , Copy-on-write - Replacement , Thrashing , Working set , Memory compression , Allocating kernel memory	**CLO3**	**9**
UNIT IV		
Managing Devices, Files, Security and Protection: I/O Management, DMA - Delayed write - Disk scheduling algorithms: Seek-time and rotational latency based - File control block , Inode , Access method ,	**CLO4**	**9**

Directory structure - Directory implementation , File allocation methods - Free space management , Program and network threats , Cryptography as a security tool , Domains of protection , Access matrix , Capability based systems		
UNIT V		
Real-time Operating Systems And Virtualization: RTOS Internals - Real-Time Scheduling - Task Specifications - Performance Metrics of RTOS , Schedulability Analysis, RTOS Programming Tools. **Need for virtualization** - Virtual machines and architectures, Hypervisors Virtualization Technologies: Para Virtualization, Full Virtualization - Virtualization types: Server virtualization, Application virtualization, Storage virtualization	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", 2018, 10th Edition, Wiley, United States.

Reference Books:

1. Arpaci-Dusseau, R. H., & Arpaci-Dusseau, A. C, "Operating Systems: Three easy pieces, 2018, 1 st Edition, Boston: Arpaci-Dusseau Books LLC.
2. Kamal, R, Embedded Systems: Architecture, Programming and Design, 2011, 1st Edition, Tata McGraw-Hill Education.
3. Portnoy, M, "Virtualization Essentials", 2012, 2nd Edition, John Wiley & Sons, New Jersey, USA.

Online Resources/E-Learning Resources.

1. https://www.geeksforgeeks.org/introduction-to-linux-operating-system/
2. https://www.techtarget.com/searchdatacenter/definition/Linux-operating-system

COURSE CURRICULUM

Name of the Program:	BCA	Semester: III	Level: UG
Course Name	Operating System-Linux Lab	Course Code/ Course Type	UBC204/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme / **Assessment Scheme**

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25

Pre-Requisite: Basic Understanding of Programming Concepts, basic hardware knowledge.

Course Objectives (CO):	The objectives of Operating System-Linux lab are: 1. To understand basic to encompass process management, synchronization strategies, memory management, file systems, device management, and virtualization. 2. To explain main components of OS and their working. 3. To familiarize the operations performed by OS as a resource Manager. 4. To impart various scheduling policies of OS 5. To teach the different memory management techniques.
Course Learning Outcomes (CLO):	Students would be able to: 1. Students would be able to Understand the fundamental operating system abstractions, including processes, threads, semaphores, and file systems. 2. Students would be able to apply the implement scheduling, devising and addressing synchronization issues. 3. Students would be able to comprehend the concept of gain an understanding of memory management tasks. 4. Students would be able to Develop real-time working prototypes of different small-scale and medium-scale embedded systems. 5. Students would be able to comprehend the basics of virtualization and differentiate types of virtualizations.

Course Contents/Syllabus: Practical Plan

Sr.No.	Practical Title	Week No.	Details	CLO	Hours
1	Introduction to Operating Systems	Week 1	Investigate the fundamental Unix/Linux commands.	CLO1	2
2		Week 2	Obtaining the OS system data file and its associated information.	CLO1	2
3		Week 3	Shell Programming.	CLO1	2
4		Week 4	Create utility programs that use I/O system calls to simulate operations such as ls, cp, grep, and others.	CLO1	2
5	Execute Commands by using Linux	Week 5/6	Create child, Orphan and Zombie processes using suitable system calls such as fork(), exec(), wait(), kill(), sleep() and exit() system calls	CLO2	2

			Create a program that mimics the CPU Scheduling algorithms including multi-level queue scheduling algorithm. Ex: Assume that all processes in the system are divided into two categories: system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue		
7		Week 7/8	Parallel Thread management using Pthreads library. Implement a data parallelism using multithreading. Ex: An application should have a thread created with synchronization and thread termination. Every thread in the sub-program must return the value and must be synchronized with the main function. Final consolidation should be done by the main (main function).	CLO2	2
8	Execute Program Using algorithm	Week 9/10	Dynamic memory allocation algorithms – First-fit, Best-fit, Worst-fit algorithms.	CLO3	2
		Week 11/12	Page Replacement Algorithms FIFO, LRU and Optimal	CLO3	2
9	Execute Program Using file locking mechanism.	Week 13	Implement a file locking mechanism	CLO4	2
10	Execute a programs by using Exception Handling	Week 14/15	RTOS Based Parameter Monitoring and Controlling System – Monitoring: Collecting data from sensors and interface display devices/actuators using a microcontroller. Controlling: Provide an alert when the received data reaches a certain threshold value.	CLO5	2
Total hours					**30**

Learning resources

Textbooks:

1. Vijay Mukhi, "The C Odyssey: UNIX: v. 3", 2004, 3rd Edition, BPB Publications, New Delhi, India

Reference Books:

1. Stevens, W. R., & Rago, S. A. (2013). Advanced Programming in the UNIX Environment: Advanc Progra UNIX Envir_p3. Addison-Wesley.
2. Love, Robert, "Linux System Programming: talking directly to the kernel and C library", 2013, 2nd Edition, O'Reilly Media, Inc, United States.

Online Resources/E-Learning Resources

1. https://www.geeksforgeeks.org/introduction-to-linux-operating-system/
2. https://www.techtarget.com/searchdatacenter/definition/Linux-operating-system

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COURSE CURRICULUM

Name of the Program:	BCA	Semester : III	Level: UG
Course Name	Software Engineering Using UML	Course Code/ Course Type	UBC205A/ MAJE
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	3	40	60	-

Prerequisite: Basic computer science principles, Discrete mathematics and probability theory.

Course Objectives (CO):	The objectives of System Analysis and Design are: 1. To recall. Knowledge of basic SW engineering methods and practices, and their appropriate application. 2. To understand the motivation for, and best practices of, a UML approach to software development 3. To introduce model object state and behaviour using UML State Machine diagrams. 4. To analyze and apply software development methodologies and frameworks appropriate for specific projects 5. To Prepare UML diagrams for software system.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the essential characteristics and identify, using examples, the connections between the characteristics of a good software system 2. Understand and apply fundamental object-oriented concepts and terminology for software development. 3. Develop Activity diagrams to model the flow of events for system processes. 4. Draw The basic building blocks of a class diagram: the concepts of "class", "attribute" and "association" 5. Comprehend the identify the different kinds of models used in the development of software and describe the relationship between models, viewpoints, and software development.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Overview of Prominent OO Methodologies: An overview - Object basics - Object state and properties, Behavior, Methods, Messages. ,Object Oriented system development life cycle., Benefits of OO Methodology,The Rumbaugh OMT., The Booch methodology. ,Jacobson's OOSE methodologies. , Unified Process. , Introduction to UML., Important views & diagram to be modeled for system by UML.	**CLO 1**	**9**
UNIT II		
Factional view(models): Use case diagram: Requirement Capture with Use case. b. Building blocks of Use Case diagram - actors, use case guidelines for use case models. c. Relationships between use cases - extend, include, generalize. **Activity diagram:** Elements of Activity Diagram - Action state, Activity state, Object. node, Control and Object flow, Transition (Fork, Merge, Join) b. Guidelines for Creating Activity Diagrams. c. Activity Diagram - Action Decomposition (Rake). d. Partition - Swim Lane.	**CLO 2**	**9**
UNIT III		
Static structural view (Models Classes, values and attributes, operations and methods, responsibilities for classes, abstract classes, access specification(visibility of attributes and operations). b. Relationships among classes: Associations, Dependencies., Inheritance - Generalizations, Aggregation. c. Adornments on Association: association names, association classes, qualified association, n-ary associations, ternary and	**CLO 3**	**9**

reflexive association. d. Dependency relationships among classes, notations e. Notes in class diagram, Extension mechanisms, Metadata, Refinements, Derived , data, constraint, stereotypes, Package & interface notation. f. Object diagram notations and modeling, relations among objects (links).		
UNIT IV		
Class Modeling and Design Approaches: a. Three approaches for identifying classes - using Noun phrases, Abstraction, Use Case Diagram. II b. Comparison of approaches. c. Using combination of approaches. d. Flexibility guidelines for class diagram: Cohesion, Coupling, Forms of coupling (identity, representational, subclass, inheritance), class Generalization, class specialization versus aggregation.	**CLO 4**	**9**
UNIT V		
Behavioral (Dynamic structural view) Sequence diagram - Sequence diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, Activations in sequence diagram. b. **Collaboration diagram** - Collaboration diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, activations in sequence diagram.	**CLO 5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Object Oriented Modeling and Design - James Rumbaugh
2. Teach Yourself UML in 24 Hours - Joseph Schmuilers
3. Object-Oriented Analysis and Design: using UML Mike O'Docherty Wiley Publication

Reference Book:

l. Designing Flexible Object-Oriented systems with UML - Charles Ritcher
2. Object Oriented Analysis & Design, Sat/.inger. Jackson, Burd Thomson
3. Object oriented Modeling and Design with UML - James Rumbaugh. Micheal Blaha (second edition)

Online Resources/E-Learning Resources

1. https://learn.oracle.com/ols/course/object-oriented-analysis-and-design-using-uml/88392/89218

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: III	Level: UG
Course Name	Business Model Engineering	Course Code/ Course Type	UBC205B/ MAJE
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Prerequisite: Business Logics

Course Objectives (CO):	The objectives of System Analysis and Design are: 1. To recall. Identify and evaluate opportunities for creating and capturing value through the design of the business model 2. To Learn and apply techniques for generating and evaluating new business models 3. To Assess the challenges associated with business model innovation in start-ups 4. To Analyze and critically evaluate business models used by actual ventures 5. To Demonstrate the ability to analyze existing business models utilizing the course frameworks, tools and techniques, evaluate their strengths and limitations, and make recommendations for improvement.
Course Learning Outcomes (CLO):	Students would be able to: 1. Learn the key concepts that enable you to analyze and design new business models, and apply them to real-world problems 2. Learn and apply techniques for generating and evaluating new business models 3. Develop your ideas into full-fledged concepts that are ready for implementation 4. Draw The basic building blocks of a class diagram: the concepts of "class", "attribute" and "association" 5. Evaluate, design, and recommend innovative business models for entrepreneurial new ventures or businesses experiencing significant changes in their external environments

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Business Model Innovation Strategy: Why Do Business Models Matter? What is a Business Model? What is it Not? Approaches Towards Defining Business Models The Business Model as an Activity System The "What, How, Who & Why" Framework - The What Dimension - The How Dimension - The Who Dimension - The Why Dimension Implications of the Framework Value Creation vs. Value Appropriation in Business Models	**CLO 1**	**9**
UNIT II		
Business Model Innovation : Adopting a Business Model Mindset and why is it needed? Leadership actions to foster a Business Model Mindset What is business model innovation? A framework for business model innovation Measuring business model innovation The Pros and Cons of business model innovation	**CLO 2**	**9**
UNIT III		
Strategic Design Process of Business Model Innovation: Why is a design perspective relevant to business model development? What is Design in the context of Business models? Business Model Strategic Design Drivers - Deployable Resources (D) - External Environment (E) - Stakeholders' Activities (S) - Incumbents' Templates (I) - Goals (G) - Perceived Needs (N) Robust Business Model Design The Business Model Design	**CLO 3**	**9**

Process - BMIdeate - BMIterate - BMImplement Building a business model innovation capability		
UNIT IV		
Business Model Design Tools and Evaluation : General Design Tools - DDP - Effectuations - Lean Startup Tools for articulating and understanding business models Tools for framing the business model design effort Tools for designing and implementing business model innovations Tools for evaluating business models Value Proposition of Business models The NICE value drivers From Value Propositions to value appropriation	**CLO 4**	**9**
UNIT V		
Business Model Innovation Strategy in the Digital Age: What are the business model implementation challenges and barriers in startups and in established firms? Creating internal fit – overcoming resistance to change and organizational inertia in established firms Addressing leadership and knowledge gaps Managing business model implementation risks in startups The sharks dilemma startups face The roles of governance and leadership in business model implementation Revenue models The strategic implications of business model innovation in the digital age How to develop a business model innovation strategy	**CLO 5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Duarte, Nancy. Resonate: Present Visual Stories that Transform Audiences. 1 st edition. John Wiley and Sons. 2010.
2. Coughter, Peter. The Art of the Pitch. 2012 (ebook – Free)
3. Klaff, Oren. Pitch Anything: An Innovative Method for Presenting, Persuading, and Winning the Deal. 2011

Online Resources/E-Learning Resources

1. YouTube.com: Strategizer Business Model Canvas Videos
2. Shark Tank- Television Show
3. Strategizer.com

COURSE CURRICULUM

Name of the Program:	BCA	Semester: III	Level: UG
Course Name	Statistical Techniques	Course Code/ Course Type	UBS207/BSC
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	-	20	30	-

Prerequisite: None

Course Objectives (CO):	The objectives of Statistical Techniques are: 1. Recall the basic concepts of statistics. 2. Illustrate the interpretations of graphs and diagrams. 3. Classify the general magnitude of the data. 4. Highlight the concepts of Probability. 5. Formulate problems based on Random variables.
Course Learning Outcomes (CLO):	Students would be able to: 1. Define the meaning, scope and limitations of Statistics 2. Explain the need for primary and secondary data. 3. Illustrate the different techniques of simple bar diagram, multiple bar diagram, percentage bar diagram, pie diagram 4. Simplify the use of central tendency to solve different statistical problems. 5. Interpret the concepts of probability for solving real life problems.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Statistics: Meaning, Scope and limitations of statistics, Basic Statistical Concepts,population,sample,variable,attribute,parameter,statistic, Collection of Data, primary and secondary, sample and census, survey(concept only),tabulation of data up to 3 characteristics(simple examples)	**CLO 1**	**6**
UNIT II		
Diagrams and graphs: Introduction, Given a diagram, interpretation of it, simple bar diagram, multiple bar diagram, percentage bar diagram, pie diagram, drawing of frequency curve, frequency polygon, histogram(class intervals of equal lengths only)	**CLO 2**	**6**
UNIT III		
Measures of Central Tendency: Arithmetic mean, weighted mean, combined mean, median, mode without grouping, quartiles(no example on missing frequency)measures of dispersion, range, quartile deviation, mean deviation from mean standard deviation and their relative measures.(concepts of shift of origin and change or scale are not to be done)	**CLO3**	**6**
UNIT IV		
Elementary Probability Theory: Concept of random experiment, trial and possible outcomes, sample space and discrete sample space, events and their types, algebra of events, mutually exclusive and exhaustive events, classical definition of probability, addition theorem (without proof),independence of events.	**CLO4**	**6**
UNIT V		
Random Variable: Probability distribution of a discrete random variable, expectation and variance, simple examples, concept of normal distribution and standard normal variate (SNV),Simple examples	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2014.
2. Ronald E Walpole, Raymond H Myers, Sharon L Myers, and Keying E Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi-9th edition, 2012.

Reference Books:

1. B.S.Grewal,Higher Engineering Mathematics,Khanna Publishers,44thEdition,2010.
2. B S Grewal,Numerical methods in engineering and science,10th Edition,Khanna publishers,2016.

Online Resources/E-Learning Resources

1. https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/resources/lecture-notes
2. https://stattrek.com/

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COURSE CURRICULUM

Name of the Program:	BCA			Semester: III		Level: UG	
Course Name	UHV-II: Understanding Harmony			Course Code/ Course Type		ACUHV201	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	-	50	-	-
Pre-Requisite: Knowledge of Rights and Values.							
Course Objectives (CO):				The objectives of Understanding Harmony are: 1. Identify the need of Harmony. 2. Classify the various forms of harmony. 3. Demonstrate the holistic perspective based on self-exploration, society and nature. 4. Integrate the harmony in the human being family, society. 5. Develop harmony to strengthen self-reflection.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Define the concepts of Universal Human Values. 2. Explain the value systems that are shared by our culture. 3. Illustrate the relevance of Universal Human Values. 4. Analyse current issues related to values. 5. Explore ways to integrate human values in personal and professional life.			

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Understanding Harmony: Understanding values in human-human relationship,Meaning of Trust and Respect,Trust and Respect as the foundational values of relationship,Difference between intention and competence,Difference between respect and differentiation, Friends and Foes, Empathy, False Prestige.	**CLO 1**	**6**
UNIT II		
Understanding harmony in Society and Professional Ethics: Understanding conflict (meaning,types),Universal value of justice, democracy, respect and gratitude,Need for a code ethics(philosophy references for ethics),Integrating Inclusiveness.	**CLO 2**	**6**
UNIT III		
Understanding harmony in Nature: Concept of harmony in Nature Meaning of harmony in nature,Disharmony with Nature causes, Implications of disharmony with nature,Harmony through mutual fulfillment of the four orders in nature,Harmony through symbiotic relationship with nature.	**CLO3**	**6**
UNIT IV		
Understanding of Harmony on Professional Ethics: Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order,Competence in professional ethics,	**CLO4**	**6**
UNIT V		
Harmony at all levels of Existence: Existence at all levels, Holistic perception of harmony in existence, Development of harmony in the existential sense,UHVs for entrepreneurship, Current issues leading to disharmony at all levels,Application of Universal Human Values for resolution of current issues.	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Dr R. R. Gaur, Sh. Rajul Asthana, Sh G.P. Bagaria, A textbook of Human Values and Professional Ethics, Excel books, New Delhi
2. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010.

Reference Books:

1. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
2. Small is Beautiful - E. F Schumacher.

Online Resources/E-Learning Resources

1. http://www.storyofstuff.com
2. https://www.swamivivekananda.guru/2017/05/07/romain-rolland/

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COURSE CURRICULUM

Name of the Program:		BSc(Cyber Security)		Semester: III		Level: UG	
Course Name		Constitution of India		Course Code/ Course Type		ACCOI201	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	-	50	-	-
Prerequisite: Knowledge of Constitution.							
Course Objectives (CO):				The objectives of Constitution of India are: 1. Recall the historical background of the constitution of India. 2. Illustrate the functioning of three wings of the government. 3. Classify the role of administration of states and union territories. 4. Examine the decentralization of power between central, state and local self-government. 5. Imagine the concept of emergency and types of emergency.		
Course Learning Outcomes (CLO):				Students would be able to: 1. Define the importance for building a democratic India. 2. Explain the functioning of the government. 3. Illustrate the value of the fundamental rights and duties. 4. Simplify the need for power decentralization. 5. Interpret the need for strengthening the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.		

