Department of Computer Application
Bachelor of Computer Application in Artificial Intelligence
Evaluation Scheme

Credit Framework for the BCA (AI) -NEP-2020									
Sem.	Major (Core)	Minor Stream	Multidisciplinary	Ability Enhancement Course	Skill Enhancement Course	Value Added Courses Common	Summer Internship	Research Project/ Dissertation	Total Credit
1	13	4	1		2	2			22
2	14	4	2						20
Students exiting the programme after securing 40 credits will be awarded UG Certificate in the relevant Discipline / Subject provided they secure 4 credits in work based vocational courses offered during summer term or internship / Apprenticeship in addition to 6 credits from skill-based courses earned during first and second semester									
3	8	3	2	2	2	3			20
4	12	3				2	3			20
Students exiting the programme after securing 80 credits will be awarded UG Diploma in the relevant Discipline / Subject provided they secure 4 credits in skill based vocational courses offered during first year or second year summer term.									
5	10	3	2			3		4	22
6	7			2		3		10	22
Students who want to undertake 3-year UG Programme will be awarded UG Degree in the relevant Discipline/ Subject Upon securing 120 credits									
7	10	3				3		6	22
8	4	3				3		12	22
Students will be awarded UG Degree(Honors) with Research in the relevant Discipline/ Subject provided they secure 160 credits									

Total = 170 Credit

Future University
BCA in Artificial Intelligence (Undergraduate Regular)
Course Structure/ Degree Award Checklist 2024-2028

Program Name:		BCA-AI				Program Code: 04

Total Credit of Program: 170

Semester-I

SN.	Course Category	Course Code	Theory	Week			Evaluation Scheme		Total	Credit
			Course Title	L	T	P	CA	EE		
1	Major Core Course	BCAA101	Computer Fundamental & Emerging Technology	4	0	0	30	70	100	4
2	Major Core Course	BCAA103	Artificial Intelligence	3	0	0	30	70	100	3
3	Major Core Course	BCAA105	Principle of Problem-Solving using Python	4	0	0	30	70	100	4
4	Minor Course	BAS105	Mathematical Foundation for AI	4	0	0	30	70	100	4
5	Skill Enhancement Course	BAS109	Professional Communication	2	0	0	0	50	50	2
6	Value Added Course	BCAA107	Cyber Security	2	0	0	30	70	100	2
7	Multidisciplinary	IKS101	IKS-I (Indian Knowledge System - I)	1	0	0	50	0	50	1
Practical										
1	Major Core Course	BCAA171	Office Automation Lab	0	0	2	25	50	75	1
2	Major Core Course	BCAA173	Programming in Python Lab	0	0	2	25	50	75	1
			TOTAL	**20**	**0**	**4**	**250**	**500**	**750**	**22**

				Semester -II							
SN.	Course Category	Course Code	Theory Course Title	Week			Evaluation Scheme		Total	Credit
				L	T	P	CA	EE		
1	Minor Course	BAS106	Discrete Mathematics	4	0	0	30	70	100	4
2	Major Core Course	BCAA102	Advance Python Programming	4	0	0	50	100	150	4
3	Major Core Course	BCAA104	Software Engineering	4	0	0	30	70	100	4
4	Major Core Course	BCAA106	Advance Database Management System	4	0	0	30	70	100	4
5	Multidisciplinary	BAS108	Environmental Science	2	0	0	50	50	100	2
6	Skill Enhancement Course	LSM102	LSM-I (Life Skills & Mentoring – I)	0	0	0	0	0	0	0
			Practical							
1	Major Core Course	BCAA180	ADBMS Lab	0	0	2	50	50	100	1
2	Major Core Course	BCAA182	Advanced Python Programming Lab	0	0	2	50	50	100	1
			TOTAL	**18**	**0**	**4**	**290**	**460**	**750**	**20**

			Theory		Week			Evaluation Scheme		Total	Credit
Semester -III											
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE		Total	Credit
1	Multidisciplinary	BCAA201	E-commerce & Digital Marketing	2	0	0	30	70		100	2
2	Major Core Course	BCAA203	Operating System and Unix Shell programming	3	0	0	30	70		100	3
3	Major Core Course	BCAA205	Web Technologies services using Python	3	0	0	30	70		100	3
4	Minor Courses	BAS203	Mathematics-III	3	0	0	30	70		100	3
5	Skill Enhancement Course	BCS213	AI for Everyone	2	0	0	30	70		100	2
6	Ability Enhancement Course	BAS211	Foreign language (French/German)	2	0	0	30	70		100	2
7	Value Added Course	BCAA207	**MOOC-I**	Self-Paced Learning						100	3
Practical											
1	Major Core Courses	BCAA271	OS and Shell programming LAB	0	0	2	50	50		100	1
2	Major Core Courses	BCAA273	Web Technologies services using Python LAB	0	0	2	50	50		100	1
			TOTAL	15	0	4	280	520		900	20

Note: In the second semester, Mathematics-III will be a compulsory subject from the list of papers for those students who did not have Mathematics in Intermediate (12th) class.

			Semester-IV							
			Theory		**Week**		**Evaluation Scheme**			
SN.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**CA**	**EE**	**Total**	**Credit**
1	Major Core Course	BCAA202	OOPs concept with Java	3	0	0	30	70	100	3
2	Major Core Course	BCAA204	Introduction to Internet of Things	3	0	0	30	70	100	3
3	Major Core Course	BCAA206	Machine Learning Technology	3	1	0	30	70	100	4
4	Minor Course	BCAA208	**Elective-I**	3	0	0	30	70	100	3
5	Value Added Course	BCAA220	**MOOC-II**	Self-Paced Learning					100	3
6	Skill Enhancement Course	BCAA224	AI for Developers	2	0	0	30	70	100	2
Practical										
1	Major Core Courses	BCAA280	OOPs concept with Java LAB	0	0	2	50	50	100	1
2	Major Core Courses	BCAA282	Machine learning technology LAB	0	0	2	50	50	100	1
			TOTAL	**14**	**1**	**4**	**250**	**450**	**800**	**20**

Semester -V											
			Theory		Week		Evaluation Scheme				
SN.	Course Category	Course Code	Course Title	L	T	P	CA	EE	Total	Credit
1	Major Core Course	BCAA301	Data Structures and Algorithms using Java	3	1	0	30	70	100	4
2	Major Core Course	BCAA303	Data Science and Analytic	3	1	0	30	70	100	4
3	Multidisciplinary	BCAA305	Intellectual Property Rights (IPR)	2	0	0	30	70	100	2
4	Minor Course	BCAA307	**Elective-II**	3	0	0	30	70	100	3
5	Value Added Course	BCAA315	**MOOC-III**	Self-Paced Learning					100	3
Practical											
1	Major Core Courses	BCAA371	Data Structures and Algorithms using Java LAB	0	0	2	50	50	100	1
2	Major Core Courses	BCAA373	Data Science and Analytic LAB	0	0	2	50	50	100	1
3	Research Project/ Dissertation	BCAA375	Minor Project	0	2	4	100		100	4
			TOTAL	**11**	**4**	**8**	**320**	**380**	**800**	**22**

			Semester-VI							
			Theory	**Week**		**Evaluation Scheme**				
SN.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**CA**	**EE**	**Total**	**Credit**
1	Major Core Courses	BCAA302	Artificial Neural Networks	3	1	0	30	70	100	4
2	Major Core Courses	BCAA304	Artificial Intelligence in Business	3	0	0	30	70	100	3
3	Value-added Courses	BCAA306	**MOOC-IV**	Self-Paced Learning					100	3
4	Ability Enhancement Course		Personality Development and Decision-making Skills	2	0	0	30	70	100	2
			Practical							
1	Research Project/ Dissertation	BCAA380	Major Project	0	0	20	200	300	500	10
			TOTAL	**8**	**1**	**20**	**290**	**510**	**900**	**22**

			Semester -VII							
			Theory		Week		Evaluation Scheme			
SN.		Course Code	Course Title	L	T	P	CA	EE	Total	Credit
1	Major Core Courses	BCAA401	Introduction to Research Methodology	3	1	0	30	70	100	4
2	Major Core Courses	BCAA403	Android Applications Development	3	1	0	30	70	100	4
3	Minor Courses	BCAA405	**Elective-III**	3	0	0	30	70	100	3
4	Value Added Courses	BCAA413	**MOOC-V**	Self-Paced Learning					100	3
			Practical							
1	Major Core Courses	BCAA471	Android Applications Development LAB	0	0	2	50	50	100	1
2	Major Core Courses	BCAA473	Research Methodology Lab	0	0	2	50	50	100	1
3	Research Project/ Dissertation	BCAA475	Minor Dissertation	0	0	12	100	100	200	6
			TOTAL	9	2	16	290	410	800	22

			Theory		Week			Evaluation Scheme			
Semester-VIII											
SN.		Course Code	Course Title	L	T	P	CA	EE	Total	Credit
1	Major Core Courses	BCAA402	Augmented Reality (AR) and Virtual Reality (VR	3	0	0	30	70	100	3
2	Minor Courses	BCAA404	**Elective-IV**	3	0	0	30	70	100	3
3	Value Added Courses	BCAA412	**MOOC-VI**	Self-Paced Learning					100	3
Practical											
1	Major Core Courses	BCAA480	AR and VR Lab	0	0	2	50	50	100	1
2	Research Project/ Dissertation	BCAA482	Major Dissertation	0	0	12	200	300	500	12
			TOTAL	6	2	14	310	490	900	22

Sr.N	Course Category
1	Major(Core)
2	Minor Stream
3	Multidisciplinary
4	Ability Enhancement Course
5	Skill Enhancement Course
6	Value Added Courses Common for All UG
7	Summer Internship
8	Research Project/ Dissertation

List of Elective Courses		
SN.	**ELECTIVE-I:**	
1	BCAA208	Introduction to AI and ML and Data Science (EL)
2	BCAA210	Data Warehousing and Data Mining (EL)
3	BCAA212	Social Media Analytics (EL)
4	BCAA214	Big Data Analytics (EL)
5	BCAA216	Computer Architecture (EL)

SN.	ELECTIVE-II:	
1	BCAA307	Introduction to Blockchain Technology (EL)
2	BCAA309	Natural Language Processing (EL)
3	BCAA311	Soft Computing (EL)
4	BCAA313	Information Security and Cyber Laws (EL)
SN.	ELECTIVE-III:	
1	BCAA405	Computer Vision (EL)
2	BCAA407	Fundamentals of Data Privacy (EL)
3	BCAA409	Storage Area Network (EL)
4	BCAA411	Mobile Computing (EL)
SN.	ELECTIVE-IV:	
1	BCAA404	Cloud Computing (EL)
2	BCAA406	Digital Image Processing (EL)
3	BCAA408	Cyber Analytics (EL)
4	BCAA410	Deep Learning (EL)

Syllabus

BCA (AI) 1st Year
Ist Semester

BCAA101: FUNDAMENTAL OF COMPUTERS & EMERGING TECHNOLOGY

Course Outcome (CO)		
CO1	Demonstrate the knowledge of the basic structure, components, features and Generations of computers.	
CO2	Describe the concept of computer languages, language translators and construct	
CO3	Algorithms to solve problem using programming concepts.	
CO4	Compare and contrast features, functioning & types of operating system and computer networks.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Introduction to Computer:** Definition, Computer Hardware & Computer Software, Types of computers, evolution of computers. **Components:** Hardware – Introduction, Input devices, Output devices, Central Processing Unit, Memory-Primary and Secondary Software-Introduction, Types – System and Application. **Computer Languages:** Introduction, Concept of Compiler, Interpreter & Assembler. **Computer Generations**: Generations of Computers.	8
II	**Operating system:** Definition, Functions, Types, Classification, concept of multiprogramming, multitasking, multithreading, multiprocessing, single-user & multi-user operating system. **Computer Network:** Overview, Types (LAN, WAN and MAN), Transmission medium, topologies.	8
III	**Internet:** Overview, Architecture, Functioning, Basic services like- WWW, FTP, HTTP, Telnet, etc., Search engines-mail, Web Browsers. **Internet of Things (IOT):** Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.	8
IV	**Block chain:** Introduction, overview, features, limitations and application are as fundamentals of Block Chain. **Cloud Computing:** It nature and benefits, AWS, Google, Microsoft & IBM Services.	8
V	**Emerging Technologies:** Introduction, overview, features, limitations and application areas of Augmented Reality, Virtual Reality, Grid computing, Green computing, Bigdata analytics, Quantum Computing and Brain Computer Interface	8

Reference Books:

1. Computer Fundamentals fourth edition by Pradeep K. Sinha and Priti Sinha BPB publications.
2. Computer Fundamentals by A. Goel, Pearson Education, 2010.
3. Discovering Computers 2016 (First Edition) Cengage Learning By Misty E. Vermaat; Susan L. Sebok; Steven M. Freund; Jennifer T. Campbell; Mark Frydenberg (Shelly Cashman Series)
4. Pearson India By M. Morris R. Mano
5. Fundamentals of Computer (First Edition- 2009) Publisher: McGraw-Hill by Balaguruswamy
6. Computer Fundamentals (First Edition-2010) Publisher: Pearson by Anita Goel

BCAA103: ARTIFICIAL INTELLIGENCE		
Course Outcome (CO)		
CO1	Design user interfaces to improve human–AI interaction and real-time decision-making.	
CO2	Evaluate the advantages, challenges, and ramifications of human–AI augmentation.	
CO3	Design and develop symbiotic human–AI systems that balance the information processing power of computational systems.	
CO4	Explain the benefits, limitations, and tradeoffs of designing engaging and ethical conversational user interactions.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.	8
II	Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing- Adversarial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.	8
III	Knowledge representation issues, predicate logic- logic programming, semantic nets-frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and Dempster-Shafer Theory.	8
IV	First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.	8
V	Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.	8

Reference Books:
1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008
4. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.