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Constitution Structure and Principles: Constitution meaning of the term, The making of the Indian Constitution, Sources and Constitutional history, Philosophy of Constituent Assembly, Citizenship, Preamble, Fundamental Rights and Duties.	**CLO 1**	**6**
UNIT II		
The Union, Executive, Legislative and Judiciary: Union Government and its Administration Structure, President and Vice President Role, Power and Position and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court, Powers and Functions.	**CLO 2**	**6**
UNIT III		
The States and The Union Territories: State Government and its Administration, Governor Role and Position, CM and Council of ministers, State Secretariat Organisation, Structure and Functions, Relation between the Union and the States.	**CLO3**	**6**
UNIT IV		
Local Administration: District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, Pachayati Raj, Functions PRI: Zilla Panchayat, Elected officials and their roles, Block level Organizational Hierarchy, Village level, Role of Elected and Appointed officials, Importance of grass root democracy	**CLO4**	**6**
UNIT V		
Emergency Provisions and Election Commission: Emergency, Proclamation of Emergency, Types of emergency, Election Commission, Role of Chief Election Commissioner, State Election Commission, Functions of Commissions for the welfare of SC/ST/OBC and women.	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd.. New Delhi
2. Subhash Kashyap, Indian Constitution, National Book Trust.

Reference Books:

1. J. Raj Indian Government and Politics
2. M.V. Pylee, Indian Constitution DurgaDasBasu, Human Rights in Constitutional Law

Online Resources/E-Learning Resources

1. ww.hss.iitb.ac.in/en/lecture-details
2. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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COURSE CURRICULUM

Name of the Program:	BCA			Semester: III		Level: UG	
Course Name	Introduction to Google Services			Course Code/ Course Type		UBC208 A/ OE	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	–
Pre-Requisite: Basic knowledge of Computer							
Course Objectives (CO):	The objectives of Develops are: 1. To Describe the functionalities of cloud based computing utilizing Google apps 2. To understand the knowledge of how to effectively use Google products and services for educational purposes 3. To learn and interact with Google services in real life applications. 4. Skills on using Google Apps efficiently will be obtained from lecture and Practical. 5. To Collaborate and carry out projects using Google Apps.						
Course Learning Outcomes (CLO):	Students would be able to: 1. Students would be able to Identify the purpose and value of Google products and services. 2. Students would be able to recall application deployment environments on Google Cloud: App Engine, Google Kubernetes Engine, and Compute Engine. 3. Students would be able to apply and effectively integrate one or more Google Apps into their teaching and learning. 4. Students would be able to describe ways in which customers have used Google Cloud, Google calendar, Gmail services. 5. Students would be able searching- organizational- communication-and collaboration components of Google Products to help students develop a deeper understanding of how Google can enhance learning among students.						

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Information: Introduction to Google , History of Google, Working of Google search Engine, Introduction to Google Apps And Services, Why Create a Google Account	**CLO 1**	**6**
UNIT II		
Google Mail: Getting started with Gmail, Managing your Gmail efficiency, Getting to inbox zero, Getting connected with Google Hangout	**CLO 2**	**6**
UNIT III		
Google Calendar : Creating an event, Reminder and Notification, Setting appointments with resources, Searching the calendar, Sharing of calendar	**CLO3**	**6**
UNIT IV:		
Google Drive: The Educational Possibilities of Google Drive, Creating Folders and adding files in Google drive. Sharing Documents, Collaborative editing and viewing. Google drive permissions.	**CLO4**	**6**
UNIT V:		
Product Apps in Google Drive: Google Docs, Google Sheets, Google Slides, Google Form to plan events and conduct surveys	**CLO5**	**6**
Total Hours		**30**

Learning resources

Reference Books:

1. Patrice-Anne Rutledge- Sherry Kinkoph Gunter.- (2016),My Google Apps . 2nd Edition Pearson Education.
2. Kyle Brumbaugh- Elizabeth Calhoon- Ramsey Musallam-Robert Pronovost- (2014), Creating a Google Apps

Online Resources/ E- Resources:

1. https://developers.google.com/android/guides/overview
2. https://support.google.com/android/answer/10546414?hl=en
3. https://www.oreilly.com/library/view/google-apps-the/9780596515799/pr04.html

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COURSE CURRICULUM

Name of the Program:		**BCA**		**Semester : III**		**Level: UG**	
Course Name		**Introduction to Ethical Hacking**		**Course Code/ Course Type**		**UBC208B/OE**	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
2	-	-	2	2	20	30	–
Prerequisite: Basic Understanding of Programming Concepts, Knowledge of Hardware and Software							
Course Objectives (CO):		The objectives of Develops are: 1. To Understand ethics and legalities related to hackers 2. To analyze the process of ethical hacking 3. Evaluate different type of attacks and its respective security 4. Understand different vulnerabilities and misconfigurations 5. Understand security risks and it's impact .					
Course Learning Outcomes (CLO):		Students would be able to: 1. Recall and identification of Perform assessment of network, web and system for weaknesses and penetrate if needed 2. Analyze the draft detailed report which includes vulnerabilities, threats, risks and its impact on system hacking. 3. Implement industry standard security protocols to minimize cyber attacks 4. Recall the concept of cryptography. 5. Apply and concur the consequences of cyber attacks.					

Course Contents/Syllabus:

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Information Gathering: What is Ethical Hacking , What are the different types of hackers, Five phases of hacking , Scope of Ethical Hacking , Passie Information Gathering ,Active Information Gathering,Five phases of hacking , Scope of Ethical Hacking	**CLO 1**	**6**
UNIT II		
System Hacking I : Introduction to Metasploit Framework ,Exploit MS17-010 Vulnerability ,Reerse TCP Connection , Privilege Escalation using post exploit bypass and get system, Reverse connection in different network using port forwarding , Android hacking using reverse TCP connection, Show software based vulnerabilities (Badblue/iceblaster)	**CLO 2**	**6**
UNIT III		
System Hacking II : Introduction to Active Directory , Explain OU, DC, TREE, FOREST , Explain LDAP , Explain how AD works , Explain smb share , Explain SPN, Introduction to Kerberos , Explain how Kerberos works (Authentication Server, Ticket Granting Server, TGT etc) , Explain Kerberoasting attack , Mention , ASREPROASTING , Golden Ticket	**CLO3**	**6**
UNIT IV:		
Cryptography: Symmetric Encryption Algorithm, Asymmetric Encryption Algorithm, Hash Algorithm , Steganography	**CLO4**	**6**
UNIT V:		
Wireless Attacks: Explain Wifi attacks (Deauth packets) , Explain Wifi 4 way handshake , Explain the attack scenario and procedure ,Explain fake access point attacks, Explain XSS attacks ,Explain different types of XSS attacks	**CLO5**	**6**
Total Hours		**30**

Learning resources

Reference Books:

1. Hacking: The Art of Exploitation by Jon Erickson
2. 2. The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws by Dafydd Stuttard and Marcus Pinto
3. 3. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy by Patrick Engebretson

Online Resources/E-Learning Resources

1. https://assets.ctfassets.net/kvf8rpi09wgk/5Yy2CMOxlE7eLlsTzFZ333/e656ff09a94ff0b63106de8d300903ac/CEH_Notes.pdf
2. https://medium.com/techloop/reconnaissance-the-key-to-ethical-hacking-3b853510d977
3. https://www.infosecinstitute.com/resources/penetration-testing/process-scanning-and-enumeration/

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COURSE CURRICULUM

Name of the Program:	Foreign Language	Semester : III	Level: UG/PG
Course Name	German A1.1	Course Code/ Course Type	UFL201A/AEC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	2	20	30	-

Pre-Requisite:	
Course Objectives (CO):	The objectives of (German A1.1) are: 1. To remember new words and their spellings. 2. To understand the new concepts. 3. To apply the basic vocab and grammar concepts. 4. To understand the German text. 5. To create basic sentences in German.
Course Learning Outcomes (CLO):	Students would be able to: 1. Spell simple words in German 2. Can understand everyday expressions. 3. Able to frame simple sentences in German language. 4. Can introduce themselves and others. 5. Can answer questions about themselves.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Guten Tag Speak about yourself and others, Speak about Countries and Languages Grammar – Sentence formation and verbs usage	**CLO 1**	**6**
UNIT II		
Freunde, Kollegen und Ich: Speak about your Hobbys, To fix a meeting, Speak about work and Profession, To creat a profile on Internet Grammar – How to use 'The' in german, Singular and plural forms of Nouns	**CLO 2**	**6**
UNIT III		
In der Stadt: To get to know about Cities and Places, how to find way and understand directions, learn international words,Grammar – Negations (how to use NO in german), Definite articles, indefinite articles	**CLO3**	**6**
UNIT IV		
Guten Appetit: To speak about food and food habits, to have a discussion about shopping Grammar – introduction of cases	**CLO4**	**6**
UNIT V		
Tag für Tag & Zeit mit Freunden: Clock timings, To speak about family and friends, Daily routine To speak about free time activity, to understand the specific information from the text, to order and to pay in a restaurantGrammar – Possessivarticle, Modalverbs, use of on,at,from…till, Seprable verbs and past tence	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/E-Learning Resources:

1.Youtubehttps://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lrhttps://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
2. Instagram : instagram.com/learngermanwithanja

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COURSE CURRICULUM

Name of the Program:	**BCA**	**Semester: III**	**Level: UG/PG**
Course Name	Basic Japanese language skill	**Course Code/Course Type**	UFL201B/AEC
Course Pattern	**2024**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/ Oral**
2	--	--	2	30	50	--	--

Pre-Requisite: Desire to get acquainted with the Japanese language.

Course Objectives (CO):	The objectives of Basic Japanese language skill are: 1. To meet the needs of ever-growing industry, with respect to language support. 2. To get introduced to Japanese society and culture through language. 3. To acquire competitive edge in career choices. 4. To participate effectively & responsibly in a multi-cultural world. 5. To enable learners to communicate effectively in Japanese language.
Course Learning Outcomes (CLO):	After learning the course, the students will be able to: 1. Read and Write Hiragana script. 2. Write and Speak basic sentences. 3. Comprehend and speak about time, hobbies, likes and dislikes. 4. Write basic kanji. 5. Use the Hiragana script in discussion.

Course Contents/Syllabus:

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Introduction to Japanese Language – Introduction of script, culture, History of script ,Speaking : Self introduction, listening : short video skit on self-introduction	**CLO 1**	**6**
UNIT II		
Introduction of Hiragana Script -Writing : Hiragana script, Speak : Basic sentences, General vocabulary : Months , Days of the week ,Basic numbers, colours	**CLO 2**	**6**
UNIT III		
Basic Sentence formation: Basic sentence structure : Affirmative and Negative , General vocabulary: about family,	**CLO 3**	**6**
UNIT IV		
Time and verbs – Speaking : Talking about routine, Writing: routine using verbs and time, reading : A clock	**CLO 4**	**6**
UNIT V		
Introduction of Katakana and basic kanji –Reading : English words, country names Writing : Basic Kanji	**CLO 5**	**6**
Total Hours		**30**

Learning resources

Textbook:

1. Minna no Nihongo , " Japanese for everyone" ,Elementary Main Textbook , Goyal Publishers & Distributors Pvt. Ltd.

Reference books:

1. Shyoho Volume 1.
2. Genki Japan
3. Haru Vol. 1 & 2

Online Resources/E-Learning Resources:

Youtube links

1. https://www.youtube.com/watch?v=shdlEapDsP4
2. https://youtu.be/K-nw5EUxDz0?feature=shared
3. https://youtu.be/o9sP-vaCEa0?si=l8yOvVKaItBQWXNu
4. https://youtu.be/JnoZE51WZg4?si=9uq68USOz5plBk2n
5. https://youtu.be/shdlEapDsP4?si=tC6RGaMtwDJgVu2d
6. https://youtu.be/9paXgC2U8L0?si=btS1G4mvrkG5C9zi

Apps

A) Learn Japanese - Hiragana APP available on Google play.
B) Hiragana Pro

BCA REVISED 2024 PATTERN
COURSE DETAILS
Semester - IV

COURSE CURRICULUM

Name of the Program:		BCA		Semester: IV		Level: UG	
Course Name		Advanced Internet Technologies		Course Code/ Course Type		UBC209 / MAJM	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Prerequisite: Basic Web technologies such as HTML, CSS, and JavaScript is required, Knowledge of Python.

Course Objectives (CO):	The objectives of Advanced Internet Technologies are: 1. An Understand the concepts of WWW, HTTP protocol and client-server architecture 2. Get knowledge on Web Pages development (HTML, CSS, Javascript) 3. To Explore the new features of CSS to define and apply CSS rules in the web pages for rich User Interface. 4. Create interactive web pages to improve the user experience using client-side scripting with Javascript. 5. Design and develop the new feature of Node.js Webserver - Server and Clients related things.
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand the concepts of WWW, HTTP protocol and client-server architecture 2. Get knowledge on Web Pages development (HTML, CSS, JavaScript) 3. Explore the new features of CSS to define and apply CSS rules in the web pages for rich User Interface. 4. Create interactive web pages to improve the user experience using client-side scripting with JavaScript. 5. Design and develop the new feature of Node.js Webserver - Server and Clients related things.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
HTML: Basics of HTML5 – Introduction, features, form new elements & attributes in HTML5, HTTP Request and Response, Architecture of web browser, Web server installation and configuration, Web security, CORS, Understanding SEO. Introduction to Scalable Vector Graphics (SVG) Angular JS, Introduction MVC architecture (Model, Controller), Directives 1.7 Filters	**CLO 1**	**9**
UNIT II		
XML : Concept of XML, features of XML ,Writing XML elements, attributes etc., XML with CSS, programs on it.,XML with DSO, programs on it., XML Namespace, XML DTD, programs on it. , XML schemas, writing simple sheet using XSLT ,SAX Parser, DOM Parser ,Introduction to SOAP, Examples on XML	**CLO 2**	**9**
UNIT III		
jQuery : Introduction to jQuery, Syntax Overview ,Anatomy of a jQuery Script, Creating first jQuery , Traversing the DOM, Selecting Elements with jQuery, Refining & Filtering Selections, Selecting Form Elements , Working with Selections - Chaining, Getters & Setters ,CSS, Styling, & Dimensions, Manipulating Elements - Getting and Setting Information about Elements, Moving, Copying, and Removing Elements, Creating New Elements , Manipulating Attributes, Utility Methods ,Events - Connecting Event to Elements, Namespacing Events, Event handling, Triggering Event handlers, Event Delegation ,JQuery Effects –hide/show, fade, slide, animate, callback, stop ,Interactions – Draggable, Droppable, Resizable, Selectable, Sortable ,Widgets - Accordian, Date Picker, Menu, Tabs ,Plugins – Using	**CLO3**	**9**

readymade plugins, Create a basic plugin, Writing Plugins		
UNIT IV:		
AJAX : AJAX Overview, jQuery's AJAX related methods, Ajax and Forms , Ajax Events	**CLO4**	**9**
UNIT V:		
PHP : Obtaining, Installing and Configuring PHP, Introduction • PHP and the Web Server Architecture • Model, Overview of PHP Capabilities,CGI vs. Shared Object Model • PHP HTML Embedding Tags and Syntax ,Simple PHP Script Example ,PHP and HTTP Environment Variables ,PHP Language Core • Variables, Constants and Data Types, and • Operators ,Decision Making , Flow Control and Loops ,Working with Arrays ,Working with Strings and functions • Outputting Data, Include and Require Statements ,File and Directory Access Operations ,Error Handling and Reporting Considerations ,Processing HTML Form Input from the User ,Creating a Dynamic HTML Form with PHP ,Login and Authenticating Users ,Using GET, POST, SESSION, and COOKIE variables	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Introducing HTML5 - Bruce Lawson, Remy Sharp
2. AngularJS - Brad Green, Shyam Seshadri
3. Learning jQuery - Jonathan Chaffer, Karl Swedberg

Reference Books:

1. XML how to program Deitel & Deitel, Pearson Pub.
2. Programming the World Wide Web Robert W. Sebesta,Pearson,4th Ed.
3. HTML5 & CSS3 , Castro Elizabeth 7th Edition
4. Beginning PHP5
5. Complete Ref. PHP
6. Beginning PHP, Apache, MySql web development

Online Resources/E-Learning Resources
Web Security and SEO

https://www.tutorialspoint.com/seo/index.htm
https://github.com/vasanthk/web-security-basics

- **HTML**

https://developer.mozilla.org/en-US/docs/Web/HTML
https://www.w3schools.com/html/
https://www.tutorialspoint.com/html/index.htm

- **CSS**

https://developer.mozilla.org/en-US/docs/Web/CSS
https://www.manning.com/books/css-in-depth
https://www.w3schools.com/css/
https://www.tutorialspoint.com/css/index.htm

- **Java Script**

https://javascript.info/
https://github.com/getify/You-Dont-Know-JS
https://www.w3schools.com/js/
https://www.tutorialspoint.com/javascript/index.htm

- **PHP**

https://www.w3schools.com/php/
https://www.tutorialspoint.com/php/index.htm |

- **Laravel**

https://www.tutorialspoint.com/laravel/index.htm
https://laravel.com/

- **Node.js**

https://www.w3schools.com/nodejs/
https://www.tutorialspoint.com/nodejs/index.htm

COURSE CURRICULUM

Name of the Program:	**BCA**	**Semester: IV**	**Level: UG**
Course Name	**Advanced Internet Technology Lab**	**Course Code/ Course Type**	**UBC210/MAJM**
Course Pattern	**2024**	**Version**	1.0

Teaching Scheme / **Assessment Scheme**

Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	1	-	1	2	25	-	25

Pre-Requisite: Basic Web technologies such as HTML, HTTP, CSS, XML, JavaScript

Course Objectives (CO):	The objectives of Advanced Internet Technologies are: 1. An Understand the concepts of WWW, HTTP protocol and client-server architecture 2. Get knowledge on Web Pages development (HTML, CSS, JavaScript) 3. To Explore the new features of CSS to define and apply CSS rules in the web pages for rich User Interface. 4. Create interactive web pages to improve the user experience using client-side scripting with JavaScript. 5. Design and develop the new feature of Node.js Webserver - Server and Clients related things.
Course Learning Outcomes (CLO):	Students would be able to: 1. An Understand the concepts of WWW, HTTP protocol and client-server architecture 2. Get knowledge on Web Pages development(HTML, CSS, Javascript) 3. Explore the new features of CSS to define and apply CSS rules in the web pages for rich User Interface. 4. Create interactive web pages to improve the user experience using client side scripting with Javascript. 5. Design and develop the new feature of Node.js Webserver - Server and Clients related things.