BCAA105: PRINCIPLE OF PROBLEM-SOLVING USING PYTHON		
Course Outcome (CO)		
CO1	Enhance the ability to solve problems using system approaches, critical and innovative thinking and technology to create solutions.	
CO2	Understand the purpose and the process of code in python.	
CO3	Understand the basics of python programming like variable and operators.	
CO4	Acquire programming skills in core python programming using Control Statements	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Python Introduction, History of Python, Introduction to Python Interpreter and program execution, Python Installation Process in Windows and Linux, Python IDE, Introduction to anaconda, python variable declaration, Keywords, Indents in Python, Python input/output operations	**8**
II	Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Ternary Operator, Operator precedence.	**8**
III	String, List, Tuple, Set, Dictionary (characteristics and methods), Conditional Statements (If, If-else, If-elif-else, Nested-if etc.) and loop control statements (for, while, Nested loops, Break, Continue, Pass statements)	**8**
IV	Introduction to functions, Function definition and calling, Function parameters, Default argument function, Variable argument function, in built functions in python, Scope of variable in python	**8**
V	Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file, some important File handling functions e.g. open(), close(), read(), readline() etc.	**8**

Reference Books:
1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, ─An Introduction to Python ─ Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. .John V Guttag, ─Introduction to Computation and Programming Using Python'', Revised
4. and expanded Edition, MIT Press , 2013

BAS105: MATHEMATICAL FOUNDATION FOR AI	
Course Outcome (CO)	
CO1	Students will be able to demonstrate competency in the areas that comprise the core of the mathematics major.
CO2	They will be able to solve applied problems with the application of differentiation and integration.
CO3	They will be able to use appropriate technologies to solve mathematical problems.
CO4	They will be able to apply matrices in different industry problems.

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**BASIC CONCEPTS**: Definition of Sets, Number systems, Relations Functions. **LIMIT CONTINUITY**: Definition of limit, Limit of a function, Right and Left hand Limits, Algebra of limits, General principle for existence of limit, limit of inequalities, Method of finding limits, Continuity of functions, Cauchy's definition, graphical meaning of continuity, Kinds of discontinuities. **DIFFERENTIAL CALCULUS**: Successive differentiation, Leibnitz theorem, Partial differentiation, Euler's Theorem, change of variables, Jacobian theorem.	8
II	**SEQUENCE:** Definition of Sequence, Series and Progression; Definition of Arithmetic Progression (AP); nth term of an AP; sum of n terms of an AP; Arithmetic Mean (AM); Properties of AP; Definition of Geometric Progression (GP); nth term of a GP; Sum of n terms of a GP; Geometric Mean (GM); Properties of GP; Definition of Harmonic Progression (HP); Harmonic Mean (HM); Relations between AM, GM and HM.	8
III	**MATRICES:** Definition of a Matrix; Various Types of Matrices; Operations on Matrices; Symmetric and Skew-Symmetric Matrices; Row Operations, Column Operations; Inverse of a Matrix by Elementary Row Operations. Determinants: Concept of Determinant; Minors and Co-factors in Determinants; Expansion of a Determinant; Properties of Determinants.	8
IV	**VECTOR CALCULUS AND ALGEBRA**: Vectors, Differentiation and partial differentiation of vector functions, derivative of sum, Dot product and cross product of two vectors, gradient, divergence and curl.	8
V	**COORDINATE GEOMETRY**: Straight lines, Circles and the system of circles; standard equations and properties of Parabola. Ellipse and Hyperbolas, General equation of second degree in two variables, tracing of simple conic section.	8

Reference Books:
1. E. Kreyzig, "Engineering Mathematics".
2. B.S. Grewal, "Higher Engineering Mathematics"
3. Shanti Narayan, "Differential Calculus"
4. K.P. Gupta. "Vector Calculus"

BAS109:	PROFESSIONAL COMMUNICATION	
	Course Outcome (CO)	
CO1	Describe primary features, processes and principles of management.	
CO2	Explain functions of management in terms of planning, decision making and organizing.	
CO3	Illustrate key factors of leadership skill in directing and controlling business resources and processes.	
CO4	Exhibit adequate verbal and non-verbal communication skills	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Technical Documentation Presentation :Accuracy and Conciseness in Technical English, Structure Format etc. for Technical Reports & Thesis, Comparing and Contractive other aspects of short reports and long dissertations.	**8**
II	Communication Skills: Communication Process: Concept & importance, System of communication: Formal & internal. Barrier to effective communication.	**8**
III	Principles of Business Communication: Planning and conduction conversations, interviews and Discussion. The preparation of oral statements, effective listening, telephonic communication.	**8**
IV	Written Communication: Guides to effective writing for business correspondence including letter and job application Memorandum, Office orders, Reports.	**8**
V	Non-Verbal Communication: Importance and Type-Cluster and congruency. Kinetics Voal CUes. Modern Forms of Communication: Telex, Fax, Telegram & Teleconferencing & E-mail.	**8**

Reference Books:

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning PLtd
2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, TMH
3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.
4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd.
5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

	BCAA107: CYBER SECURITY	
	Course Outcome (CO)	
CO1	Learn the foundations of Cyber security and threat landscape.	
CO2	To equip with the technical knowledge and skills needed to protect and defend against cyber threats.	
CO3	To develop skills to plan, implement, and monitor cyber security mechanisms	
CO4	To expose students to governance, regulatory, social and ethical contexts of cyber security	
	DETAILED SYLLABUS	
Unit	**Topic**	**Proposed Lecture**
I	Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security	8
II	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 offences, Organizations dealing with Cybercrime and Cyber security in India, Case studies.	8
III	Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.	8
IV	Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payment Settlement Act,2007,	8
V	End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.	8

Reference Books:
1. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
5. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.

IKS101: IKS-I (INDIAN KNOWLEDGE SYSTEM – I)		
Course Outcome (CO)		
CO1	Creating awareness amongst the youths about the true history and rich culture of the country.	
CO2	Understanding the scientific value of the traditional knowledge of Bharata.	
CO3	Promoting the youths to do research in the various fields of Bhartiya knowledge system.	
CO4	Converting the Bhartiya wisdom into the applied aspect of the modern scientific paradigm.	
CO5	Adding career, professional and business opportunities to the youths.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Indian Education** • Vedic Education: Focuses on the traditional system of learning during the Vedic period. • Spiritual and Moral Development: The role of education in promoting ethics and spiritual growth. • Intellectual Growth: How Vedic education contributed to intellectual advancement. Social and Cultural Refinement: The cultural impact of education on society.	3
II	**Methodology of Indian Knowledge System** • **Pramana:** The means of obtaining knowledge and validation in Indian philosophy. • **Nyaya:** Logical reasoning and debate in the Indian knowledge tradition.	3
III	**Indian Metallurgy** • **Indian Text for Metallurgy:** Ancient Indian scriptures related to metallurgy. • **Important Specimens of Metals Preserved/Found:** Notable examples of metalwork from Indian history. • **Vedic References of Metals:** Mentions of metals in Vedic texts and their significance.	3

IV	**Indian Health Sciences**
	
	• **Literature:**
	   o **Vedic Foundations of Ayurveda:** Ancient texts that form the basis of Ayurveda.
	   o **Ayurveda Concern for Good Health:** Focus on holistic well-being.
	   o **Three Guna, Three Dosha, Panch Mahabhoot, Sapta Dhatu, Six Rasa:** Concepts central to Ayurveda.
	   o **Dincharya & Ritucharya:** Daily and seasonal regimens for health.
	• **Practical:**
	   o **Sushruta Samhita:** Ancient text on surgery.
	   o **Charaka Samhita:** Ayurvedic text on medicine.
		3

	o **Ashtanga Hridaya – Sutra Sthana:** An Ayurvedic classic. o **Qualities of a Surgeon:** The required attributes of a good surgeon. **Surgical Practices:** Ancient Indian surgical methods.	
V	**Foundational Literature of Indian Civilization** **Vedang, Ayurveda, Natya Shastra, Dharma Shastra, Arthashastra:** Key texts that shaped Indian civilization in various fields like linguistics, health, arts, law, and politics.	**3**
VI	**Bharata varsha—A Land of Rare Natural Endowments** **Seasons, Land Variations, Heritage, Natural Resources, Geographical Isolation:** The geography of India and how it shaped the country's culture, heritage, and resources.	**3**

Reference Books:

1. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006).

2. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).

3. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).

BCAA171: OFFICE AUTOMATION LAB		
Course Outcome (CO)		
CO1	Demonstrate the knowledge of the basic structure, features and Generations of computers.	
CO2	Describe the concept of computer languages construct Algorithms to solve problem using programming concepts.	
CO3	Compare and contrast features, types of operating system and computer networks.	
CO4	Demonstrate architecture, functioning & services of the Internet and basics of Multimedia.	
CO5	Illustrate the emerging trends and technologies in the field of Information Technology.	

<div align="center">DETAILED SYLLABUS</div>

Unit	Topic	Proposed Lecture
	Demonstrate the various hardware components of computer system. 1. Open the command prompt and create a directory in C: system drive using MS DOS commands. Now change the directory and create a subdirectory in this folder. 2. Create the following directory structure using MS DOS commands ❖ UIM ❖ UIT • CSE • MECH ❖ LAW ❖ USCS • MCA • BCA • BSCIT i. Remove the directory named MECH and MGT. ii. Remove the directory named UIT in single step. iii. Rename the directory LAW to LLB iv. Display the directory structure of UU. v. Rename the directory named BSCIT to BSIT. 3. Create Microsoft Word document with the name as UIM-MY-BIOGRAPHY. Write about your basic information, likes, dislikes, strengths and weakness. Along with, write the fields in which you excel. Also write about the concepts that inspire you. The font size of the title must be 14 and that of remaining text as 12. The font must be Times New Roman. Write a short biography having not more than 150 words. 4. Create your C.V. using pre-installed templates in WORD. 1- Use table for education qualification, apply paragraph formatting while stating the summary at the end of your C.V., use bullets and numbering wherever applicable 2- Use TIMES NEW ROMAN with font of size 12 and for heading size 14. 5. Invite your friends and relatives to your birthday party by creating a .mdb and linking it with the word document using a utility called Mail Merge. The list of invitees should not be less than 15. Apply formatting to the invitation - apply page borders to the final merged document. Provide the word "birthday invitation " in the header part and "name and contact number" in the footer part.	

6. Create the following table in MS Word and name it as UIM-Student.

Roll no.	Name	Father's Name
1	Aman	Akhilesh Sharma
2	Raman	Narendra Gupta

Insert one more row in the existing table and input the data as: Roll no=3, Name= Daman, Father's Name= Anuj Kumar. Insert one more column named Mother's Name, next to the Column named Father's Name and complete the data of existing records. The student named "Raman" decided to leave the course, so his record needs to be removed from the table. Apply table design to improve its visibility.

7. Create a power point presentation of topic of your own choice and apply different transitions, animations to the slide in your presentation. You must have at least 15 slides in your presentation.

NOTE:- The presentation must have table of contents, consisting of
1. Introduction
2. History/ Background
3. Features
4. Working
5. Advantages
6. Limitation
7. Conclusion, if applicable
8. References- mandatory
9. Thank you .

8. Create the record of at least 10 students in MS Excel consisting of the following Columns:-
Column 1. Serial number
Column 2. Roll number
Column 3. University ID
Column 4. Your name
Column 5. Father's name
Column 6. Mother's name
Column 7. Address
Column 8. Your contact number
Column 9. Father's contact number
Column 10. Mother's contact number
Column 11. Date of birth
Column 12. Total Marks obtained in previous semester
Column 13. Percentage obtained in previous semester
Consider the following sample table:

Student Data

S. No.	R. No.	UID	Name	Father's Name	Mother's Name	Address	Contact No.	Father's Contact no.	Mother's Contact No.	Date of Birth	Marks Obtained in Previous Semester	Percentage Obtained in Previous Semester
1	1	UU101	Aman	Amit	Sunita	#123, Prem Nagar, Dehradun, UK	7000800000	7000610900	7000615756	12 March 2000	404	
3	4	UU104	Cherry	Amar	Priya	#1190, Jolagol, Dehradun, UK	7000807272	7000612120	7000610060	24 March 2000	408	
4	5	UU105	Daman	Simar	Anita	#1233, Clement Town, Dehradun, UK	7000607876	7000612716	7000617574	15 April 2000	433	
5	6	UU106	Elvish	Amit	Priya	#1323, Sudhowala, Dehradun, UK	7000808484	7000613332	7000618180	26 April 2000	340	
6	7	UU107	Gagan	Gurighal	Vachadhri	#1324, Sudhowala, Dehradun, UK	7000609090	7000613938	7000618786	17 March 2000	350	
7	9	UU109	Ishar	Jasjeet	Mamta	#1234, Clement Town, Dehradun, UK	7000809690	7000614544	7000619362	28 October 2000	359	
8	10	UU110	Jagan	Anuj	Rajshree	#1235, Clement Town, Dehradun, UK	7000610202	7000615150	7000619996	19 January 2000	351	
9	11	UU111	Kamal	Abhishek	Priyanka	#1026, Vasant Vihar, Dehradun, UK	7000610908	7000615756	7000620604	22 March 2000	440	
10	12	UU112	Madan	Parunaj	Anamika	#126, Prem Nagar, Dehradun, UK	7000611514	7000616362	7000621710	26 June 2000	468	

9. Display 10 student's result with
   Column 1. Roll number
   Column 2. Name
   Column 3. Subject 1
   Column 4. Subject 2
   Column 5. Subject 3
   Column 6. Subject 4
   Column 7. Subject 5
   Column 8. Calculate the sum of marks obtained in all the subject
   Column 9. Calculate percentage marks obtained
   Column 10. If percentage is >=40 then display "Pass" in front of that cell otherwise
   display "Fail"?
   Consider the following sample data:

				Student Data							
S. No.	R. No.	UID	Name	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Marks Obtained	Percentage	Result	Remarks
1	1	UU101	Aman	61	76	88	66	67	358	71.6	Pass	
2	2	UU102	Baman	43	82	40	82	87	334	66.8	Pass	
3	4	UU104	Cherry	90	67	52	81	82	372	74.4	Pass	
4	5	UU105	Daman	40	78	54	58	67	297	59.4	Pass	
5	6	UU106	Elvish	89	63	85	62	83	382	76.4	Pass	
6	7	UU107	Gagan	98	54	90	56	68	366	73.2	Pass	
7	9	UU109	Ishar	97	74	61	68	94	394	78.8	Pass	
8	10	UU110	Jagan	50	93	72	71	58	344	68.8	Pass	
9	11	UU111	Kamal	92	88	72	83	40	375	75	Pass	
10	12	UU112	Madan	91	51	57	83	48	330	66	Pass	

10. In the above task include the following column as well:
Column 11. Display remarks as "Excellent" if percentage of student is greater than or
equal to 85 but less than 95 and display remarks as "Distinction" if percentage is greater
than or equal to 95 but less than or equal to 100.

11. Consider the following sample data of students:

S. No.	Male Height	Female Height
1	159	152
2	162	148
3	163	156
4	164	155

1. Find the average height of male and female students respectively.
2. Find the maximum and minimum height of male and female students
   respectively.

BCAA173: PROGRAMMING IN PYTHON LAB	
Course Outcome (CO)	
CO1	Enhance the ability to solve problems using system approaches, critical and innovative thinking and technology to create solutions.
CO2	Understand the purpose and the process of code in python.
CO3	Understand the basics of python programming like variable and operators.
CO4	Acquire programming skills in core python programming using Control Statements
CO5	Design and analyse the working of functions in python programming.

DETAILED SYLLABUS

LIST OF PROGRAMS:

1. **Input and Output**

    (a) Write a program to find the largest element among three Numbers.
    (b) Write a program to print the sum of all the even numbers in the range 1 - 50 and print the even sum.
    (c) Write a Program to display all prime numbers within an interval of given X1 & X2.

2. **Variables and Functions**

    a. Write a program to swap two numbers without using a temporary variable.

    b. Write a program to define a function with multiple return values.

    c. Write a program to define a function using default arguments.

3. **Loops and conditionals**

    a. Write a program to print the following patterns using loop: *

    ** *** ****

    b. Write a program to print multiplication table of a given number X1 to range X2.

4. **Strings**

    a. Write a program to find the length of the string without using any library functions.

    b. Write a program to check if two strings are anagrams or not.

    c. Write a program to check if the substring is present in a given string or not.

5. **Lists**

    a. Write a program to perform the given operations on a list:

        i. add   ii. insert   iii. Slicing

    b. Write a program to perform any 5 built-in functions by taking any list.

    c. Write a program to get a list of the even numbers from a given list of numbers. (use only comprehensions)

6. **Tuples**

    a. Write a program to create tuples (name, age, address, college) for at least two members

and concatenate the tuples and print the concatenated tuples.

b. Write a program to return the top 'n' most frequently occurring chars and their respective counts.

e.g. aaaaabbbbcccc, 2 should return [(a 5) (b 4)]

7. **Sets**
   a. Write a program to count the number of vowels in a string (No control flow allowed).
   b. Write a program that displays which letters are present in both strings.
   c. Write a program to sort given list of strings in the order of their vowel counts.

8. **Dictionaries**
   a. Write a program to check if a given key exists in a dictionary or not.
   b. Write a program to add a new key-value pair to an existing dictionary.
   c. Write a program to sum all the items in a given dictionary.

9. **Files**

   a. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper case words from source must be lowered.
   b. Write a program to find the most frequent words in a text (read from a text file).

10. **Classes**

   a. Write a Python class named Person with attributes name, age, weight (kgs), height (ft) and takes them through the constructor and exposes a method get_bmi_result() which returns one of "underweight", "healthy", "obese".
   b. Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.

Syllabus

BCA (AI) 1st Year
IInd Semester

BAS106: DISCRETE MATHEMATICS

	Course Outcome (CO)	
CO1	Discuss mathematical logic and Boolean algebraic switching circuits & logic circuits.	
CO2	Discuss the type of relationship and apply the knowledge using the Hass diagram.	
CO3	Discuss the set theory and recursive function. Also, they will construct the grammars.	
CO4	Describe graph theory and its applicability in various computer applications.	