Course Contents/Syllabus: Practical Plan

Sr No	**Practical Title**	**Week No.**	**Details**	**CLO**	**Hours**
1	To introduce client side scripting with Javascript and DHTML	Week 1	To create a simple student bio-data form using html5 . it should contain the following name (text box), address (multiline text box),gender (radio button male,female),skill sets known (check boxes – c,c++,java,C#etc), extra curricular activities (text box), nationality (combobox) ,submit and reset button.	CLO1	2
		Week 2	Create table structure as given in image using table. Also Create 5 page structures for your website.	CLO1	2
2		Week 3	To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.	CLO1	2
3		Week 4	Design the webpage by applying the different styles using inline, external & internal style sheets.	CLO1	2
4	To introduce server side programming	Week 5	Write a java script program to read .XML file and display data in a neat format.	CLO1	

5	with Java servlets, JSP and PHP	Week 6	To write a Javascript program to define a user defined function for sorting the values in an array. Use HTML5 for user interface.	CLO2	2
7		Week 7/8	To create an html page to demonstrate exception handling in javascript Create an html page named as ―exception.html‖ and do the following. i. within the script tag write code to handle exception a) define a method RunTest() to get any string values(str) from the user and call the method Areletters(str). b) In Areletters(str) method check whether str contain only alphabets (a-z, AZ), if not throw exception. c) Define a exception method Input Exception(str) to handle the exception thrown by the above method. ii. Within the body tag define a script tag to call Runtest() method define	CLO2	2
8	To learn the basic web concepts and Internet protocols	Week 9	Write a jsp servlet program to implement the single text field calculator.	CLO3	2
		Week 10	Write a jsp servlet program to demonstrate session handling using – url rewriting --hidden form field --cookies --sessions	CLO3	2
9	Client side scripting using java sript and DHTML	Week 10/11	To create a php program to demonstrate the different predefined function in array,Math, Data & Regular Expression. Procedure: ➢ Create php file named as Regularexpression.php ➢ for demonstrating the method for handling various strings with regular expression Array.php ➢ for demonstrating the methods for handling the array values Math_function.php ➢ to demonstrate the predefined in math objects. Date_time.php to demonstrate the predefined function in date subject	CLO4	2
10	Able to do server side programming with Java Servelets, JSP and PHP.	Week 12/13	Write a program in PHP for a simple email processing with attachment using forms	CLO5	2
			Write a program for PHP for a login script ; create a login database and store username and password		
		Week 14/15	Create Registration, login, logout system and implement in your website using session in php.	CLO5	2
			Create an admin panel by which admin can add, update and delete user details as well as content		
Total Hours					**30 hrs.**

Learning resources

Online Resources/E-Learning Resources

1. https://faculty.utrgv.edu/emmett.tomai/courses/6312/
2. https://www.lecturenotes.net/home/institute_courses3_lecturenotes/advanced-internet-technologies/1222/1300/1
3. https://aits-tpt.edu.in/wp-content/uploads/2022/06/WP_lab_manual-min.pdf

COURSE CURRICULUM

Name of the Program:	BCA	Semester: IV	Level: UG
Course Name	Core Java	Course Code/ Course Type	UBC211 / MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Prerequisite: Basic Computer Programming with OOPs Concepts

Course Objectives (CO):	The objectives of Develops are: 1. To introduce object-oriented programming concepts. 2. To understand object-oriented programming concepts, and apply them in solving problems. 3. To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes 4. To introduce the implementation of packages and interfaces 5. To introduce the concepts of exception handling and multithreading.
Course Learning Outcomes (CLO):	Students would be able to: 1. Recall real world problems using OOP techniques. 2. Understand the use of abstract classes. · 3. Solve problems using basic concepts of control structures 4. Develop multithreaded applications with synchronization. 5. Design applications involving Object Oriented Programming concepts such as inheritance, association, aggregation, composition, polymorphism, abstract classes and interfaces.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction To Core Java: : History, architecture and its components, Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable, Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.	**CLO 1**	**9**
UNIT II		
Control Flow Statements: : The If…Else If…Else Statement, The Switch…Case Statement Iterations: The While Loop, The Do … While Loop, The For Loop, The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection.	**CLO 2**	**9**
UNIT III		
Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class,	**CLO 3**	**9**

Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces. Packages: Creating Packages, Default Package, Importing Packages, Using A Package.		
UNIT IV		
Enumerations, Arrays: : Two Dimensional Arrays, MultiDimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A II Vector, Working With The Size of The Vector. Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file	**CLO 4**	**9**
UNIT V		
Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout.	**CLO 5**	**9**
Total Hours		**45**

Learning resources

Text Books:

1. "Complete Reference- J2EE", Jim Keogh ISBN-0070529124.
2. "Java 2 Complete Reference", Patric Naughton, Herbert Schildt ISBN-0070495432.

Reference Books:

1. Core Java 2 Volume – I, Cay S Horstmann, Fary Cornell ,ISBN-0130894680.
2. Core Java 2 Volume – II, Cay S Horstmann, Fary Cornell ,ISBN-0131118269.

Online Resources/E-Learning Resources:

1. **https://www.w3schools.com/java/**
2. **https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/pages/lecture-notes/**

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: IV	Level: UG
Course Name	Core JAVA Lab	Course Code/ Course Type	UBC212/MAJM
Course Pattern	2024	Version	1.0

Teaching Scheme / **Assessment Scheme**

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25

Pre-Requisite: Basic OOPs Concepts.

Course Objectives (CO):	The objectives of Develops are: 1. To introduce the object-oriented programming concepts. 2. To understand object-oriented programming concepts, and apply them in solving problems. 3. To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes 4. To introduce the implementation of packages and interfaces 5. To introduce the concepts of exception handling and multithreading.
Course Learning Outcomes (CLO):	Students would be able to: 1. Recall real world problems using OOP techniques. 2. Understand the use of abstract classes. 3. Construct the Inheritance concept to solve the problem 4. Solve problems using java Programs using Enumerations, Arrays 5. Develop Event handling applications by using java Programming.

Course Contents/Syllabus: Practical Plan

Practical No	Practical Title	Week	Details	CLO	Hours
1	Simple Programs without classes and objects, methods	Week 1/Turn 1	Write a java program to find the Fibonacci series using recursive and non-recursive functions. Write a java program to multiply two given matrices.	CLO1	2
2	Program based on the concepts of classes and objects, constructor, parameterized constructor	Week 2	Write a Java program to display the employee details using the Scanner class. Write a Java program that checks whether a given string is palindrome or not.	CLO1	2
3	Abstract Classes, Interface	Week 3	Write a java program to represent Abstract class with example. Write a java program to implement Interface using extends keyword.	CLO 2	2
4	Package	Week4/5	Write a java program to create user defined package. a) Write a java program to create inner classes. b) Write a java program for creating multiple catch blocks.	CLO3	4
5	Single level & Multi level inheritance	Week6/7	Write a program on . Single level Inheritance	CLO3	4

			· Multiple inheritance · Super · Order of Constructor calling · Method overriding		
6	Exception handling	Week8/9	Write Java program(s) which uses the exception handling features of the language, creates exceptions and handles them properly, uses the predefined exceptions, and create own exceptions	CLO3	4
7		Week10/ 11	Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value	CLO4	4
8		Week 12/13	a) Write an applet program that displays a simple message. 123	CLO5	4
9	Event Handling	Week 14	a)Write a program for Java event handling by implementing Action Listener b) Write a program for Java event handling by outer class	CLO5	2
10		Week 15	a)Write a program for Java event handling by anonymous class b) Write a program for Java AWT Button Example	CLO5	2
Total					**30 hrs.**

Learning resources

Text Books :

1. "Complete Reference- J2EE", Jim Keogh ISBN-0070529124.
2. "Java 2 Complete Reference", Patric Naughton, Herbert Schildt ISBN-0070495432.

Reference Books :

1. Core Java 2 Volume – I, Cay S Horstmann, Fary Cornell ,ISBN-0130894680.
2. Core Java 2 Volume – II, Cay S Horstmann, Fary Cornell ,ISBN-0131118269.

Online Resources/E-Learning Resources

1. https://www.javatpoint.com/event-handling-in-java
2. https://www.geeksforgeeks.org/event-handling-in-java/
3. https://www.upgrad.com/tutorials/software-engineering/java-tutorial/event-handling-in-java/

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COURSE CURRICULUM

Name of the Program:	BCA	Semester : IV	Level: UG
Course Name	Software Project Management	Course Code/ Course Type	UBC213A/MAJE
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Prerequisite: Soft skills Leadership, Team Management, Communication

Course Objectives (CO):	The objectives of Software Project Management are: 1. To recall the fundamental concepts of Software development process. 2. To recognize the concepts of system analysis and design for system requirement specification 3. To apply the principles of Coding, Testing, documentation, and project Management 4. To Apply different techniques in monitoring and control of project 5. To evaluate the different modes of communication among people.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify knowledge of the fundamental elements and concepts related to Project Management activities and types of software projects. 2. Analyze the Steps involved in analyzing the Software projects and concepts to meet the estimation of the software Projects. 3. Schedule the activities of the project to get a critical path. 4. Develop an activity network to perform PERT and to get knowledge of Risk Management. 5. Use and apply Visualization techniques for planning the activities related to Software projects..

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction: Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline, Software Engineering Historical Development from Jackson Structured Programming to Agile Development. Use and apply Visualization techniques for planning the activities related to Software projects.	**CLO 1**	**9**
UNIT II		
Project Evaluation And Activity Planning : Step wise approach for planning the software project- Product break down structure for identifying the project activities- Strategic Assessment – Technical Assessment – Cost Benefit Evaluation Techniques – Risk Evaluation Objectives – Project Schedule –Activity based approach- Product based approach- Hybrid approach Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass.	**CLO 2**	**9**
UNIT III		
Risk Management And Monitoring: Nature Of Risk – Types Of Risk – Managing Risk – Software project risk and strategies to reduce the risk- PERT using three estimates. Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned M.C.A. Page 18 Value Analysis	**CLO3**	**9**
UNIT IV		
Control And Organizing Teams: Change Control – Managing Contracts – Introduction – Types Of Contract – Contract Management.Introduction – Understanding Behavior – Organizational Behavior: A Background – Selecting The Right Person For The Job – Working in group- Decision Making- Leadership.	**CLO4**	**9**
UNIT V		

Object Oriented Analysis And Agile Software: Concepts -the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object-oriented construction principles; object-oriented metrics. Concepts of Agile Methods, Extreme Programming; Agile Process Model - Scrum, Feature; Scenarios and Stories.	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Mike Cotterell, Bob Hughes, Rajib Mall - Software Project Management, 2011, 5 THEdition, Tata McGraw-Hill.
2. Roger S. Pressman, Software engineering: a practitioner's approach, Palgrave macmillan, 7th Edition, 2017.

Reference Books:

1. Greg Horine-Project Management Absolute Beginner's Guide, 2012, 3 rd Edition, Que Publishing
2. The Essentials of Modern Software Engineering: Free the Practices from the Method Prisons, Ivar Jacobson, Harold "Bud" Lawson, Pan-Wei Ng, Paul E. McMahon and Michael Goedicke

Online Resources/E-Learning Resources

1. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/
2. https://www.manage.gov.in/studymaterial/PM.pdf
3. https://www.smartsheet.com/content/software-project-management

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COURSE CURRICULUM

Name of the Program:	BCA			Semester: IV		Level: UG	
Course Name	Software Testing			Course Code/ Course Type		UBC213B / MAJE	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-
Prerequisite: would include knowledge of Programming languages, Database concepts, Project life cycle, Testing concepts, testing types							
Course Objectives (CO):	The objectives of Software Testing are: 1. To recall the knowledge of software testing techniques 2. To understand how testing methods can be used as an effective tool in quality assurance of software. 3. To analyze skills to design test case plans for testing software. 4. To Understand the knowledge of the latest testing methods 5. To develop innovative testing methods to apply on applications						
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify various software testing methods and strategies. 2. Understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software. 3. Design test cases and test plans, review reports of testing for qualitative software. 4. Identify various software testing issues and solutions in software unit test; integration, regression, and system testing 5. Develop and execute a testing project for use modern software testing tools to support software testing projects.						

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Software Testing: Basics of Software Testing – faults, errors and failures Testing objectives: -Principles of testing Testing and debugging, Testing metrics and measurements ,Verification and Validation :- Testing Life Cycle, Measurement Theory, Software Measurement and Models, Measurement Scales, Classification of Software Measures, Measurement Framework, Theory of Program Testing, Graph Theory for Testers, Software Complexity, Measuring Internal Product Attributes: Size, Measuring Internal Product Attributes: Structure, Halstead's Software Science, Product Quality Metrics, In-Process Quality Metrics, Software Reliability: Measurement and Prediction.	**CLO 1**	**9**
UNIT II		
Software Testing Strategies & Techniques: Testability - Characteristics lead to testable software. Test characteristics Test Case Design for Desktop, Mobile, Web applications using Excel White Box Testing - Basis path testing, Control Structure Testing. Black Box Testing- Boundary Value Analysis, Equivalence partitioning. Differences between BBT & WBT	**CLO 2**	**9**
UNIT III		
Levels of Testing: A Strategic Approach to Software Testing Test strategies for conventional Software Unit testing Integration testing – Top-Down, Bottom-up integration System Testing – Acceptance, performance, regression, Load/Stress testing, Security testing, Internationalization testing. Alpha, Beta Testing Usability and accessibility testing Configuration, compatibility testing.	**CLO3**	**9**
UNIT IV		
Functional Testing: Test Plan, Test Management, Test Execution and Reporting, Test Specialist Skills, Tester's Workbench and Tool Categories, Test Maturity Model and Test Process Assessment, Debugging & Root Cause Analysis, Software Items, Component & Units, Test Bed, Traceability and Testability, Attributes of Testable Requirements, Test Matrix, Types of Testing Documentation, Verification Testing, Validation Testing, Integration Testing, System and Acceptance Testing, GUI Testing, Regression Testing,	**CLO4**	**9**

Selection, Minimization and Prioritization of Test Cases for Regression Testing, Creating Test Cases from Requirements and Use cases, Software Defects: Origins of Defects, Defect Classes, Defect Repository / Test Design, Defect Repository		
UNIT V		
Higher Order Testing: Object Oriented Testing, Specification Based Testing, Performance Testing, Ad-hoc Testing, Usability and Accessibility Testing, Risk-based Testing, Exploratory Testing, Scenario-based Testing, Random Testing Compatibility Testing, User Documentation Testing, Client–Server System Testing, RAD Testing, Configuration Testing, Testing internal Controls, Multiplatform Environment Testing, Security Testing, Web-based System Testing, Reliability Testing, Efficiency Testing, Maintainability Testing, Portability Testing, Introduction to Performance Testing, Application Performance Testing, Process of Performance Testing, Effective Root-Cause analysis, Testing VS Test Automation, Tool evaluation and selection, Automation team roles, Architectures, Planning and implementing test automation process	**ClO5**	**9**
Total Hours		**45**

Learning resources

Text Books

1. NareshChauhan "Software Testing Principles and Practices",Oxford University Press, 2010
2. Ilene Burnstein, "Practical Software Testing", Springer Verlag International Edition, Springer (India) Pvt Ltd - (Indian reprint edition 2013)

Reference Books:

1. Software Engineering – A Practitioners Approach, Roger S. Pressman, 7 thEdition, Tata McGraw Hill, 20
2. Effective Methods of Software Testing, William E Perry, 3rd Edition, Wiley Publishing Inc
3. Managing the Testing Process: Practical Tools and Techniques for Managing Hardware and Software Testing, Rex Black, Microsoft Press, 1999

Online Resources/E-Learning Resources

1. https://www.guru99.com/software-testing.html
2. https://www.geeksforgeeks.org/software-testing-tutorial/
3. https://www.softwaretestingmaterial.com/

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: IV	Level: UG
Course Name	Constitution of India	Course Code/ Course Type	ACCOI201/AC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	2	50	-	-

Pre-Requisite: Basic Knowledge of Constitution

Course Objectives (CO):	The objectives of Constitution of India are: 1. To familiarize the students with the key elements of the Indian constitution. 2. To enable students to grasp the constitutional provisions and values. 3. To acquaint the students with the powers and functions of various constitutional offices and institutions. 4. To make students understand the basic premises of Indian politics. 5. To make students understand the role of constitution and citizen-oriented measures in a democracy
Course Learning Outcomes (CLO):	Students would be able to: 1. Analyze the basic structure of Indian Constitution. 2. Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution. 3. Know about our Union Government, political structure & codes, procedures. 4. Understand our State Executive & Elections system of India. 5. Access the Amendments and Emergency Provisions, other important provisions given by the constitution

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	**CLO 1**	**6**
UNIT II		
FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building	**CLO 2**	**6**
UNIT III		
Governance and Constitution: Federalism in India - Features , Local Government -Panchayats – Powers and functions; 73rd and 74th amendments, Election Commission – Composition, Powers and Functions; Electoral Reforms, Citizen oriented measures – RTI and PIL – Provisions and significance..	**CLO 3**	**6**
UNIT IV		
Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	**CLO 4**	**6**
UNIT V		
State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution	**CLO 5**	**6**

(How and Why) and Important Constitutional Amendments till today. Emergency Provisions.		
Total Hours		**30**

Learning resources

Text Books

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
2. "Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004

Reference Books:

1. "SamvidhanaOdu" - for Students & Youths by Justice HN NagamohanDhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu):Prentice –Hall, 2008.
4. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks
Activity (with short Report Submission) - 20 Marks
Academic Sincerity - 10 marks
Few of suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.
Few of suggested topics related to Constitution of India are:

Debate Topics

- Rights and duties
- Base of Reservation and need

Assignment

- Characteristics of Constitution
- Working of Constitution

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: IV	Level: UG
Course Name	UHV-II: Understanding Harmony	Course Code/ Course Type	ACUHV201/AC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	2	50	-	-

Pre-Requisite:	
Course Objectives (CO):	The objectives of Universal Human Value- Understanding Harmony are: 1. To train the student for Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. 2. To comprehend (or develop clarity) the harmony in the human being, family, society and nature/existence 3. To strengthen self-reflection. 4. To infuse a sense of commitment and courage to act 5. To understand Holistic Understanding of Harmony on Professional Ethics
Course Learning Outcomes (CLO):	Students would be able to: 1. Analyze the most important requirement for any human being. 2. Apply correct appraisal of Physical needs, meaning of Prosperity in detail. 3. Analyze salient values in relationship, Friends and Foes, Empathy, False Prestige. 4. Develop holistic perception of harmony at all levels of existence. 5. Apply the Holistic Understanding of Harmony on Professional Ethics.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; Personality Traits- Self Excellence, „Natural Acceptance‟ and Experiential Validation- as the process for self-exploration, Adaptability, Belief and Understanding- Self discipline, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.	**CLO 1**	**6**
UNIT II		
Understanding Harmony in the Human Being - Harmony in Myself: Understanding human being as a co-existence of the sentient „I‟ and the material „Body‟, Understanding the needs of Self („I‟) and „Body‟ - happiness and physical facility, Understanding the Body as an instrument of „I‟ (I being the doer, seer and enjoyer)- Habits and Hobbies, SWOT Analysis (Activity) ,Understanding the characteristics and activities of „I‟ and harmony in „I‟ – Dalai Lamas‟ Tibetan Personality Test – Dr. Menninger‟s Psychometric Test., Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail	**CLO 2**	**6**
UNIT III		
Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and	**CLO 3**	**6**

competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Friends and Foes, Empathy, False Prestige.		
UNIT IV		
Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature and its Equanimity, Respect for all, Nature as Teacher, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.	**CLO 4**	**6**
UNIT V		
Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Vision for the Holistic alternatives, UHVs for entrepreneurship	**CLO 5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Reference Books:

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. Small is Beautiful - E. F Schumacher
4. Slow is Beautiful - Cecile Andrews

Online Resources/E-Learning Resources

1. https://www.studocu.com/in/document/jss-science-and-technology-university/human-values/uhv-handout-2-harmony-in-the-human-being/
2. https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf
3. https://vemu.org/uploads/lecture_notes/22_12_2022_1850871704.pdf

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks
Activity (with short Report Submission) - 20 Marks
Academic Sincerity - 10 marks
Few of suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.
Few of suggested topics related to UHVII-Understand Harmony are:

Debate Topics

- Materialistic things make you happy
- Happiness in individualism and family
- Spirituality vs Materialistic
- Satisfaction of Body and self (Soul)

Assignment

1. Students maintain a reflective account of the times they felt happy and prosperous and the causes of that happiness and prosperity for them.