DETAILED SYLLABUS

Unit	Topic	Proposed Lecture
I	**Mathematical Logic**: Proposition & Propositional Form conditional and Bi- conditional Statements, Negation operation, Logic connectives and compound statements, conjunction, disjunction, truth tables, Duality conditional and in- conditional statements.	8
II	**Boolean Algebra** : Development of Boolean Algebra, Truth functions, The AND, OR, NOT operators, Laws of Boolean Algebras, Reducing Boolean Expressions, Boolean expressions and logic diagrams Universal Building blocks, Negative Logic Min terms, Truth tables and K-maps, Reduction of K maps Disjunctive normal form.	8
III	**Set Theory:** Sets, Types of Sets, Basic Operations on Sets, Venn diagram, Cartesian product of two sets, Distributive law, De Morgan's Law. Functions: Interval and sub-intervals. Definition of function and examples, polynomial, rational, exponential, logarithmic and trigonometric functions.	8
IV	**Function and Relation** : Injective and subjective functions, composition of function, Inverse function, Use of function in coding theory, Relation composition of relation, Equivalence relation.	8
V	**Graph theory**: Definition of a graph, finite and infinite graphs, Incidence and degree, null graph, Sub graphs walks, Paths and circuits in a graph, connected graphs, Trees, Properties of Trees, Planner graphs. Incidence Matrix.	8

Reference Books:
1. C.L. Liu, "Elements of Discrete Mathematics" Mc Graw Hill Book Co., 1985
2. N. Deop, "Graph Theory with applications to Engineering and Computer Science", PHI 1993.
3. B. Colman and Robert C. Busby, "Discrete Mathematical structure for Computer Science," PHI.
4. Olympia Nicodemi, "Discrete Mathematics" CBS Publication, Delhi.
5. M.N.S. Swamy and K. Thulasiraman, "Graphs, Networks and Algorithms," Wiley Inter Science, NY, 1989.

BCAA102: ADVANCE PYTHON PROGRAMMING		
Course Outcome (CO)		
CO1	Understand advanced features of Python like file handling, error handling, and OOP.	
CO2	Develop real-world applications using object-oriented concepts.	
CO3	Use Python for database interaction and basic GUI development.	
CO4	Work with advanced modules like NumPy, Pandas, and Matplotlib for data handling and visualization.	
CO5	Implement mini projects and scripts for automation, data processing, or GUI-based apps.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Advanced Python Basics:** Review of Python basics (data types, loops, functions), Modules and Packages, File Handling (Text, Binary, CSV), Exception Handling (try, except, else, finally), Working with with statement.	**8**
II	**Object-Oriented Programming:** Classes and Objects, __init__() and __str__() methods, Inheritance and Method Overriding, Encapsulation and Polymorphism, Static and Class Methods.	**9**
III	GUI and Database Programming: Introduction to Tkinter (Basic GUI: Label, Entry, Button), Event handling in GUI, Connecting Python with MySQL using MySQL.Connector, CRUD Operations (Create, Read, Update, Delete), Form-based simple database applications.	**9**
IV	**Data Handling and Visualization:** Introduction to NumPy (Arrays, Slicing, Indexing), Introduction to Pandas (Series, DataFrames, Import/Export CSV), Data Cleaning and Filtering, Visualization using Matplotlib (Line, Bar, Pie charts).	**8**
V	**Advanced Topics and Mini Projects:** Working with JSON and XML, Sending Emails with smtplib, Web Scraping using BeautifulSoup or requests, **Mini Projects:** Student Information System, Weather App using API, Expense Tracker, Data Plotting Dashboard.	**8**

Suggested Readings:

Reference Books:
1. "Python Programming" by Reema Thareja – Oxford University Press
2. "Learning Python" by Mark Lutz – O'Reilly Media
3. "Python for Everybody" by Dr. Charles R. Severance – Free eBook
4. "Automate the Boring Stuff with Python" by Al Sweigart – No Starch Press

Online Documentation:
1. https://docs.python.org/3/
2. https://pandas.pydata.org/
3. https://matplotlib.org/

BCAA104: SOFTWARE ENGINEERING		
Course Outcome (CO)		
CO1	To apply fundamental software engineering principles.	
CO2	To apply fundamental software engineering practices to real-world scenarios.	
CO3	To compare and contrast different SDLC models	
CO4	To analyse user needs and translate into clear, concise, and measurable requirements	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	The Evolution of software, Software Crisis, Software Engineering Paradigms The Changing Nature of Software Development, The Role of the Software Engineer, The software life cycle, The relationship of software engineering to other areas of computer science, Programming Languages, Operating Systems, Database, The evolving role of software, An Industry Perspective, Some Initial Solutions	8
II	Requirements Analysis, Analysis Tasks, The Analyst, Problems in Requirements Analysis, Communication Techniques, Analysis Principles, Requirements Analysis Methods, Data Structure Oriented Methods, Formal Specification techniques, Automated Techniques for Requirement Analysis, Important qualities of software product and process, Correctness, Reliability, Robustness, User Friendliness, Verifiability, Maintainability, Reusability, Portability, Data Abstraction, Modularity, Principles of software engineering	8
III	Structured Methodologies, Major Influencing factors, Evolution of End-User Computing, Emergence of CASE Tools, Use of Prototyping 4GL Tools, Relational Databases, Using the methodology, Choosing the Right Methodology, Implementing a Methodology, Current generations of software Development tools, Fourth Generation, Fifth Generation, Fourth Generation Languages, End –user computing, Prototyping, Non-procedural, Considerations in applications development, Problem in Applications Development, Limitation Of 4GLS, Impact OF 4GLS, Why study systems investigations?, The life cycle of an information system , Phase of Systems investigation, The people involved in a system investigation, Problems in System Investigations, General Principles of Systems Investigations	8
IV	Program Evaluation Review Technique (PERT), Methodology and standards, Expression of a Need, Perception of a Problem, Defining the problem, Relating the Problem to the domain of the Computer, Formalizing the Need, Stages in the Systems development life cycle.	8
V	Specification Of Requirements, System Design, Programming, System Testing, Implementation, System Review, What is wrong with current development methods? Software and its increasing cost, Software errors and their impact, An Engineering Approach to Software, Case Tools, Generation of CASE Tools, Categories of CASE Tools, Selecting Case Tools, Deft Case Tools, Factors Affecting Software Development.	8
Reference Books:		

Reference Books:
1. Pressman. "A Practitioner approach to Software engineering"
2. Pnkaj Jalote. "An introduction to Software Engineering".
3. Behhforoz & Frederick Hudson, Software Engineering Fundamentals, OXFORD
4. Rajib Mall, Fundamentals of software Engineering, Prentice Hall of India.
5. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner's ViewPoint, Wiley.