COURSE CURRICULUM

Name of the Program:		**BCA**		**Semester :IV**		**Level: UG**	
Course Name		**Search Engine Optimization**		**Course Code/ Course Type**		**UBS214A/OE**	
Course Pattern		**2024**		**Version**		**1.0**	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
2	-	-	2	-	20	30	-
Prerequisite: Basic Knowledge of Web is required.							
Course Objectives (CO):		The objectives of Search Engine Optimization are: 1. Remember the basics of Google search and other search engines. 2. Illustrate the various types of SEO's 3. Identify the Importance of Technical SEO. 4. Examine the role of Keyword research for various types of search techniques. 5. Discuss On-page and off-page optimization.					
Course Learning Outcomes (CLO):		Students would be able to: 1. Identify the various types of SEO's. 2. Explain the types of tags associated with optimization of technical SEO. 3. Apply knowledge of SEO for competitive analysis on a webpage. 4. Analyze the data to see which content gets the most shares. 5. Create a report of findings and recommendations for SEO.					

Course Contents/Syllabus:

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Search Engine Optimization: Introduction, Working of SEO, Need for SEO, History for SEO, Google Crawler, Types Of SEO technique, Google's SEO Algorithm, strategies for SEO,SEO tools and why we need it.	**CLO 1**	**6**
UNIT II		
Technical SEO: Technical SEO, Type of meta tags and their effect on SEO, Site architecture Optimization, Breadcrumbs, Permalinks optimization, canonicalization, Fixing Broken Links and Errors.	**CLO 2**	**6**
UNIT III		
Keyword Research: Introduction, Importance of Keyword Research, Different types of keywords, Analysis of keywords using Free & Paid Tools, Keywords related to your website and business, Analysis of Keyword Using Chrome Extension.	**CLO3**	**6**
UNIT IV		
Content Planning and Creation: Content Research, Content Structure, Content Planning With Keywords, How to make SEO friendly content using AI tool	**CLO4**	**6**
UNIT V		
On Page SEO: On page SEO checklist, Title Optimization, Content optimization, Cases to be discussed.	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. SEO For Beginners: An Introduction To SEO Basics
2. Entity SEO: Moving from Strings to Things

Reference Books:

1. Search Engine Optimization by Andreas Veglis,Dimitrios Giomelakis
2. SEO For Beginners: An Introduction To SEO Basics.

Online Resources/E-Learning Resources

1. https://mdpi-res.com/bookfiles/book/3418/Search_Engine_Optimization.pdf?v=1713229263
2. https://ahrefs.com/

COURSE CURRICULUM

Name of the Program:	BCA	Semester :IV	Level: UG
Course Name	Introduction to WordPress	Course Code/ Course Type	UBS214B/OE
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	-	20	30	-

Prerequisite: Basic Knowledge of Web is required.

Course Objectives (CO):	The objectives of Introduction to WordPress are: 1. Remember the basics of CMS. 2. To Recognize the need for WordPress. 3. Identify the types of themes in WordPress. 4. Analyze the working of widgets for creating a website. 5. Creating a Webpage by adding Widgets along with Content.
Course Learning Outcomes (CLO):	Students would be able to: 1. To Identify the need for having a CMS. 2. Explain the different types of tools available for creating a CMS. 3. Demonstrate the working of themes in a web page. 4. Integrate the themes,Widgets and Content for creating a web page. 5. Create a Web page by adding widgets and plugins.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Content Management System: Introduction, ECM, WCM, Components of CMS, Features of CMS, Advantages, Disadvantages, Cases.	**CLO 1**	**6**
UNIT II		
WordPress: Introduction, Features, WordPress Advantages, Wordpress.org, WordPress.com, WordPress Admin, Creating Users, User Rights & Roles.	**CLO 2**	**6**
UNIT III		
Themes: Free Theme Vs Paid Theme, Theme Selection Process, Adding/installing Themes, Changing Themes, Preview & Activating Themes	**CLO3**	**6**
UNIT IV		
Working with Widgets: Installing widgets in sidebar, Installing widgets in footer Creating menus, Activating Plugin & managing plugins, Upgrading plugins	**CLO4**	**6**
UNIT V		
Working with Content: Posts Vs Pages, Adding Hyperlinks, Playing with Media content, Previewing and Editing Posts, Previewing and Editing Pages.	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. WordPress For Dummies by Lisa Sabin-Wilson
2. Professional WordPress: Design and Development by Brad Williams, David Damstra, and Hal Stern

Reference Books:

1. Teach Yourself VISUALLY WordPress by George Plumley.
2. Professional WordPress: Design and Development by Brad Williams, David Damstra, and Hal Stern

Online Resources/E-Learning Resources

1. https://www.slainstitute.com/
2. https://www.wpbeginner.com/beginners-guide/beginners-guide-on-how-to-add-a-link-in-wordpress/

COURSE CURRICULUM

Name of the Program:	BCA	Semester: IV	Level: UG/PG
Course Name	Japanese language skill - L2	Course Code/Course Type	UFL201B/AEC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	--	--	2	2	20	30	--

Pre-Requisite: Desire to get acquainted with the Japanese language. Basic knowledge of Hiragana and Katakana.

Course Objectives (CO):	The objectives of Basic Japanese language skill are: 1. To meet the needs of ever-growing industry, with respect to language support. 2. To get introduced to Japanese society and culture through language. 3. To promote multilingualism in exposing students to different cultures 4. Fostering respect for linguistic diversity. 5. Learning additional language to develop a better memory, talent for problem solving, ability to concentrate.
Course Learning Outcomes (CLO):	**After learning the course, the students will be able to:** **1. Read & write words that have been borrowed from other language.** **2. Comprehend and speak basic conversation with basic particles** **3. Speak and write about Routine** **4. Basic sentence patterns incorporated into short dialogues indicating how they are used in actual conversation.** **5. To understand grammatical structure, and improve communication abilities.**

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Katakana ScriptKatakana Script / Writing Kanji	**CLO 1**	**6**
UNIT II		
System of demonstrative words:Minna no Nihongo lesson no. 1,2 & 3	**CLO 2**	**6**
UNIT III		
Minna no Nihongo lesson no. 4 (Write and speak basic sentences in correct tenses)	**CLO 3**	**6**
UNIT IV		
Reading: Basic conversation using particles, Listening : conversation related to particles,Speaking : Sentences about give, lend, teach, receive	**CLO 4**	**6**
UNIT V		
Tenses :Writing : Affirmative present ,past & future ,Negative present ,past,& future sentences ,Writing : About Routine	**CLO 5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

Minna no Nihongo , " Japanese for everyone" ,Elementary Main Textbook , Goyal Publishers & Distributors Pvt. Ltd.

Reference books:

1. **Shyoho** Volume 1
2. Genki Japan
3. Haru Vol. 1 & 2

Online Resources/E-Learning Resources:

You Tube links

1. https://youtu.be/1JephUxTHxg?si=ouCwTXZc_fYgY9Kh
2. https://youtu.be/9EfbkBkF2ag?si=rLNzc55_REacMoGu
3. https://youtu.be/DpEolYasgyg?si=dya9ue-YMSHO3VOG
4. https://youtu.be/itccOS1_LSk?si=hvPqILKlviuncMvA

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COURSE CURRICULUM

Name of the Program:	BCA			Semester: IV		Level: UG	
Course Name	German A1.2			Course Code/Course Type		UFL 202 A/AEC	
Course Pattern	2024			Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	2	20	30	-
Pre-Requisite: Can understand and use familiar, everyday expressions and very simple sentences aimed at satisfying specific needs.							
Course Objectives (CO):				The objectives of (German A1.2) are: 1. To get along with a basic vocab. 2. To understand German day to day culture. 3. Can communicate in routine situations. 4. To be able to have a direct exchange of information about familiar matters. 5. To describe own surroundings.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Communicate in the areas of immediate importance. 2. Able to frame simple sentences in formal conversation. 3. Translate simple sentences from English to the German language and vice-versa. 4. Construct a dialogue, in the German language, for basic human interactions in a social context. 5. Take part in an interaction relating to basic conversation.			

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Kontakte: Planning of letter writing, ramification of Letter, ,writing and understanding, discussion about language learning, find information from texts, understand conversations on various topics, texts related to office life.Grammar – Usage of Articles and Prepositions	**CLO 1**	**6**
UNIT II		
MeineWohnung: Understand home advertisements, describe house, how to reply invitations, how to express 'likes and dislikes', speak about different forms of living, how to write a text on house Grammar – Adjectives	**CLO 2**	**6**
UNIT III		
AllesArbeit?Talk about daily routine, talk about past, understand job advertisements, understand blogs on jobs, express opinions about jobs, prepare telephonic dialogues, speak about jobs Grammar – Past tense, Sentence connectors	**CLO3**	**6**
UNIT IV		
Kleidung und Mode: Speak about cloths and shopping, lead a discussion during cloths shopping, discussion in departmental store, understand and research information about Berlin Grammar – Separable and non-separable verbs	**CLO4**	**6**
UNITV		
Gesund und munter&Ab in den Urlaub: Learn body parts, Health related dialogue, City orientation, Travel reports, discussion regarding different travel destinations and weather Grammar – Imperative, Time adverbs	**CLO5**	**6**
Total		**30 hrs.**

Learning resources

Textbooks:

1. Netzwerk A1, Ernst klettVerlag and Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, CornelesenVerlag and Goyal Publishers & Distributors Pvt. Ltd.
3. NetzwerkNeu A1, Ernst klettVerlag&Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,ErnstKlettVerlag, Goyal Publishers & Distributors Pvt. Ltd
2. ThemenAktuell 1, Hueberverlag
3. Maximal Ernst klettVerlag&Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/E-Learning Resources:

YouTube

1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
3. Instagram :instagram.com/learngermanwithanja

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COURSE CURRICULUM

Name of the Program:	**BCA**			**Semester: Exit Policy**	**Level: UG Certificate**	
Course Name	**PHP and MySQL**			**Course Code/ Course Type**	UCEXIBC101/VSC	
Course Pattern	**2024**			**Version**	1.0	
Teaching Scheme				**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hrs.**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
2	-	-	2	2	50	-	-
Prerequisite: Students should have basic Knowledge of web programming							
Course Objectives (CO):	The objectives of PHP and MySQL are: 1. To remember the knowledge about PHP. 2. To understand and trace the execution of programs written using Function. 3. To apply array and HTML Form using programs in PHP language. 4. To analyze the concepts files and directories in PHP language. 5. To demonstrate database connectivity with MySQL						
Course Learning Outcomes (CLO):	Students will be able to: 1. Remember the knowledge about PHP. 2. Understand and trace the execution of programs written using Function. 3. Apply array and HTML Form using programs in PHP language. 4. Analyze the concept of files and directories in PHP language. 5. Demonstrate database connectivity with MySQL						

Course Contents/Syllabus:

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Introduction to PHP: Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator, and Expression. Decisions and loop: Making Decisions, Doing Repetitive tasks with looping, Mixing Decisions, and looping with HTML.	**CLO 1**	6
UNIT II		
Function in PHP: What is a function, Define a function, Call by value and Call by reference, Recursive function, String Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function	**CLO 2**	**6**
UNIT III		
Array: Anatomy of an Array, Creating index-based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function. **Handling Html Form with Php**: Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.	**CLO3**	**6**
UNIT IV		
Working with files and Directories Understanding file & directory, Opening, and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folders, File Uploading & Downloading. **Session and Cookie** Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering	**CL04**	**6**

Session variables, Destroying the variables and Session.		
UNIT V		
Database Connectivity with MySql: Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query- Join (Cross joins, Inner joins, Outer Joins, Self joins.)	**CLO5**	**6**
Total		**30 Hrs**

Learning resources

Textbooks:

1. PHP and MySQL Web Development (4th Edition), Luke Welling and Laura Thomson, SamsImprint of Simon and Schuster 201 W. 103 St. Indianapolis, IN United States

Reference Books:

1. Learning PHP, MySQL, books by ' O'riley Press

Online Resources/E-Learning Resources:

1. https://www.mysql.com/
2. https://www.w3schools.com/php/

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: Exit Policy	Level: UG
Course Name	Advance C++ Programming	Course Code/ Course Type	UDIEXBC201/VSC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	50	-	-

Prerequisite: Students should have basic Knowledge of C++ Programming.	
Course Objectives (CO):	The objectives of Advance C++ Programming are: 1. To remember the knowledge about C++ templates. 2. Understand and trace the execution of programs by using Exception Handling. 3. To apply Class Design in a Program. 4. To analyze the concepts of Object Storage Management. 5. To demonstrate multiple Inheritance in C++
Course Learning Outcomes (CLO):	Students will be able to: 1. Remember the knowledge about templates. 2. Understand and trace the execution of programs written using Exception handling. 3. Apply the concept of Class for designing a program. 4. Analyze the concept of object storage management for design approach. 5. Demonstrate the use of multiple Inheritances.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Templates: Template Functions and Classes, Instantiation, Overloading Working with Templates, Member Templates, Using export STL (Standard Template Library) Containers and Iterators	**CLO 1**	6
UNIT II		
Exception Handling: Using Exceptions, Exception Formats, Exception, Specifications, Unexpected Exceptions, Uncaught Exceptions, Designing with Exceptions, Exception Hierarchies, Exceptions thrown from Constructors, Exceptions thrown from Destructors, Resource Management	**CLO 2**	**6**
UNIT III		
Class Design: Class Design, Mutable Data Members, Using explicit with Constructors, Member Initialization, Class Design Boilerplate, Copy Initialization and Assignment, Modifiers and Selectors, Clone Functions	**CLO3**	**6**
UNIT IV		
Object Storage Management: New and Delete Formats, No throw Operator new, Explicit Destructor Calls**,** Class Specific New and Delete, Overriding Global Operators, Memory Pools**,** Reference Counts, Design Approach, Implementation	**CL04**	**6**
UNIT V		
Multiple Inheritance: Design Concepts, Member Initialization, Ambiguities, Multiple Inheritance Patterns, Distinct Bases, Multiple Inclusion, Virtual Bases	**CLO5**	**6**
Total		**30 Hrs.**

Learning Resources

Textbooks:

1. Effective Modern C++ by Scott Meyers
2. Beyond the C++ Standard Library: An Introduction to Boost by John Purcell

Reference Books:

1. Modern C++ Design: Andrei Alexandrescu
2. C++ Template Metaprogramming by Bjorne Stroustrup.

Online Resources/E-Learning Resources:

1. **https://www.programiz.com/cpp-programming**
2. https://www.pluralsight.com/courses/adv-cpp

BCA REVISED 2024 PATTERN COURSE DETAILS Semester - V

COURSE CURRICULUM

Name of the Program:	BCA	**Semester: V**	**Level: UG**
Course Name	Advanced Java Programming	**Course Code and Course Type**	UBC301
Course Pattern	**Revised 2024**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite: Students should have a basic concept Core Java.

Course Objectives (CO):	The objectives of this course are to: 1.Equip students with an advanced understanding of Java programming concepts and frameworks. 2. Develop multithreaded applications using Java for concurrent execution and efficient performance. 3. Implement Java Database Connectivity (JDBC) to interact with databases and manage transactions effectively. 4. Design and develop dynamic web applications using Java Servlets and Java Server Pages (JSP). 5. Apply Java networking concepts to create distributed and networked applications.
Course Learning Outcomes (CLO):	Students will be able to: 1.Design and implement advanced Java applications using object-oriented principles. 2.Understand the concept of multithreading and implement multi-threaded applications using Thread class and Runnable interface. 3. Perform CRUD (Create, Read, Update, Delete) operations using JDBC 4. Understand Servlet lifecycle and how to deploy servlets in a web application. 5. Develop distributed applications using Java Remote Method Invocation (RMI).

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I :- Advanced Java Fundamentals and Java I/O		
Java Basics Revision (Inheritance, Polymorphism, Interfaces, Abstract Classes),,Packages and Access Modifiers, Java Collections Framework (List, Set, Map), Java Streams and Lambda Expressions, Advanced Java I/O: File Handling, BufferedReader, PrintWriter, Serialization and Deserialization.	**CLO 1**	9
UNIT II:- Multithreading & Exception Handling		
Java Threads: Creating threads using Thread class & Runnable interface**,** Thread Lifecycle, Thread Synchronization, Inter-thread communication, Concurrency & Executor framework**,** Exception Handling: Try-catch, finally, throws, throw, User-defined Exceptions	**CLO 2**	9

UNIT III :- Java Database Connectivity (JDBC)		
Introduction to JDBC, Types of JDBC drivers, Connecting Java with MySQL/Oracle, Executing SQL queries (Statement, PreparedStatement, CallableStatement), JDBC Transaction Management (Commit & Rollback)	**CLO3**	9
UNIT IV :- **Java Servlets & Java Server Pages (JSP)**		
Introduction to Servlets**,** Servlet Life Cycle & Deployment, Request & Response Handling (GET, POST), Session Tracking (Cookies, HttpSession, URL Rewriting) Introduction to JSP & JSP Life Cycle**,** JSP Elements: Directives, Scripting Elements, Standard Actions, JSP with JDBC for Database Handling.	**CLO4**	9
UNIT V:- Java Networking & RMI (Remote Method Invocation)		
Introduction to Java Networking, Socket Programming (TCP & UDP Sockets) URL, URLConnection & HttpURLConnection Classes, Introduction to RMI (Remote Method Invocation), Creating Remote Interface & Remote Object RMI Architecture & Implementation	**CLO5**	9
Total Hours		45

Learning resources

Textbooks:

1. Java: The Complete Reference, Herbert Schildt, 11th Edition, McGraw-Hill.
2. Core Java Volume II – Advanced Features, **Cay S. Horstmann**, 11th Edition, Pearson Education.