BCAA106: ADVANCE DATABASE MANAGEMENT SYSTEM		
	Course Outcome (CO)	
CO1	Apply knowledge of database for real life applications.	
CO2	Apply query-processing techniques to automate the real time problems of databases	
CO3	Identify and solve the redundancy problem in database tables using normalization.	
CO4	Design, develop and implement a small database project using database tools.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**Introduction**: Data, information and knowledge, Characteristics of database approach, Data independence, Architecture of database system, Data dictionary, Types of database language, database system life cycle, Overview of hierarchical, network and relational model. Relations and Codd's rules, Concepts of keys.	8
II	**Relation Algebra**: Select, Project, Joins, Set operations, Update operations tuple relational calculus, Relational Calculus vs. relational algebra. Data definition, data manipulation, view definition, nested queries, updation, Embedded SQL, Handling of nulls and cursors.	8
III	**Data Models**: Conceptual, Logical and Physical design, ER models, ER diagrams, Strong and weak entity sets, Generalization, Specialization and Aggregation, Conversion of ER model into relational schemas, Extended Relational Model & Object Oriented Database System; New Data Types, User Defined Abstract Data Types	8
IV	**Normalization**: Normalization concepts, Functional dependencies and dependency preservations, Normal forms – 1NF, 2NF, 3NF, BCNF, 4NF, 5NF. **SQL**: Introduction, Data definition, views and queries in SQL, SQL construct, Type of SQL (Brief Overview), SQL Join: Multiple table queries, Built-in functions, Specifying constraints and indexes in SQL, Data Manipulation, Data maintenance, Multiple Table Operations, Transaction integrity facilities, Overview of ORACLE; (Data Type, DDL, DML, DCL).	8
V	**Transaction Handling**: Transaction recovery, System recovery, two phase commit, concurrency problems, locking, deadlocks, security.	8

Reference Books:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon &Leon,"Database Management Systems", Vikas Publishing House
7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar& Bhattacharya, "Database Management System", TMH

BAS108: ENVIRONMENTAL SCIENCE		
Course Outcome (CO)		
CO1	This course will help students understand the importance of these resources and how to preserve these resources.	
CO2	Environment studies will also help students to develop the knowledge and skills required to address challenging environmental issues.	
CO3	It will help them understand how their decisions and actions affect the environment.	
CO4	Students will be made aware about the various types of pollution, and how to minimize them.	

	DETAILED SYLLABUS	
Unit	**Topic**	**Proposed Lecture**
I	**Origin of Earth and System processes:** Solar system formation and planetary differentiation; formation of the Earth: formation and composition of core, mantle, crust; chemical composition of Earth; geological time scale and major changes on the Earth's surface; Holocene and the emergence of humans. Concept of plate tectonics and continental drift theory, continental collision and formation of the Himalaya; ocean floor spreading; mantle convection and, major plates; earthquakes; volcanic activities; orogeny; isostasy; gravitational and magnetic fields of the earth; paleontological evidences of plate tectonics.	6
II	**Minerals and rocks:** Minerals and important rock forming minerals; rock cycle: lithification and metamorphism; Three rock laws; rock structure, igneous, sedimentary and metamorphic rocks; weathering: physical, biogeochemical processes; erosion: physical processes of erosion, factors affecting erosion; agents of erosion: rivers and streams, glacial and aeolian transportation and deposition of sediments by running water, wind and glaciers.	6
III	**Earth surface processes:** Atmosphere: evolution of earth's atmosphere, composition of atmosphere, physical and optical properties, circulation; interfaces: atmosphere–ocean interface, atmosphere–land interface, ocean– land interface; land surface processes: fluvial and glacial processes, rivers and geomorphology; types of glaciers, glacier dynamics, erosional and depositional processes and glaciated landscapes; coastal processes.	6
IV	**Importance of being a mountain:** Formation of Peninsular Indian mountain systems - Western and Eastern Ghats, Vindhyas, Aravalli, etc. Formation of the Himalaya; development of glaciers, perennial river systems and evolution of monsoon in Indian subcontinent; formation of Indo-Gangetic Plains, arrival of humans; evolution of Indus Valley civilization; progression of agriculture in the Indian subcontinent in Holocene; withdrawing monsoon and lessons to draw.	6

Reference Books:

1. Anji Reddy .M (2007), Textbook of Environmental Sciences and Technology, Hyderabad, BS Publications.
2. Y Anjaneyulu.(2004), Introduction to Environmental Sciences, BS Publications

LSM102:	LSM-I (Life Skills & Mentoring – I)	
	Course Outcome (CO)	
CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession.	
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	
CO3	Understand the value of harmonious relationship based on trust and respect in their life and profession.	
CO4	Understand the role of a human being in ensuring harmony in society and nature.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Overview of Life Skills:** Meaning and significance of life skills, Life skills identified by WHO: Self- awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion.	8
II	**Life skills for professionals:** positive thinking, right attitude, attention to detail, having the big picture, learning skills, research skills, perseverance, setting goals and achieving them, helping others, leadership, motivation, self-motivation, and motivating others, personality development, IQ, EQ, and SQ	8
III	**Self-awareness:** definition, need for self-awareness; Coping With Stress and Emotions, Human Values, tools and techniques of SA: questionnaires, journaling, reflective questions, meditation, mindfulness, psychometric tests, feedback. Stress Management: Stress, reasons and effects, identifying stress, stress diaries, the four A's of stress management, techniques, Approaches: action- oriented, emotion oriented, acceptance- oriented, resilience, Gratitude Training,	8
IV	**Coping with emotions:** Identifying and managing emotions, harmful ways of dealing with emotions, PATH method and relaxation techniques. **Morals, Values and Ethics:** Integrity, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Time management, Cooperation, Commitment, Empathy, Self-Confidence, Character, Spirituality, Avoiding Procrastination, Sense of Engineering Ethics.	8
V	**Leadership:** Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, turnaround leadership, managing diverse stakeholders, crisis management. Types of Leadership, Traits, Styles, VUCA Leadership, Levels of Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders.	8

Reference Books:

1. Girish Batra, Experiments in Leadership, Chennai: Notion Press, 2018
2. Mitesh Khatri, Awaken the Leader in You, Mumbai: Jaico Publishing House, 2013
3. Carnegie Dale, Become an Effective Leader, New Delhi: Amaryllis, 2012
4. Hall, C.S., Lindzey. G. & Campbell, J.B Theories of Personality. John Wiley & Sons,1998
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.

BCAA280: DBMS LAB		
Course Outcome (CO)		
CO1	Identify the basic concepts and various data model used in database design ER modelling concepts and architecture use and design queries using SQL.	
CO2	Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression from queries.	
CO3	Recognize and identify the use of normalization and functional dependency, indexing and hashing technique used in database design.	
CO4	Recognize/ identify the purpose of query processing and optimization and also demonstrate the basic of query evaluation.	
CO5	Apply and relate the concept of transaction, concurrency control and recovery in database.	
DETAILED SYLLABUS		

1. Create a table named uim_employee having attributes such as: Employee id, Employee name, Employee's department number, Employee's date of joining, Employee's salary, Employee's email_id and Employee's contact number.
   Consider the following table:

Attribute	Datatype	Size
employee_id	Varchar2	10
employee_name	Char	25
employee_department_no	Number	03
employee_date_of_joining	Date	-
employee_salary	Number	8,2
employee_email_id	Varchar2	30
employee_contact_no	Number	12

   Note: Insert department number values as 111, 222, 333, 444, ...etc.