Reference Books:

1. Java How to Program (Early Objects), **Paul Deitel & Harvey Deitel**, 11th Edition, Pearson.
2. Head First Java, **Bryan Basham, Kathy Sierra, Bert Bates**, 2nd Edition, O'Reilly.

Online Resources and E-Learning Resources

1. https://docs.oracle.com/en/java/javase/
3. https://www.w3schools.com/java/

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester: V**	**Level: UG**
Course Name	Advanced Java Programming Lab	**Course Code and Course Type**	UBC302
Course Pattern	Revised 2024	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
-	1	-	1	2	25	-	25

Prerequisite: Students should have a basic concept Core Java.

Course Objectives (CO):	The objectives of this course are to: 1. Apply object-oriented programming (OOP) principles, collections, and Java I/O operations for software development. 2. Develop multi-threaded applications with proper synchronization and exception-handling techniques. 3. Implement Java Database Connectivity (JDBC) for database-driven applications with transaction management. 4. Design and deploy dynamic web applications using Servlets and JSP, including session management. 5. Implement Java networking and distributed computing using Socket Programming and RMI.
Course Learning Outcomes (CLO):	Students will be able to: 1. Apply object-oriented programming (OOP) concepts such as inheritance, polymorphism, interfaces, and abstract classes in Java applications.. 2. Develop multi-threaded applications using Thread class and Runnable interface to achieve parallel execution and Implement exception handling mechanisms (try-catch-finally, throw, throws) and create user-defined exceptions.. 3. Perform CRUD (Create, Read, Update, Delete) operations using Statement, Prepared Statement, and Callable Statement. 4. Develop Servlet-based web applications and JSP-based web applications that interact with databases using JDBC. 5. Develop TCP and UDP-based socket programming applications for network communication and Implement Remote Method Invocation (RMI) for distributed computing applications..

Course Contents and Syllabus: Practical Plan

Practical No.	**Practical Title**	**Week**	**Details**	**CLO**	**Hours**
1	Implementing Inheritance, Polymorphism, and Interfaces.	Week 1	Apply OOP concepts such as inheritance, polymorphism, abstract classes, and interfaces in Java programs.	CLO 1	2
2	Java Collections Framework (List, Set, Map)	Week 2	Implement Java Collections API for managing data efficiently using List, Set, and Map interfaces.	CLO 1	2
3	File Handling and Serialization	Week3	Perform file handling operations and implement object serialization &	CLO1	2

			deserialization in Java.		
4	Creating and Managing Threads	Week4	Develop multi-threaded applications using Thread class and Runnable interface.	CLO2	2
5	Thread Synchronization and Inter-thread Communication	Week5	Apply thread synchronization mechanisms and inter-thread communication for handling concurrency.	CLO2	2
6	Exception Handling in Java	Week6	Implement exception handling techniques using try-catch, finally, throw, and throws.	CLO2	2
7	Establishing JDBC Connection	Week7	Establish a JDBC connection with a MySQL/Oracle database and execute basic queries.	CLO3	2
8	Performing CRUD Operations using JDBC	Week8	Implement CRUD (Create, Read, Update, Delete) operations using JDBC API with Statement and PreparedStatement.	CLO3	2
9	JDBC Transaction Management	Week9	Apply JDBC transaction management techniques using commit and rollback operations.	CLO3	2
10	Creating and Deploying a Java Servlet	Week10	Develop a Servlet-based web application that handles HTTP GET and POST requests.	CLO4	2
11	Implementing Session Management in Servlets	Week11	Implement session tracking techniques in Servlets using Cookies and HttpSession.	CLO4	2
12	JSP with JDBC for Dynamic Web Applications	Weeek 12	Create JSP-based dynamic web applications with database integration using JDBC.	CLO4	2
13	Implementing Socket Programming (TCP Client-Server Communication)	Week13	Develop a TCP-based client-server application using Socket programming.	CLO5	2
14	Implementing URL and HTTP URL Connection in Java	Week14	Write Java programs that interact with the web using URL and HTTPURLConnection**.**	CLO5	2
15	Implementing Java RMI for Remote Communication	Week15	Implement Java RMI (Remote Method Invocation) for distributed computing.	CLO5	2
Total Hours					30 hrs.

Learning resources

Textbooks:

1. *Java: The Complete Reference*, Herbert Schildt, 11th Edition, McGraw-Hill.
2. *Core Java Volume II – Advanced Features*, **Cay S. Horstmann**, 11th Edition, Pearson Education.

Reference Books:

1. *Java How to Program* (Early Objects), **Paul Deitel & Harvey Deitel**, 11th Edition, Pearson.
2. *Head First Java*, **Bryan Basham, Kathy Sierra, Bert Bates**, 2nd Edition, O'Reilly.

Online Resources and E-Learning Resources

1.https://www.javatpoint.com/advanced-java-tutorial
2. https://www.w3schools.com/java/

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester: V**	**Level: UG**
Course Name	Python Programming	**Course Code and Course Type**	UBC303 / MAJM
Course Pattern	Revised 2024	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite:

Course Objectives (CO):	The Objectives of Python Programming are: 1. Understand the fundamental concepts of Python programming and its environment. 2. Illustrate data structures like lists, tuples, sets, and dictionaries for real-world applications. 3. Develop structured and modular Python programs using functions, modules, and exception handling. 4. Analyse object-oriented programming principles and GUI development in Python. 5. Design and optimize Python programs for data handling, file operations, and database integration.
Course Learning Outcomes (CLO):	Students will be able to: 1. Explain Python programming concepts, syntax, and constructs. 2. Illustrate built-in data structures for handling and processing data efficiently. 3. Apply control structures, loops, and functions to solve computational problems. 4. Develop object-oriented programs and graphical user interfaces using Python libraries. 5. Evaluate and integrate file handling and database connectivity in Python applications.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Introduction to Python Programming: Introduction to Python, Features, Installation, and Python IDEs, Basic Syntax, Variables, Data Types, and Operators Input/Output operations and Type Conversion, Control Statements: Conditional Statements (if-else), Loops (for, while), Loop manipulation using pass, continue, break and else	**CLO 1**	**9**
UNIT II		
Data Structures in Python: Lists: Definition, Slicing, Methods, List Comprehensions, Tuples: Definition, Operations, and Applications, Sets: Definition, Operations, and Use Cases, Dictionaries: Creating, Manipulating, and Dictionary	**CLO 2**	**9**

Comprehensions, Iterators and Generators		
UNIT III		
Functions, Modules, and Exception Handling: Introduction to Functions: Built-in Functions & User-defined Functions, Defining and Calling Functions, Function Arguments, and Recursion, Anonymous Functions, Modules and Packages: Importing and Creating Modules, Exception Handling: try, except, finally, raise, Decorator	**CLO3**	**9**
UNIT IV		
Object-Oriented Programming (OOP) & GUI in Python: Classes and Objects, Constructors & Destructors, Inheritance, Polymorphism, and Method Overriding, Encapsulation and Data Abstraction, GUI Programming using Tkinter (Widgets, Layouts, Event Handling), Introduction to PyQt	**CLO4**	**9**
UNIT V		
File Handling and Database Connectivity: File Handling: Reading and Writing Files (Text, CSV, JSON), File Operations: Append, Modify, Delete, Database Connectivity using SQLite & MySQL, Performing CRUD Operations	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Mark Lutz, *Learning Python*, O'Reilly Media, 5th Edition.
2. Paul Barry, *Head First Python*, O'Reilly Media, 2nd Edition.
3. Reema Thareja, *Python Programming: Using Problem Solving Approach*, Oxford University Press.

Reference Books:

1. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, 2nd Edition, O'Reilly Media.
2. Wesley Chun, *Core Python Applications Programming*, Pearson, 3rd Edition.
3. David Beazley & Brian K. Jones, *Python Cookbook*, O'Reilly Media.

Online & E-Learning Resources:

1. **Official Python Documentation:** https://docs.python.org/3/
2. **Python for Beginners (W3Schools):** https://www.w3schools.com/python/
3. **Python Course (GeeksforGeeks):** https://www.geeksforgeeks.org/python-programming-language/

MOOCs & Online Courses:

1. Coursera: 'Python for Everybody' by University of Michigan
2. Udemy: 'Complete Python Bootcamp: From Zero to Hero'
3. edX: 'Introduction to Python' by Microsoft

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: V	Level: UG
Course Name	Python Programming Lab	Course Code/ Course Type	UBC304/MAJM
Course Pattern	Revised 2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25

Prerequisite: Basic Knowledge of Computers are required.

Course Objectives (CO):	The Objectives of Python Programming are: 1. To introduce students to Python programming basics, including syntax, data types, and control structures. 2. To enable students to write modular and reusable programs using functions, recursion, and exception handling. 3. To familiarize students with Python's built-in data structures (lists, tuples, dictionaries, sets) and their applications. 4. To expose students to object-oriented programming concepts such as classes, objects, inheritance, and polymorphism using Python. 5. To provide hands-on experience in file handling, GUI development using Tkinter, and database connectivity using SQLite.
Course Learning Outcomes (CLO):	Students would be able to: 1. Demonstrate proficiency in writing Python programs using variables, data types, control structures, and loops. 2. Apply Python functions, recursion, and exception handling to develop modular and error-resilient programs. 3. Implement and manipulate Python's data structures (lists, tuples, dictionaries, sets) to solve programming problems 4. Design object-oriented solutions using Python classes, objects, inheritance, and polymorphism. 5. Develop Python applications incorporating file handling, GUI elements using Tkinter, and database operations using SQLite.

Course Contents/Syllabus: Practical Plan

Activity Number	Assignment/Practical/Activity Title	Week Number	Details	CLO	Hours
1	Introduction to Python	Week 1	• Writing basic Python scripts • Understanding variables, data types, and I/O operations	CLO1	2
2	Control Structures	Week 2	• Implementing if-else, elif, and nested conditions.	CLO1	2
3	Control Structures	Week 3	• Using loops (for, while) with break, continue, pass	CLO1	2

4	Working with Lists and Tuples	Week 4	• Performing operations on lists (slicing, sorting, list comprehension) • Implementing tuples for immutable data storage.	CLO2	2
5	Dictionaries and Sets	Week 5	• Implementing dictionaries for key-value data storage • Using sets for unique data handling and mathematical operations	CLO2	2
6	Iterators, Generators	Week 6	• Using iter() and next() for iteration • Creating generators with yield	CLO2	2
7	Functions	Week 7	• Implementing user-defined functions and recursion • Anonymous function	CLO3	2
8	Exception Handling	Week 8	• Using try-except-finally for error handling	CLO3	2
9	Modules and Packages	Week 9	• Creating custom modules and importing built-in libraries • Using standard modules like math, random, datetime • Implementing decorators to modify functions	CLO3	2
10	Object-Oriented Programming	Week 9 & 10	• Implementing classes and objects • Using constructors, destructors, inheritance, and polymorphism	CLO4	4
11	GUI Development using Tkinter	Week 11	• Designing a GUI application with buttons, labels, and input fields • Handling events using Tkinter	CLO4	2
12	File Handling in Python	Week 12 & Week 13	• Reading and writing text, CSV, and JSON files • Performing file operations (append, modify, delete)	CLO5	4
13	Database Connectivity using SQLite	Week 14 & Week 15	• Connecting Python with SQLite • Performing CRUD operations on databases	CLO5	4
Total Marks					**30 hrs**

Learning resources

Textbooks:

1. Mark Lutz, *Learning Python*, O'Reilly Media, 5th Edition.
2. Paul Barry, *Head First Python*, O'Reilly Media, 2nd Edition.
3. Reema Thareja, *Python Programming: Using Problem Solving Approach*, Oxford University Press.

Reference Books:

1. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, 2nd Edition, O'Reilly Media.
2. Wesley Chun, *Core Python Applications Programming*, Pearson, 3rd Edition.
3. David Beazley & Brian K. Jones, *Python Cookbook*, O'Reilly Media.

Online & E-Learning Resources:

1. **Official Python Documentation:** https://docs.python.org/3/
2. **Python for Beginners (W3Schools):** https://www.w3schools.com/python/
3. **Python Course (GeeksforGeeks):** https://www.geeksforgeeks.org/python-programming-language/

MOOCs & Online Courses:

1. Coursera: 'Python for Everybody' by University of Michigan
2. Udemy: 'Complete Python Bootcamp: From Zero to Hero'
3. edX: 'Introduction to Python' by Microsoft

COURSE CURRICULUM

Name of the Program:	BCA	**Semester: V**			**Level: UG**		
Course Name	Competitive Mathematics	**Course Code and Course Type**			UBC306		
Course Pattern	**Revised 2024**	**Version**			1.0		
Teaching Scheme: Theory				**Assessment Scheme:**			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-
Prerequisite:							
Course Objectives (CO):	**The objectives of:** 1. Develop mathematical reasoning and problem-solving skills essential for competitive exams. 2. Strengthen understanding of quantitative aptitude and numerical ability. 3. Enhance proficiency in logical reasoning and data interpretation. 4. Introduce advanced mathematical topics for competitive problem solving. 5. Prepare students for real-world applications of mathematics in various competitive scenarios.						
Course Learning Outcomes (CLO):	**Students will be able to:** 1. Apply mathematical reasoning and quantitative aptitude to solve problems. 2. Solve advanced numerical ability questions efficiently. 3. Analyze and interpret data for logical reasoning and decision-making. 4. Utilize advanced techniques in algebra, geometry, and number theory for competitive problem solving. 5. Demonstrate proficiency in time management and problem-solving strategies in mock tests.						

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I - Basics of Quantitative Aptitude		
Number systems: Properties, divisibility rules, and remainders. Percentages, profit and loss, ratio and proportion. Simple and compound interest, time and work, time and distance. Tricks for quick calculations and approximations.	**CLO 1**	9
UNIT II - Numerical Ability and Logical Reasoning		
Series and sequences: Arithmetic, geometric, and special sequences. Simplifications and approximations. Logical reasoning: Syllogisms, puzzles, seating arrangements, and	**CLO 2**	9

blood relations. Analytical reasoning: Cause and effect, assumptions, and conclusions.		
UNIT III - Data Interpretation and Analysis		
Introduction to data representation: Tables, charts, graphs, and caselets. Speed and accuracy in solving DI problems. Statistical analysis: Mean, median, mode, and standard deviation. Probability and permutations and combinations.	**CLO3**	9
UNIT IV - Advanced Mathematics for Competitions		
Algebra: Linear and quadratic equations, inequalities. Geometry: Triangles, circles, and polygons; mensuration. Trigonometry: Basic identities, heights, and distances. Number theory: Prime numbers, HCF/LCM, and modular arithmetic.	**CLO4**	9
UNIT V - Competitive Problem Solving and Strategies		
Mock tests and time management strategies. Common patterns and shortcuts in competitive exams. Practice sessions: Questions from competitive exams like GRE, CAT, GMAT, and UPSC. Evaluation and feedback: Identifying strengths and areas of improvement.	**CLO5**	9
Total Hours		45

Learning resources

Textbooks:

1. "Discrete Mathematics" by N. Chandrasekaran and M. Umaparvathi
2. "Data Structures and Algorithm Analysis in C" by Mark Allen Weiss
3. "Engineering Mathematics" by K.A. Stroud (covers applied mathematics topics useful for computer applications).
4. "Object-Oriented Programming and Software Engineering" by Timothy Budd (mathematical aspects in programming).

Reference Books:

1. **Discrete Mathematics**
   - "Discrete Mathematics and Its Applications" by Kenneth H. Rosen
   - "Elements of Discrete Mathematics" by C.L. Liu and D.P. Mohapatra
2. **Mathematical Logic**
   - "Introduction to Mathematical Logic" by Elliott Mendelson
   - "A Mathematical Introduction to Logic" by Herbert B. Enderton
3. **Graph Theory**
   - "Introduction to Graph Theory" by Douglas B. West
   - "Graph Theory" by Reinhard Diestel
4. **Linear Algebra**
   - "Linear Algebra and Its Applications" by Gilbert Strang
   - "Introduction to Linear Algebra" by Serge Lang
5. **Probability and Statistics**
   - "A First Course in Probability" by Sheldon Ross
   - "Probability and Statistics for Engineers and Scientists" by Ronald E. Walpole
6. **Algorithms**
   - "Introduction to Algorithms" by Cormen, Leiserson, Rivest, and Stein (CLRS)
   - "Algorithm Design" by Jon Kleinberg and Éva Tardos
7. **Competitive Mathematics**

- *"How to Solve It by Computer"* by R.G. Dromey
- *"Mathematics for Computer Science"* by Eric Lehman, F. Thomson Leighton, and Albert R. Meyer (available online via MIT OpenCourseWare).

Online Resources and E-Learning Resources:

Online Resources

1. **General Mathematics and Competitive Preparation**
   - **Brilliant:** www.brilliant.org
     Offers interactive lessons on logic, algorithms, and discrete mathematics.
   - **GeeksforGeeks:** www.geeksforgeeks.org
     Focus on algorithms, data structures, and mathematical concepts for programming.
   - **Khan Academy:** www.khanacademy.org
     Covers discrete mathematics, probability, and statistics.
2. **Algorithm and Data Structures Practice**
   - **LeetCode:** www.leetcode.com
     Practice problems with mathematical algorithms.
   - **Codeforces:** www.codeforces.com
     Competitive programming with math-based problems.
   - **HackerRank:** www.hackerrank.com
     Mathematics and algorithms-focused practice.
3. **Graph Theory and Discrete Mathematics**
   - **MIT OpenCourseWare (Discrete Mathematics):** Discrete Mathematics Course
   - **CS50 by Harvard University:** CS50 Introduction to Computer Science
     Includes modules on logic, graph theory, and problem-solving.

E-Learning Platforms

1. **edX:** Courses on discrete mathematics, graph theory, and algorithms offered by top universities.
2. **Coursera:** Courses like "Discrete Mathematics" by UC San Diego and "Introduction to Logic" by Stanford University.
3. **Udemy:** Offers practical courses on competitive programming and mathematical concepts for computer science.
4. **NPTEL (India):** Free online courses on discrete mathematics, probability, and graph theory for computer science students.

E-Leaning and Practice Apps

1. **Microsoft Math Solver:** Solves equations, provides step-by-step explanations, and offers practice problems.
2. **Wolfram Alpha:** An advanced computational engine for solving mathematical problems.
3. **Photomath:** Helpful for basic problem-solving and understanding equations.
4. **Mathway:** A versatile tool for solving algebra, calculus, and statistics problems.

COURSE CURRICULUM

Name of the Program:	BCA	**Semester: V**	**Level: UG**
Course Name	User Interface and User Experience Design (MOOC)	**Course Code and Course Type**	UBCM109
Course Pattern	Revised 2024	**Version**	1.0

Teaching Scheme				**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2			2	2	25		25

Prerequisite: No prior experience is required to get started.

Course Objectives (CO):	The objectives of: 1. Explain core principles of UX, Human-Centered Design, design thinking frameworks, UX roles, and user research methods. 2. Analyze user needs to generate design solutions using ideation techniques, storyboarding, and information architecture. 3. Create interactive prototypes using wireframes, mockups, prototyping tools, and apply design systems and style guides. 4. Apply foundational UX concepts, like user-centered design, accessibility, and equity-focused design 5. Create a professional UX portfolio, including end-to-end projects, so that you're ready to apply for jobs
Course Learning Outcomes (CLO):	Students will be able to: 1. Describe UX principles, Human-Centered Design, design thinking frameworks, and UX team roles and research methods. 2. Analyze user needs to generate design ideas using ideation techniques, storyboarding, and information architecture. 3. Develop interactive prototypes using wireframes, mockups, prototyping tools, and apply design systems and style guides. 4. Create high-fidelity mockups using visual design principles that align with platform standards and ensure accessibility. 5. Apply and Create each step of the UX design thinking framework (empathize, define, ideate, prototype, test) to create a project focused on social good.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Introduction to User Experience Design: - Introduction to the Microsoft UX Design Professional Certificate, Fundamentals of UI/UX Design, Figma Fast Track: Follow-Along Video, Overview of UX Design, The Power of Visuals in UX, UX Design as a Win-Win Proposition, The UX Designer's Career Journey, Creating a Seamless User Journey, Design Principles in Practice	**CLO 1**	6

UNIT II		
Introduction to Roles in a UX Design Team: A Day in the Life of a UX Designer, Insights from UX Designers: Confessions and Experiences, Understanding the UX Team Structure: The UX Team Orchestra, Clarifying UX and UI Job Titles, The UX Dream Team in Action, Collaboration Strategies for UX Teams	**CLO 2**	6
UNIT III		
Frameworks and process:- Introduction to UX Design Frameworks and Process, Understanding Frameworks in UX Design, Applying the User-Centered Design (UCD) ,Framework to a UX Problem, Overview of Design Thinking, Applying Design Thinking in UX/UI Design, Design Thinking in Action, Understanding UX Deliverables, Creating Wireframes Using Popular Tools	**CLO3**	6
UNIT IV		
Build wireframes and Low Fidelity Prototypes: - Information Architecture, User Experience Design using Figma (Design Software), User Interface and User Experience (UI/UX) Design: User Centered Design, Storyboarding: Wireframing, User Flows	**CLO4**	6
UNIT V		
Building An Online Presence:- Exploring Personal Branding for UX Designers, Using Writing Best Practices in a UX Portfolio, Building an Online Presence as a UX Professional, Creating or Updating Social Media Profiles, Engaging with UX Design Communities, Networking and Finding a UX Mentor, Understanding and Overcoming Impostor Syndrome	**CLO5**	6
Total Hours		30

Learning resources

Textbooks:

1. The Elements of User Experience: User-Centered Design for the Web and Beyond, 1 Jesse James Garrett
2. Designing and Prototyping Interfaces with Figma, Fabio Staiano

Online Resources and E-Learning Resources

LEARNING WEBSITES & PORTAL

Sr. No	Link / Portal	Description
1	https://aim.gov.in/pdf/Design_Thinking.pdf	Design thinking phases and learning resources
2	https://www.ideou.com/pages/design-thinking-resources	Design thinking resources
3	https://www.figma.com/resource-library/what-is-design-thinki ng/	Design thinking and its stages
4	https://www.figma.com/resource-library/what-is-ui-design/	Key elements of UI design
5	https://youtu.be/-wzNTPXVIyM?si=zET5z3GpIPl-cAry	User Experience and research methods
6	https://youtu.be/XT152i5asdQ?si=jPdLFFExnaZO8NRs	User Experience and research methods
7	https://usabilitypost.com/2008/08/14/using-light-color-and-c ontrast-effectively-in-ui-design/	Using Light, Color and Contrast Effectively in UI Design
8	http://web.cs.wpi.edu/~matt/courses/cs563/talks/smartin/int_ design.html	Effective Visual Communication for Graphical User Interfaces
9	https://youtu.be/Y9ixRTTx5iU?si=vSCsbCr6	Visual Communication Design

	gXD5eG-n	
10	https://youtu.be/K-DRTBMnzm8?si=DaUPM4iLW2CU3oSU	Low fidelity design
11	https://youtu.be/KCYLE78w074?si=xZsvSnO9qx7iVE2S	High fidelity design
12	www.figma.com	Figma - Design Tools - Figma and FigJam (Freeware)
13	https://www.figma.com/resource-library/design-basics/	Design basics using Figma (Freeware)
14	https://wireframe.cc/	Single-page, public wireframe without user account available in free version.
15	https://drive.google.com/file/d/1Od0G1mtlRHz5LkxgT3GPr7wDEIw 7GV05/view	Design Thinking and user experience research (Notes by NPTEL)
16	https://www.mindmeister.com/	Collaborative mind mapping tool
17	https://miro.com/	UX tool
18	https://www.hotjar.com/	UIUX tool

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COURSE CURRICULUM

Name of the Program:	**BCA**			**Semester: V**		**Level: UG**	
Course Name	**Database Design and Development**			**Course Code/ Course Type**		UBC305A/MAJE	
Course Pattern	Revised 2024			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hrs.**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	-	3	3	40	60	-
Prerequisite: Students should have a basic concept database.							
Course Objectives (CO):				The objectives of Database Design and Development are: 1. To Understand the fundamentals of the relational data model. 2. To describe Database development life cycle and its environment. 3. To Implement constraints using SQL to enforce data integrity. 4. To Analyze different concepts associated with No SQL databases. 5. Evaluate the design of Enhanced Data Models used in databases.			
Course Learning Outcomes (CLO):				Students would be able to: 1. Define the fundamental concepts of the relational data model and its Constraints. 2. Explain the importance of conceptual data modeling in database design. 3. Construct relational schemas based on ERDs, ensuring that they reflect accurate data modeling. 4. Analyze the key characteristics and differences between NoSQL and traditional relational databases. 5. Assess the applicability of enhanced data models to different real-world scenarios and problem domains.			

Course Contents and Syllabus:

UNIT I	**CLO**	**Hours**
Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas, Update operations, anomalies, dealing with constraints, Object and Object-Relational Databases: Overview of Object Database Concepts, Object Database Extensions to SQL, The ODMG Object Model.	**CLO1**	**9**
UNIT II		
Conceptual Data Modeling & Database environment: Database system development life cycle, Requirements collection, Database design, Entity-Relationship model, Enhanced-ER model, UML class diagrams. **Cases to be Covered.**	**CLO2**	**9**
UNIT III		
Relational Database Design and Normalization: EER-to-Relational mapping, Update anomalies, Functional dependencies, Inference rules, Properties of relational decomposition, Normalization.	**CLO3**	**9**

Case studies to be Covered.		
UNIT IV		
NOSQL Databases: Introduction to NOSQL Systems, The CAP Theorem, Document Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j. **Cases to be Covered.**	**CLO4**	**9**
UNIT V		
Enhanced Data Models: Temporal, Spatial, Multimedia, and Deductive Databases, Active Database Concepts, Introduction to Information Retrieval and Web Search and Information Retrieval (IR) Concepts. **Cases to be Covered.**	**CLO5**	**9**
Total		**45 hrs**

Books and References:

Text Books

1. Fundamentals of Database Systems, Elmasri and Navathe, Pearson Education2013.
2. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill, 3rd Edition, 2013.

Reference Books

1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, "Database Modeling and Design - Logical Design", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation,and Management, Ninth Edition, Cengage learning, 2012

Web links and Video Lectures (e-Resources):

1. https://link.springer.com/book/10.1007/978-3-7091-2704-9
2. https://www.youtube.com/watch?v=ywTn9qHyI9I
3. https://www.youtube.com/watch?v=_qbKMdqQS6E
4. https://www.youtube.com/watch?v=PqPkYmRSQ_w

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COURSE CURRICULUM

Name of the Program:	**BCA**	**Semester: V**	**Level: UG**
Course Name	**Business Intelligence**	**Course Code and Course Type**	UBC305B/MAJE
Course Pattern	**Revised 2024**	**Version**	1.0

Teaching Scheme				**Assessment Scheme**			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite: Data Mining, Knowledge of probability theory, statistics, and programming

Course Objectives (CO):	The objectives of: 1. Understand the fundamental concepts and importance of Business Intelligence. 2. Learn data warehousing, ETL processes, and data integration techniques. 3. Develop knowledge of data mining, analytics, and reporting techniques. 4. Gain hands-on experience with BI tools and data visualization. 5. Understand security, privacy, and ethical aspects of BI implementation.
Course Learning Outcomes (CLO):	Students will be able to: 1. To Understand Define Business Intelligence and its importance. 2. To Implement the ETL process for data transformation and loading. 3. To Evaluate data mining techniques for business decision-making. 4. To Apply SQL queries for business data analysis. 5. To Develop a BI project using visualization tools.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Introduction to Business Intelligence:- Introduction to Business Intelligence (BI) Evolution and Need for BI,Data, Information, and Intelligence,BI vs. Data Analytics vs. Data Science,BI Applications in Various Industries,BI Architecture and Framework,BI Components: Data Sources, ETL, Data Warehousing, Analytics, Visualization	**CLO 1**	9
UNIT II		

Data Warehousing and ETL Process:- Introduction to Data Warehousing, Data Warehouse Architecture: Star Schema & Snowflake Schema, OLAP (Online Analytical Processing) – Types and Operations, Extract, Transform, Load (ETL) Process, Data Cleaning, Integration, and Preprocessing, ETL Tools Overview (Informatica , Talend, Microsoft SSIS)	**CLO 2**	9
UNIT III		
Data Mining and BI Analytics:- Introduction to Data Mining and Its Role in BI, Data Mining Techniques: Classification, Clustering, Association Rules, Business Analytics: Descriptive, Predictive, and Prescriptive Analytics, Machine Learning Concepts in BI, Key Performance Indicators (KPI) and Metrics Analysis, Case Study on Data Mining in Business Intelligence	**CLO3**	9
UNIT IV		
BI Tools and Visualization:- Introduction to BI Tools (Power BI, Tableau, Google Data Studio),Data Visualization Principles and Best Practices, Creating Interactive Reports and Dashboards, SQL for Business Intelligence, Aggregate Functions, Joins, Sub queries, Writing Queries for Data Analysis, Cloud BI and Big Data (AWS, Google Cloud, Microsoft Azure)	**CLO4**	9
UNIT V		
BI Implementation, Security, and Future Trends:- Business Performance Measurement and Reporting, Balanced Scorecard & Performance Metrics, BI Security, Privacy, and Ethical Considerations, Data Governance, GDPR, and Compliance in BI, Challenges in BI Implementation, Future Trends in Business Intelligence, Case Study :- Develop a BI Dashboard using Power BI/Tableau	**CLO5**	9
Total Hours		**45**

Learning resources

Textbooks:

1. David Dietrich, Barry Hiller, "Data Science & Big Data Analytics", EMC education services, Wiley publications, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.

Reference Books:

1. Business Intelligence – Data Mining and Optimization for Decision Making – Carlo Vercellis – Wiley Publications.
2. Big Data & Analytics – Seema Acharya & Subhashini Chellappan – Wiley Publications
3. Big Data (Black Book) – DT Editorial Services – Dreamtech Press.

BCA REVISED 2024 PATTERN COURSE DETAILS Semester - VI

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester: VI**	**Level: UG**
Course Name	Design Analysis of Algorithm	**Course Code and Course Type**	UBC308/MAJ
Course Pattern	**Revised 2024**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	-	-	2		20	30	

Prerequisite:	
Course Objectives (CO):	The objectives of Design Analysis of Algorithm are: 1. To Describe the fundamentals of Algorithms. 2. Solve problems using the Divide and Conquer strategy. 3. Develop solutions using Greedy and Dynamic programming and compare both. 4. Classify the methods for Backtracking Strategy. 5. To Evaluate NP Complete and NP Hard Problems.
Course Learning Outcomes (CLO):	Students will be able to: 1. Students will be able to understand the Basics Algorithms and types. 2. Divide the problem into two or more sub-problems of the same or related type. 3. Apply knowledge of different algorithm design techniques for a given problem. 4. Analyze different algorithm design techniques. 5. Examine the techniques to account for the true cost of the computation.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Introduction to Algorithms: Fundamentals of Algorithm, Asymptotic Notations and their Properties, Time and Space Complexity, Union and Find Algorithms, Sorting in Linear Time, Tower of Hanoi.	**CLO 1**	**6**
UNIT II		
Divide And Conquer: Divide and Conquer General Strategy, Exponentiation, Binary Search, Quick Sort, Merge Sort, Heaps and Heap Sort.	**CLO 2**	**6**
UNIT III		
Greedy Method and Dynamic Programming: Knapsack Problem, Job sequencing with Deadlines, Optimal Merge Patterns, Minimal Spanning Trees-Prim's Algorithms, Kruskal's Algorithms, Travelling Salesman Problem.	**CLO 3**	**6**
UNIT IV		
Backtracking: Backtracking: General Strategy, N- Queen's Problem, Graph Coloring,	**CLO4**	**6**

The Maximum Matching Problem, Maximum Matching in Bipartite Graph, Stable Marriage Problem.		
UNIT V		
NP-Complete and NP-Hard Problems: Basic Concepts of P, NP, NP Complete and NP Hard Problems, Hamiltonian Cycle, LIFO and FIFO Search, Assignment Problem.	**CLO5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. AnanyLevitin, ―Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2017.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.

Reference Books:

1. "Fundamental of Algorithm" Bressard, PHI
2. "Fundamentals of computer Algorithms" Horowitz/Sahani, Galgotia
3. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Pearson Education

Online Resources and E-Learning Resources

1. https://soumadip.github.io/courses/DAA/
2. https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms

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COURSE CURRICULUM

Name of the Program:	BCA	Semester: VI	Level: UG
Course Name	Research Methodologies and Techniques (MOOC)	Course Code/ Course Type	UBCM110
Course Pattern	Revised 2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	25	-	25

Prerequisite: Anyone can take this course with basic knowledge of English communication

Course Objectives (CO):	The objectives of Research Methodologies and Techniques are: 1. Provide fundamental knowledge of research methodologies. 2. Develop analytical skills for conducting systematic research. 3. Enhance understanding of qualitative and quantitative research techniques. 4. Introduce research ethics, literature review, and citation methods. 5. Enable students to apply research tools for problem-solving and decision-making.
Course Learning Outcomes (CLO):	Students would be able to: 1. Explain the concept, purpose, and significance of research. 2. Apply research techniques in academic and professional settings. 3. Conduct literature reviews and apply proper citation methods. 4. Differentiate between qualitative and quantitative research methodologies. 5. Develop and present a structured research proposal.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Research Methodology: Definition and importance of research, Types of research (exploratory, descriptive, analytical, applied), Research process and characteristics of good research	**CLO 1**	**6**
UNIT II		
Research Design and Sampling Techniques: Research design types, Formulating research problems, Hypothesis development, Sampling methods and data collection techniques	**CLO 2**	**6**
UNIT III		
Literature Review and Citation Techniques: Importance of literature review, Searching academic sources, Referencing and plagiarism, Citation styles (APA, MLA, IEEE)	**CLO3**	**6**
UNIT IV		
Qualitative & Quantitative Research Methods: Overview of qualitative and quantitative approaches, Data analysis techniques, Survey design, Interview techniques	**CLO4**	**6**
UNIT V		
Research Proposal and Ethical Considerations: Writing a research proposal, Ethical principles in research, Institutional Review Boards (IRB), Presenting research findings effectively	**CLO5**	**6**
Total Hours		**30 hrs.**

Learning resources

Textbooks:

1. **Research Methodology: A Step-by-Step Guide for Beginners** – Ranjit Kumar
2. **Business Research Methods** – Donald R. Cooper & Pamela S. Schindler

Reference Books:

1. **The Craft of Research** – Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams
2. **Qualitative Inquiry and Research Design: Choosing Among Five Approaches** – John W. Creswell

Online Resources:

- **Coursera:** Research Methods
- **MIT OpenCourseWare:** Introduction to Research Methods
- **Google Scholar:** https://scholar.google.com/

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COURSE CURRICULUM

Name of the Program:	**BCA**	**Semester: VI**	**Level: UG**
Course Name	**Cloud Computing Security (MOOC)**	**Course Code and Course Type**	UBCM111
Course Pattern	**Revised 2024**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA(End Semester Assessment)**	**Practical and Oral**
-	-	-	2	30	25	-	25

Prerequisite:

Course Objectives (CO):	The objectives of: 1. To Understand the fundamentals of Google Cloud architecture and its shared responsibility security model. 2. To Implement identity and access management policies to enforce principle of least privilege. 3. To Design and configure secure network architectures using VPCs, firewalls, and private connectivity options. 4. To Apply advanced techniques for data protection including encryption, key management, and secure storage practices. 5. To Monitor and manage security threats using Google Cloud's logging, monitoring, and threat detection tools.
Course Learning Outcomes (CLO):	Students will be able to: 1. To Explain the fundamental concepts of cloud computing and security challenges. 2. To apply encryption, access control mechanisms, and data protection strategies in cloud environments. 3. To Analyze different network security threats and propose mitigation techniques in cloud computing. 4. To evaluate governance, risk management, and compliance strategies for cloud security. 5. To assess real-world cloud security incidents and propose suitable security measures.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
Unit 1: Introduction to Google Cloud Security		
Introduction to Google Cloud Security, Cloud Security Frameworks (NIST, CSA) The Shared Responsibility Model, Security in IaaS, PaaS, and SaaS on GCP,Overview of GCP services (IAM, VPC, Compute Engine, Cloud Storage)	**CLO 1**	6
Unit 2: Identity and Access Management (IAM)		
Overview of Identity and Access Management (IAM),Understanding IAM Roles: Basic, Predefined, and Custom, Service accounts and their use cases, Cloud Identity for enterprise identity management,Best practices for least privilege and role-based access control	**CLO 2**	6

Unit 3: Network Security in GCP		
Google Cloud Virtual Private Cloud (VPC) Security, Firewall rules and VPC Service Controls, Network segmentation and subnet isolation, Secure interconnect and peering, Shielded VMs and secure boot, Private access and hybrid networking security.	**CLO3**	6
Unit 4: Data Protection and Encryption Mechanisms		
Data encryption at rest and in transit, Cloud Key Management Service (KMS), Customer-managed and customer-supplied encryption keys, Secure storage using Cloud Storage and Persistent Disks, Data loss prevention (DLP) and privacy controls,Security Command Center and Forseti Security	**CLO4**	6
Unit 5: Security Monitoring and Threat Detection		
Logging and Monitoring with Cloud Logging and Cloud Monitoring, Auditing with Cloud Audit Logs, Security Command Center for threat detection, IAM policy analysis and troubleshooting, Incident response strategy in GCP, Automation and remediation with Security Health Analytics	**CLO5**	6
Total Hours		**30**

Learning resources

Reference Books:

1. Cloud Security Handbook by Eyal Estrin
2. Security and Resilience in Cloud Computing by Lee Newcombe
3. Google Cloud Platform for Architects by Vitthal Srinivasan & Valliappa Lakshmanan

Online Resources and E-Learning Resources

1. Coursera – Security in Google Cloud Specialization
2. Pluralsight – Security in Google Cloud Platform Learning Path
3. Google Cloud Skills Boost – Security Engineer Learning Path

BCA REVISED 2024 PATTERN COURSE DETAILS Semester - VII

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester: VII**	**Level: UG**
Course Name	Big Data Analytics	**Course Code and Course Type**	UBC401 / MAJM
Course Pattern	**Revised 2024**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite:	
Course Objectives (CO):	The Objectives of Big Data Analytics are: 1. Identify and describe the concepts, architecture, and components of Big Data and the Hadoop ecosystem. 2. Explain the architecture, operations, and scripting concepts of Apache Pig for processing Big Data. 3. Apply HiveQL to create, manage, and query data in Hive, demonstrating efficient data querying techniques like partitioning and bucketing. 4. Analyze how Sqoop facilitates bi-directional data transfer between relational databases and Hadoop, including incremental data imports. 5. Evaluate the role of Information Retrieval techniques and Solr in indexing, searching, and managing structured and unstructured data.
Course Learning Outcomes (CLO):	Students will be able to: 1. Explain the key concepts, sources, and architecture of Big Data and Hadoop along with its core components . 2. Demonstrate the Pig architecture and evaluation of pig scripts. 3. Describe the Hive architecture and Execute HiveQL queries on sample data sets. 4. Analyze the process of importing and exporting data between RDBMS and Hadoop using Sqoop, including incremental and full data transfers. 5. Design a basic Solr indexing and search system, incorporating information retrieval concepts and Solr's indexing and querying capabilities.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Introduction to Big Data Analytics: Introduction to Big data- Concepts, Needs and Challenges of Big Data; Types and source of Big Data; Architecture of Hadoop**;** Components of Hadoop System- HDFS, YARN, MAPREDUCE**;** Process: Access and storage, Data Intelligence, Data Integration, Data Serialization, Monitoring, Indexing.	**CLO 1**	**9**
UNIT II		
Apache Pig: Introduction to Apache Pig**,** Pig Architecture**,** Pig Installation and Grunt**,** Pig Latin- Input and Output**,** Relational operators**,** Working with scripts, User defined functions.	**CLO 2**	**9**
UNIT III		
Apache Hive Fundamentals & Advanced Concepts: Introduction to Hive, Hive versus Pig; Hive Architecture and modules; Data types and file formats; Hive QL-Data Definition and Data Manipulation, Hive QL queries; Hive QL views- reduce query complexity, Hive QL Indexes-create, show, drop; Bucketing vs Partitioning; Hive scripts.	**CLO3**	**9**

UNIT IV		
Introduction to Sqoop: RDBMS in Hadoop; Bi directional data transfer: Importing data from relational databases into Hadoop (HDFS/Hive), Exporting data from Hadoop back to relational databases; Importing data- Entire tables, subset data, use different file formats; Incremental Data- Incrementally import data (Append Mode, Last modified mode), preserving the value; Integration with Hive.	**CLO4**	**9**
UNIT V		
Information Retrieval and Solr: Information Retrieval(IR)- Need, Importance; Role of Search engines in Big Data Analytics; Categories of data handled in IR: Structured, Semi-Structured, Unstructured.**Solr:** Inverted index in Search Engines- Concept, Importance; Search Engine Design- Overview of Solr, field attributes and types; Indexing-indexing tools, Index data from various sources (CSV, JSON), Indexing operations using CV documents; Searching data- Search using parameters, default query behaviour.	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Tom White, *Hadoop: The Definitive Guide*, O'Reilly Media (4th Edition)
2. Seema Acharya & Subhashini Chellappan, *Big Data and Analytics*, Wiley India (Covers Big Data concepts, Hadoop ecosystem, Pig, Hive)
3. Alan Gates, *Programming Pig*, O'Reilly Media
4. Edward Capriolo, Dean Wampler & Jason Rutherglen, *Programming Hive*, O'Reilly Media
5. Krishna Sankar & Susan A. Bouchard, *Enterprise Search with Apache Solr*, Packt Publishing

Reference Books:

1. Boris Lublinsky et al., *Professional Hadoop Solutions*, Wiley
2. Chuck Lam, *Hadoop in Action*, Manning
3. Lucene & Solr: The Definitive Guide, O'Reilly Media
4. Tamer Elsayed, *Information Retrieval: A Guide to Searching in the 21st Century*, Cambridge University Press

Online & E-Learning Resources:

1. Apache Hadoop Official Documentation: https://hadoop.apache.org/docs/
2. Apache Pig Documentation: https://pig.apache.org/docs/latest/
3. Apache Hive Documentation: https://cwiki.apache.org/confluence/display/Hive/Home
4. Apache Sqoop Documentation: https://sqoop.apache.org/docs/
5. Apache Solr Documentation: https://solr.apache.org/guide/

MOOCs & Online Courses:

1. Coursera: Big Data Specialization (University of California, San Diego)
2. Edureka: Big Data Hadoop Certification Training
3. Udemy: The Ultimate Hands-On Hadoop: Tame your Big Data!

COURSE CURRICULUM

Name of the Program:	BCA	Semester: VII	Level: UG
Course Name	Big Data Analytics Lab	Course Code/ Course Type	UBC402/MAJM
Course Pattern	Revised 2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25

Prerequisite: Basic Knowledge of Computers are required.

Course Objectives (CO):	The Objectives of Big Data Analytics Lab are: 1. Set up and configure a Hadoop environment and effectively manage data using HDFS commands. 2. Implement data processing workflows using Apache Pig for handling Big Data scenarios. 3. Use Hive for efficient querying, analysis, and management of large datasets using structured query language (HiveQL). 4. Perform bi-directional data transfer between relational databases and Hadoop using Apache Sqoop. 5. Build and test an Information Retrieval system using Apache Solr for indexing, searching, and querying datasets.
Course Learning Outcomes (CLO):	Students would be able to: 1. Demonstrate the ability to set up a Hadoop environment and perform file operations on HDFS. 2. Develop Pig scripts to perform basic and advanced data transformations on structured and semi-structured data stored in Hadoop. 3. Create Hive tables, load data, and write queries using HiveQL for data processing and analysis, including partitioning and bucketing. 4. Use Sqoop to transfer data between relational databases and Hadoop, including performing full and incremental imports/exports. 5. Design and implement a basic data indexing and search solution using Apache Solr for both structured and unstructured data.

Course Contents/Syllabus: Practical Plan

Activity Number	Assignment/Practical/Activity Title	Week Number	Details	CLO	Hours
1	Introduction to Hadoop Ecosystem	Week 1	Installing Hadoop (Single Node Cluster)	CLO1	2
2	Working with HDFS	Week 2	Basic Commands (Put, Get, List, Delete, Copy)	CLO1	2
3	Hadoop (MapReduce)	Week 3	Running WordCount Program in MapReduce	CLO1	2
4	Apache Pig	Week 4	Apache Pig Installation & Setup (Local and HDFS modes)	CLO2	2
5	Apache Pig	Week 5	Writing and Running Basic Pig Latin Scripts (Load, Filter, Group, Dump)	CLO2	2

6	Apache Pig	Week 6	Advanced Pig Operations - Join, Order By, Distinct, Store	CLO2	2
7	Apache Hive	Week 7	- Apache Hive Installation & Setup (Database Creation)	CLO3	2
8	Apache Hive	Week 8	- Create Tables in Hive and Load Data (Different File Formats: Text, ORC, Parquet)	CLO3	2
9	Apache Hive	Week 9	- HiveQL Queries - DDL, DML, Partitioning & Bucketing	CLO3	2
10	Apache Hive	Week 10	- Indexing and Views in Hive	CLO4	2
11	Apache Sqoop	Week 11	- Sqoop Installation & Setup	CLO4	2
12	Apache Sqoop	Week 12	- Importing Data from MySQL to HDFS using Sqoop	CLO4	2
13	Apache Sqoop	Week 13	- Exporting Processed Data from HDFS to MySQL using Sqoop	CLO4	2
14	Apache Solr	Week 14	- Installing and Configuring Apache Solr	CLO5	2
15	Apache Solr	Week 15	- Indexing and Searching Data in Solr (Structured & Unstructured Data)	CLO5	2
Total Marks					**30 hrs**

Learning resources

Textbooks:

1. Tom White, *Hadoop: The Definitive Guide*, O'Reilly Media (4th Edition)
2. Seema Acharya & Subhashini Chellappan, *Big Data and Analytics*, Wiley India (Covers Big Data concepts, Hadoop ecosystem, Pig, Hive)
3. Alan Gates, *Programming Pig*, O'Reilly Media
4. Edward Capriolo, Dean Wampler & Jason Rutherglen, *Programming Hive*, O'Reilly Media
5. Krishna Sankar & Susan A. Bouchard, *Enterprise Search with Apache Solr*, Packt Publishing

Reference Books:

1. Boris Lublinsky et al., Professional Hadoop Solutions, Wiley
2. Chuck Lam, Hadoop in Action, Manning
3. Lucene & Solr: The Definitive Guide, O'Reilly Media
4. Tamer Elsayed, Information Retrieval: A Guide to Searching in the 21st Century, Cambridge University Press

Online & E-Learning Resources:

1. Apache Hadoop Official Documentation: https://hadoop.apache.org/docs/
2. Apache Pig Documentation: https://pig.apache.org/docs/latest/
3. Apache Hive Documentation: https://cwiki.apache.org/confluence/display/Hive/Home
4. Apache Sqoop Documentation: https://sqoop.apache.org/docs/
5. Apache Solr Documentation: https://solr.apache.org/guide/

MOOCs & Online Courses:

1. Coursera: Big Data Specialization (University of California, San Diego)
2. Edureka: Big Data Hadoop Certification Training
3. Udemy: The Ultimate Hands-On Hadoop: Tame your Big Data!

COURSE CURRICULUM

Name of the Program:	**BCA**		**Semester : VII**		**Level: UG**		
Course Name	Mobile Computing		**Course Code/ Course Type**		**UBC403/MAJM**		
Course Pattern	**Revised 2024**		**Version**		**1.0**		
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	-	3	-	40	60	-
Prerequisite: Basic knowledge of Computer Network and Java.							
Course Objectives (CO):	The objectives of Mobile Security are: 1. To introduce students to the concepts and principles of mobile computing. 2. To familiarize students with wireless communication technologies. 3. To equip students with basic Android application development skills. 4. To understand data management and security issues in mobile computing. 5. To explore emerging trends in the field.						
Course Learning Outcomes (CLO):	Students would be able to: 1. Explain the fundamental concepts of mobile computing. 2. Describe wireless communication technologies and network architectures. 3. Develop simple Android applications using modern development tools. 4. Analyze issues related to data management, synchronization, and security in mobile computing. 5. Discuss emerging technologies and trends in mobile computing.						

Course Contents/Syllabus:

Descriptors/Topics	**CLO**	**Hours**
UNIT I		
Introduction to Mobile Computing & Wireless Technologies: Overview of Mobile Computing, Evolution from 1G to 5G, Mobile Communication Systems: Components and Functions, Wireless Transmission Technologies: Infrared, Bluetooth, Wi-Fi, NFC, Cellular Systems: Cells, Clusters, Frequency Reuse, and Handoff, Applications and Challenges of Mobile Computing.	**CLO 1**	**9**
UNIT II		
Mobile Network Architecture & Communication Protocols: GSM Network Architecture, GPRS & EDGE Overview, Mobile IP and Mobile TCP (Basics), Wireless LANs (Wi-Fi): Architecture, Protocol Stack, Introduction to Ad Hoc Networks (MANETs) and Sensor Networks, Security Challenges in Mobile Networks.	**CLO 2**	**9**
UNIT III		

Mobile Application Development – Android Basics: Introduction to Android Development Environment, Android Studio Installation and Project Setup, Components of Android Apps: Activities, Services, Intents, Broadcast Receivers, Content Providers, Activity Lifecycle Management, Designing User Interfaces: Layouts, Views, Widgets, Basic Event Handling (Button Click, Text Input)	**CLO3**	**9**
UNIT IV		
Data Storage, Synchronization & Location Services: Data Storage in Mobile Devices: Internal, External Storage & SQLite Databases, Shared Preferences and File Handling, Data Synchronization Techniques, Cloud Integration (Firebase)	**CLO4**	**9**
UNIT V		
Advanced Trends and Security in Mobile Computing: Mobile Security Issues, Threats, Encryption, Authentication, Power Management in Mobile Devices, Introduction to Mobile Cloud Computing (MCC), Mobile Computing Applications: mHealth, mCommerce, mGovernance, Emerging Technologies: 5G	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. **Jochen Schiller**, "Mobile Communications", 2nd Edition, Pearson Education
2. **Asoke Talukder**, Roopa Yavagal, Hasan Ahmed, "Mobile Computing – Technology, Applications and Service Creation", McGraw Hill

Reference Books:

1. **Reto Meier**, "Professional Android 4 Application Development", Wrox
2. **Raj Kamal**, "Mobile Computing", Oxford University Press

Online Resources/E-Learning Resources:

1. https://nptel.ac.in/courses/106106147
2. https://ocw.mit.edu
3. https://www.coursera.org/specializations/android-app-development
4. https://www.coursera.org/learn/wireless-communications

COURSE CURRICULUM

Name of the Program:	BCA	Semester: VII	Level: UG
Course Name	Mobile Computing Lab	Course Code/ Course Type	UBC409/MAJM
Course Pattern	Revised 2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	1	-	1	2	25	-	25

Prerequisite: Basic knowledge of Computer Network and Java.

Course Objectives (CO):	The objectives of Mobile Security are: 1. To introduce students to the concepts and principles of mobile computing. 2. To familiarize students with wireless communication technologies. 3. To equip students with basic Android application development skills. 4. To understand data management and security issues in mobile computing. 5. To explore emerging trends in the field.
Course Learning Outcomes (CLO):	Students would be able to: 1. Explain the fundamental concepts of mobile computing. 2. Describe wireless communication technologies and network architectures. 3. Develop simple Android applications using modern development tools. 4. Analyze issues related to data management, synchronization, and security in mobile computing. 5. Discuss emerging technologies and trends in mobile computing.

Practical Plan

Activity Number	Assignment/Practical/ Activity Title	Week Number/Turn	Details	CLO	Hours
1	Study and setup of Android Studio IDE.	Week 1	Students will download, install, and configure **Android Studio**, the official IDE for Android development.	CLO1	2
2	Study and setup of Android Studio IDE.	Week 2	Students will download, install, and configure **Android Studio**, the official IDE for Android development.	CLO1	2
3	Develop a Simple Android App with UI Components (TextView, Button, EditText)	Week 3	Create an Android application with a basic User Interface (UI) that uses common UI components such as TextView (display text), EditText (user input), and Button (click action).	CLO1	2
4	Develop a Simple Android App with UI Components (TextView, Button, EditText)	Week 4	Create an Android application with a basic User Interface (UI) that uses common UI components such as TextView (display text), EditText (user input), and Button (click action).	CLO1, CLO2	2
5	Implementation of Activity Lifecycle and	Week 5	Create an Android app demonstrating the complete Activity Lifecycle	CLO2	2

	Intent (Explicit and Implicit)		(onCreate, onStart, onResume, etc.) and implement navigation between two activities using Explicit Intent and open an external app using Implicit Intent.		
6	Implementation of Activity Lifecycle and Intent (Explicit and Implicit)	Week 6	Create an Android app demonstrating the complete Activity Lifecycle (onCreate, onStart, onResume, etc.) and implement navigation between two activities using Explicit Intent and open an external app using Implicit Intent.	CLO2	2
7	Develop an App to Demonstrate Data Storage using SharedPreferences	Week 7	Create an app where user preferences (like username, theme color, etc.) are stored using **SharedPreferences**. The stored data should persist even after the app is closed and reopened.	CLO3	2
8	Develop an App to Demonstrate Data Storage using SharedPreferences	Week 8	Create an app where user preferences (like username, theme color, etc.) are stored using **SharedPreferences**. The stored data should persist even after the app is closed and reopened.	CLO3	2
9	Create an App for SQLite Database CRUD Operations	Week 9	Develop a CRUD (Create, Read, Update, Delete) application using SQLite database in Android. This app can be a simple contact manager, to-do list, or student record system.	CLO3	2
10	Create an App for SQLite Database CRUD Operations	Week 10	Develop a CRUD (Create, Read, Update, Delete) application using SQLite database in Android. This app can be a simple contact manager, to-do list, or student record system.	CLO3	2
11	Develop an App for Capturing Location using GPS and Google Maps Integration	Week 11	Create an app that accesses the device's GPS to capture the current location and display it on Google Maps using Google Maps API.	CLO4, CLO5	2
12	Develop an App for Capturing Location using GPS and Google Maps Integration	Week 12	Create an app that accesses the device's GPS to capture the current location and display it on Google Maps using Google Maps API.	CLO4, CLO5	2
13	Develop a Mobile Application using Firebase for User Authentication	Week 13	Create an app that uses Firebase Authentication to allow users to sign up and log in using email and password.	CLO5	2
14	Develop an App for Reading/Writing NFC Tags (if supported by device)	Week 14	Develop an app to read and write data to NFC tags. This program will be hardware-dependent and works on devices with NFC support.	CLO5	2
15	Study Mobile Security Practices and Create a Report on Common Threats and Mitigation Techniques in Mobile Computing	Week 15	Prepare a report covering: Common threats in mobile computing (malware, phishing, man-in-the-middle attacks). Security best practices (encryption, secure app development, data protection).	CLO5	2
Total					**30**

Learning resources

Textbooks:

1. **Jochen Schiller**, "Mobile Communications", 2nd Edition, Pearson Education
2. **Asoke Talukder**, Roopa Yavagal, Hasan Ahmed, "Mobile Computing – Technology, Applications and Service Creation", McGraw Hill

Reference Books:

1. **Reto Meier**, "Professional Android 4 Application Development", Wrox
2. **Raj Kamal**, "Mobile Computing", Oxford University Press

Online Resources/E-Learning Resources:

1. https://nptel.ac.in/courses/106106147
2. https://ocw.mit.edu
3. https://www.coursera.org/specializations/android-app-development
4. https://www.coursera.org/learn/wireless-communications

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester:** VII	**Level:** UG
Course Name	Current Trends and Practices in IT	**Course Code and Course Type**	UBC405 / VSEC
Course Pattern	Revised 2024	**Version**	1.0

Teaching Scheme				**Assessment Scheme**			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	-		2	30	20	30	-

Prerequisite:

Course Objectives (CO):	The objectives of organizational behaviour are: 1. To explore and understand the latest trends and technologies in Information Technology. 2. To analyse current industry practices and methodologies. 3. To evaluate the impact of current cybersecurity trends. 4. To develop hands-on skills using contemporary IT tools, platforms, and technologies 5. To foster critical thinking and awareness of the ethical, social, and legal implications of adopting current IT trends,
Course Learning Outcomes (CLO):	Students will be able to: 1. Demonstrate knowledge of emerging IT technologies. 2. Apply modern software development practices, such as Agile methodologies and DevOps, to design, develop, and deploy IT solutions effectively. 3. Evaluate the importance of cybersecurity measures, including data protection strategies, ethical hacking, and compliance with regulatory standards, in safeguarding IT infrastructure. 4. Implement hands-on projects using state-of-the-art tools, frameworks, and platforms to address challenges in contemporary IT practices. 5. Analyse the ethical, legal, and social implications of adopting modern IT trends, and propose sustainable and innovative solutions for industry challenges

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Emerging Technologies: Introduction to Emerging IT Trends - Overview of current advancements in IT and their impact, Artificial Intelligence (AI) - Basics of AI, Machine Learning, Deep Learning, and Natural Language Processing (NLP), Blockchain Technology-Concepts, Smart Contracts, Decentralized Applications, and Cryptocurrencies, Internet of Things (IoT) - IoT architecture, applications, and security challenges,	**CLO 1**	6
UNIT II		
Cloud Computing and Virtualization: Introduction to Cloud Computing - Service models (IaaS, PaaS, SaaS), Deployment models (Public, Private, Hybrid), Virtualization - Basics of virtualization and its role in modern IT infrastructure, Cloud Platforms - Overview of AWS, Microsoft Azure, Google Cloud, Challenges in Cloud Computing - Security, cost management, and migration issues, Hands-on Session: Basics of deploying an application on a cloud platform.	**CLO 2**	6
UNIT III		

Big Data and Analytics: Introduction to Big Data: Characteristics (Volume, Velocity, Variety), and its significance in IT, Big Data Tools - Overview of Hadoop, Spark, and NoSQL Databases, Data Analytics - Types of analytics (Descriptive, Predictive, Prescriptive), Applications of Data Analytics - Use cases in Healthcare, Finance, and Retail.	**CLO3**	6
UNIT IV		
Cybersecurity Trends: Modern Cybersecurity Threats - Ransomware, Phishing, Zero-Day Attacks, and Malware. Security Practices - Ethical hacking, Penetration Testing, and Encryption Techniques, Frameworks and Standards - GDPR, ISO 27001, and NIST Cybersecurity Framework, Emerging Areas: AI in cybersecurity and Zero Trust Architecture	**CLO4**	6
UNIT V		
Future IT Trends and Modern Practices: Agile Methodologies - Introduction to Scrum, Kanban, and Lean Development, DevOps Practices: CI/CD pipelines, Automation, and Tools like Docker and Kubernetes, Green IT: Energy-efficient computing and sustainable IT practices, Future Trends: Quantum Computing, Edge Computing, and 5G Technology.	**CLO5**	6
Total Hours		30

Learning resources

Textbooks:

1. "Introduction to Information Technology" by Elliott D. S.
2. Information Technology for Management: Digital Strategies for Insight, Action, and Sustainable Performance" by Efraim Turban, Linda Volonino, Gregory R. Wood
3. "The DevOps Handbook" by Gene Kim, Patrick Debois, and John Willis
4. "Cybersecurity Essentials" by Charles J. Brooks

Reference Books:

1. Digital Transformation: Survive and Thrive in an Era of Mass Extinction" by Thomas M. Siebe
2. "Information Technology for Management: Advancing Sustainable, Profitable Business Growth" by Efraim Turban, Linda Volonino

Online Resources and E-Learning Resources

1. https://www.technologyreview.com/
2. https://www.gartner.com
3. https://www.coursera.org/learn/ai-for-everyone

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester: VII**	**Level: UG**
Course Name	Data Privacy and Security	**Course Code and Course Type**	UBC406/ VSEC
Course Pattern	**Revised 2024**	**Version**	1.0

Teaching Scheme				**Assessment Scheme**			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-		2	30	20	30	-

Prerequisite:	
Course Objectives (CO):	The objectives of Data Privacy and security are: 1. To understand fundamental concepts of data privacy, security, and legal frameworks. 2. To apply cryptographic techniques to ensure data confidentiality and integrity. 3. To analyse network and cloud security mechanisms to protect sensitive data. 4. To implement access control and authentication mechanisms to secure systems. 5. To evaluate ethical hacking, incident response strategies, and compliance requirements
Course Learning Outcomes (CLO):	Students will be able to: 1. Explain the key concepts of data privacy, security, and various data protection laws. 2. Demonstrate knowledge of encryption, hashing, and digital signatures. 3. Describe network security tools, VPNs, and cloud security strategies. 4. Apply identity and access management techniques in real-world scenarios. 5. Conduct basic security assessments and understand compliance frameworks

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I Introduction to Data Privacy and Security		
Basics of Data Privacy and Security - Definition, importance, and objectives, Difference between privacy and security; Key Concepts - Confidentiality, Integrity, and Availability (CIA); Data protection laws (GDPR, CCPA, IT Act 2000 – Overview); Types of cyber threats (malware, phishing, ransomware, etc.); Case studies on data breaches	**CLO 1**	6
UNIT II Cryptography and Encryption Techniques		
Basics of Cryptography (Symmetric & Asymmetric encryption); Hashing algorithms (SHA, MD5); Public Key Infrastructure (PKI) and Digital Signatures; SSL/TLS and HTTPS security; Hands-on: Encrypting and hashing data using tools	**CLO 2**	6
UNIT III Network & Cloud Security		
Basics of Network Security (Firewalls, IDS, IPS); VPNs and Secure Communication; Cloud Security fundamentals (AWS, Azure, Google Cloud); Security challenges in Cloud Computing; Case study: Securing cloud-stored data	**CLO3**	6
UNIT IV Access Control & Authentication Mechanism		
Identity & Access Management (IAM); Multi-Factor Authentication (MFA); Role-Based Access Control (RBAC); OAuth, SAML, and OpenID Connect; Hands-on: Implementing authentication in applications	**CLO4**	6
UNIT V Ethical Hacking, Incident Response & Compliance		

Introduction to Ethical Hacking & Penetration Testing; Data Protection Strategies & Best Practices; Incident Response & Forensics; Compliance & Auditing Standards (ISO 27001, HIPAA); Hands-on: Conducting basic security assessments.	**CLO5**	6
Total Hours		30

Learning resources

Textbooks:

1. Cryptography and Network Security: Principles and Practice (7th Edition) by William Stallings.
2. Ethics in Information Technology (6th Edition) by George W. Reynolds
3. Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives by B.B. Gupta, D.P. Agrawal, and Haoxiang Wang

Reference Books:

1. Network Security Essentials: Applications and Standards
2. Data Privacy and Security: An Applied Approach

Online Resources and E-Learning Resources

1. Cybersecurity Courses & Cyber Security Training Online | Cybrary
2. Free Cyber Security Training & Resources | SANS Institute

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester: VII**	**Level: UG**
Course Name	Blockchain & Cryptography (MOOC)	**Course Code and Course Type**	UBCM112
Course Pattern	**2024**	**Version**	1.0

Teaching Scheme: Theory					**Assessment Scheme:**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
2	-	-	2	2	20	30	-

Prerequisite: Basic understanding of computer networks, programming, and cryptographic concepts

Course Objectives (CO):	**The objectives of:** 1. Grasp core cryptographic principles for secure digital communication. 2. Explain the technical workings of blockchain systems. 3. Apply cryptographic tools to maintain blockchain integrity and authenticity. 4. Demonstrate blockchain applications in diverse sectors. 5. Critically assess limitations and future developments in blockchain technology.
Course Learning Outcomes (CLO):	**Students will be able to:** **1.** Understand the basics of cryptography and its role in blockchain. **2.** Describe blockchain architecture, components, and consensus mechanisms. **3.** Analyze the use of cryptographic primitives like hash functions and digital signatures. **4.** Apply blockchain in real-world scenarios like cryptocurrency and smart contracts. **5.** Evaluate the security, privacy, and scalability challenges of blockchain systems.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I - Introduction to Cryptography		6
Classical Cryptography (Caesar Cipher, Vigenère), Symmetric vs Asymmetric Encryption, Hash Functions: SHA-256, Merkle Trees, Digital Signatures and Public Key Infrastructure	**CLO 1**	
UNIT II - Blockchain Fundamentals		6
Introduction to Blockchain, Structure of a Block and Blockchain, Distributed Ledger Technology, Cryptographic Hashes and Immutable Records	**CLO 2**	
UNIT III - Consensus Mechanisms & Smart Contracts		6
Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance, Smart Contracts and Ethereum Basics, Solidity Programming Introduction	**CLO3**	
UNIT IV - Cryptography in Blockchain		6
Role of Hash Functions in Block Integrity, Use of Digital Signatures (ECDSA), Zero Knowledge Proofs, Ring Signatures and Homomorphic Encryption	**CLO4**	
UNIT V - Applications, Security & Challenges		6
Cryptocurrencies: Bitcoin, Ethereum, Blockchain for Supply Chain, Identity, and IoT, Scalability & Privacy Issues (Layer 2, Sharding), Legal and Ethical Considerations	**CLO5**	
Total Hours		30

Learning resources

Textbooks & Reference Books:

1. "Blockchain Basics" by Daniel Drescher
2. "Mastering Bitcoin" by Andreas M. Antonopoulos
3. "Cryptography and Network Security" by William Stallings
4. "Blockchain Technology Explained" by Alan T. Norman

Online Resources and E-Learning Resources

Platform	Recommended Courses
Coursera	- Block-chain Basics (University at Buffalo) - Cryptography I (Stanford)
edX	- Block-chain for Business (Linux Foundation) - Cybersecurity Micro-Masters
Udemy	- Block-chain and Cryptocurrency Explained - Cryptography Masterclass
NPTEL (Swayam)	- Block-chain Architecture Design and Use Cases - Introduction to Cryptography
MIT OpenCourseWare	- Applied Cryptography - Distributed Systems

BCA REVISED 2024 PATTERN COURSE DETAILS Semester - VIII

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester: VIII**	**Level: UG**
Course Name	DevOps	**Course Code and Course Type**	UBCM114 / MOOC
Course Pattern	**Revised 2024**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	50	-	50

Prerequisite:	
Course Objectives (CO):	The Objectives of DevOps are: 1. To introduce the concept, culture, and principles of DevOps and establish a strong foundational understanding. 2. To provide practical exposure to key DevOps tools like Git and Jenkins. 3. To introduce students to containerization using Docker and orchestration using Kubernetes. 4. To equip students with skills in automating infrastructure and configuration management. 5. To develop an understanding of DevOps measurement, apply real-world learning through case studies, and introduce basic automation scripting.
Course Learning Outcomes (CLO):	Students will be able to: 1. Explain the fundamentals of DevOps, its need, and its cultural shift in software engineering. 2. Demonstrate the use of Git and Jenkins in setting up a basic Continuous Integration process. 3. Develop and Deploy a containerized application using Docker and Kubernetes. 4. Implement Infrastructure as Code using Terraform and automate server configuration with Ansible. 5. Analyze DevOps success using metrics and create simple Python scripts to automate DevOps tasks.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I		
Foundations of DevOps: What is DevOps? (Overview of DevOps); Why DevOps- Evolution from traditional development and operations; DevOps culture and principles; Thinking DevOps mindset; Working DevOps - collaboration models; Organizing DevOps Teams.	**CLO 1**	**9**
UNIT II		
Essential Tools for DevOps: Git Basics for DevOps (version control essentials); Jenkins Basics (CI/CD pipeline introduction); Case study- Continuous Integration workflow; Git repository setup and Jenkins pipeline creation.	**CLO 2**	**9**
UNIT III		
Containerization and Orchestration: Docker Basics for DevOps; Kubernetes Basics for DevOps; Setting up and running containers; Deploying applications on Kubernetes cluster; Dockerize a simple application and deploy on Kubernetes.	**CLO3**	**9**
UNIT IV		

Automation and Infrastructure Management: Infrastructure as Code (IaC) concept; Terraform Basics; Introduction to Ansible for configuration management; Provision basic infrastructure using Terraform and automate configuration with Ansible.	**CLO4**	**9**
UNIT V		
DevOps Measurement, Case Studies, and Python Basics: Measuring DevOps Success (KPIs and Metrics); Introduction to DevOps case studies (Real-world applications); Basics of Python for automation; Simple Python scripts for DevOps tasks (e.g., monitoring, automation).	**CLO5**	**9**
Total Hours		**45**

Learning resources

Textbooks:

1. Gene Kim, Jez Humble, Patrick Debois, John Willis, *The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations*, IT Revolution Press.
2. Kelsey Hightower, Brendan Burns, and Joe Beda, *Kubernetes: Up and Running*, O'Reilly Media.
3. James Turnbull, *The Docker Book: Containerization is the New Virtualization*, Turnbull Press.

Reference Books:

1. John Arundel and Justin Domingus, *Cloud Native DevOps with Kubernetes*, O'Reilly Media.
2. Ernest Mueller, Karthik Gaekwad, Peco Karayanev, James Wickett, *DevOps for Dummies*, Wiley.
3. Mikael Krief, *Terraform Cookbook*, Packt Publishing.
4. Lorin Hochstein and Rene Moser, *Ansible: Up and Running*, O'Reilly Media.
5. Brent Laster, *Jenkins 2: Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation*, O'Reilly Media.
6. Git Version Control Cookbook, Packt Publishing.

Online & E-Learning Resources:

1. Git Official Documentation: https://git-scm.com/doc
2. Jenkins Official Documentation: https://www.jenkins.io/doc/
3. Docker Official Documentation: https://docs.docker.com/
4. Kubernetes Official Documentation: https://kubernetes.io/docs/
5. Terraform by HashiCorp Documentation: https://developer.hashicorp.com/terraform/docs
6. Ansible Official Documentation: https://docs.ansible.com/
7. Python Official Documentation (for scripting basics): https://docs.python.org/3/

MOOCs & Online Courses:

1. Coursera: Coursera: *DevOps Mastery Specialization* (KodeKloud)
2. Coursera: *Introduction to DevOps* (IBM)
3. Udemy: *Docker and Kubernetes: The Complete Guide* by Stephen Grider
4. Udemy: *Learn Terraform on Azure* by Houssem Dellai
5. Edureka: *DevOps Certification Training Course*

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COURSE CURRICULUM

Name of the Program:	BCA	**Semester: IV**	**Level: UG**
Course Name	Full Stack Developer (MOOC)	**Course Code and Course Type**	UBCM115
Course Pattern	**Rev. 2024**	**Version**	1.0

Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical and Oral**
3	-	-	3	3	40	60	-

Prerequisite: Basic programming knowledge (HTML, CSS, and JavaScript recommended)

Course Objectives (CO):	The objectives of this course are to: 1. Design and build responsive and interactive web interfaces using frontend tools. 2. Develop server-side logic and APIs using backend technologies. 3. Implement and manage relational and NoSQL databases. 4. Integrate frontend, backend, and database to build full-stack applications. 5. Deploy full-stack applications and apply DevOps principles.
Course Learning Outcomes (CLO):	Students will be able to: 1. Apply HTML, CSS, and JavaScript to build user-friendly web pages. **2.** Develop secure backend services and RESTful APIs using Node.js and Express.js**.** 3. Design and manage databases using both SQL and NoSQL approaches. 4. Integrate complete full-stack solutions including authentication and state mgmt. 5. 5. Use tools like Git, Docker, and cloud platforms to deploy scalable applications.

Course Contents and Syllabus:

Descriptors and Topics	**CLO**	**Hours**
UNIT I :- Frontend Web Development		
HTML5, CSS3, Flexbox, Grid, Responsive Design, JavaScript ES6+ features ,DOM Manipulation, Frontend Frameworks: React.js / Vue.js basics, UI/UX best practices	**CLO 1**	9
UNIT II:- Backend Development		
Introduction to server-side development, Node.js, Express.js fundamentals , RESTful API design and integration ,Middleware and routing, Session management & authentication basics	**CLO 2**	9
UNIT III :- Database Management		
Relational Databases: MySQL / PostgreSQL, NoSQL Databases: MongoDB , CRUD operations ,Data modelling and indexing ,Integrating database with backend	**CLO3**	9
UNIT IV :- **Full Stack Integration**		
Connecting frontend with backend , API communication (Axios / Fetch) ,Authentication & Authorization (JWT, OAuth),State Management in Frontend (Redux, Context API),Real-time applications with WebSockets.	**CLO4**	9

UNIT V:- Deployment & DevOps Essentials		
Version Control with Git & GitHub , CI/CD basics, Deploying applications (Netlify, Vercel, Heroku, Render),Docker basics for development, Security best practices & performance optimization	**CLO5**	9
Total Hours		45

Learning resources

Textbooks**:**

1. **Full-Stack React Projects** by Shama Hoque, Packt Publishing, 2nd Edition
2. **Node.js Web Development** by David Herron, Packt Publishing, 5th Edition

Reference Books**:**

1. **Full Stack Development with MongoDB and Express.js** by Mithun Satheesh, Packt Publishing
2. **Learning Web Design** by Jennifer Robbins, 5th Edition, O'Reilly
3. **Eloquent JavaScript: A Modern Introduction to Programming** by Marijn Haverbeke, 3rd Edition, No Starch Press

Online Resources and E-Learning Resources

Platform	Recommended Courses
Coursera	"Full-Stack Web Development with React" by HKUST, "Meta Full Stack Developer"
edX	"Full Stack Developer Program" by IBM, "CS50's Web Programming with Python"
Udemy	"The Complete 2024 Web Development Bootcamp" by Angela Yu
NPTEL	"Full Stack Web Development" by Prof. Soumya Kanti Ghosh (IIT Kharagpur)
Free Code Camp	"Full Stack Developer Certification"
Pluralsight	"Full Stack Web Development Path"