   Note: Insert employee id values as UU1001, UU1002, UU1003, UU1004, ...etc.

   Write SQL queries to:

   i. Insert at least 10 tuples in the table.

   ii. Display employee's complete details including *employee_id*, *employee_name*, *employee_department_no*, *employee_date_of_joining*, *employee_salary*, *employee_email_id* and *employee_contact_no*.

   iii. Display employee's complete details including *employee_id*, *employee_name*, *employee_department_no*, *employee_date_of_joining*, *employee_salary*, *employee_email_id* and *employee_contact_no* who work in department number 444.

   iv. Display *employee_id*, *employee_name* and *employee_date_of_joining* who work in work in department number 222.

   v. Delete the employee's details having *employee_id* as UU1003.

   vi. Update employee_contact_no to 9592929295 having *employee_id* as UU1007.

2.   Implement DDL and DML on the uim_employee table.
Consider the following table:

Attribute	Datatype	Size
employee_id	Varchar2	10
employee_name	Char	25
employee_department_no	Number	03
employee_date_of_joining	Date	-
employee_salary	Number	8,2
employee_email_id	Varchar2	30
employee_contact_no	Number	12

i. Add a new column named *employee_address* having data type as varchar2, size 30 in the *uim_employee* table.

ii. Update the addresses of existing uim_employees in the table.

iii. Drop the column named *employee_date_of_joining* from the table.

iv. Modify the size of the column named *employee_contact_no* to 14.

v. Rename the table to *uim_employee_details* from the table name *uim_employee*.

vi. Truncate as the records from the *uim_employee_details* table.

vii. Drop the table named *uim_employee_details*.

3.   Implementation of keys and constraints concept. Create a table named uim_student having attributes such as: student's roll number, student's name, student's date of birth, student's course, student's house address, student's contact number, student's aadhaar number. The attribute named: student_roll_no has a PRIMARY KEY constraint, student_name has NOT NULL constraint, student_ aadhaar _no as UNIQUE constraint.
Consider the following table:

Attribute	Datatype	Size	Constraint
student_roll_no	Number	3	PRIMARY KEY
student_name	Char	25	NOT NULL
student_date_of_birth	Date	-	-
student_course	Varchar	15	-
student_address	Varchar2	30	-
student_contact_no	Number	10	-
student_aadhaar_no	Number	12	UNIQUE

i. Describe the structure of uim_student table.

ii. Insert few tuples in the table.

iii. Examine the error message by inserting same *student_roll_no* values for two rows. Write the error message and reason.

iv. Examine the error message by NOT inserting *student_name* value in a row in the table.

Write the error message and reason.

v. Examine the error message by inserting same *student_ aadhaar_no* values for two rows. Write the error message and reason.

4.   Implementation of Foreign key concept using two tables named: uim_employee and uim_department. The employee table has employee's id, employee's name and employee's department number. The department table has department number, department name and department location.

Consider the following two tables:

Table name: uim_employee				Table name: uim_department			
Attribute	Data type	Siz e	Constra int	Attribute	Data type	Siz e	Constrai nt
employee_id	Char	8	-	department_no	Numb er	3	PRIMA RY KEY
employee_name	Varch ar2	20	-	department_na me	Char	15	-
employee_departm ent_no	Numb er	3	FOREI GN KEY	department_lo cation	Varch ar2	20	-

i. Display the structure of uim_employee table
ii. Display the structure of uim_department table
iii. Insert at least three department details in the uim_department table.
iv. Display the data of uim_department table.
v. Insert employee's details working in the corresponding departments as in the uim_department table.
vi. Display the data of uim_department table.
vii. Examine the error message by inserting a value in *employee_department_no* which is NOT there in uim_department table's *department_no*. Write the error message and reason.
iii. Delete any department number from the uim_department table and examine its effects in uim_employee table.

5.   Create a table named *employee_contact_details* from *employee* table by taking the attribute named: *employee_id*.

Consider the table below:

Table name: employee_contact_details		
Attribute	Datatype	Size
employee_id	employee_id from employee table	

i. Display the contents of *employee_contact_details* table

ii. Add a new column employee_contact_no having data type as Number and size as 12 in *employee_contact_details* table

iii. Display the contents of employee_contact_details table.
iv. Update the contact details of existing employees

v.Display the updated contents of employee_contact_details table

6.   Create a table named uim_book having the attributes related to book id, book name and book theme. The *book_theme* attribute can have only two values: IT or MGT where IT is Information Technology and MGT is Management. Apply CHECK constraint on the attribute named *book_theme*.

Consider the table below:

Table name: book			
Attribute	Datatype	Size	Constraint
Book_id	Number	10	PRIMARY KEY
book_name	Varchar2	25	NOT NULL
book_theme	Char	4	CHECK

i.Describe the structure of uim_book table.

ii.Insert few tuples in the uim_book table.

iii.Display the contents of uim_book table.

iv.Examine the error message by inserting a value other than IT/MGT in column named *book_theme*. Write the error message and reason.

7.   Extract the data from both the tables by performing join. Given two tables named: uim_employee and uim_department. The employee table has attributes related to employee's id, employee's name and employee's department number. The department table has attributes related to department number, department name and department location.

Consider the following two tables:

Table name: uim_employee				Table name: uim_department			
Attribute	Data type	Size	Constraint	Attribute	Data type	Size	Constraint
employee_id	Char	8	-	department_no	Number	3	PRIMARY KEY
employee_name	Varchar2	20	-	department_name	Char	15	-
employee_department_no	Number	3	FOREIGN KEY	department_location	Varchar2	20	-

i.Display the structure of uim_employee table
ii.Display the structure of uim_department table
iii.Insert at least three department details in the department table.

iv.Display the data of uim_department table.
v.Insert employee's details in uim_employee table who workin the corresponding departments as in the uim_department table.
vi.Display the data of uim_employee table.
vii.Display employee_id, employee_name, department_no and department_name of employees from both the tables uim_employee and uim_department by performing join.

viii.Display employee_id, department_no, department_name and department_location of employees from both the tables uim_employee and uim_department by performing join.

BCAA182: ADVANCED PYTHON PROGRAMMING LAB	
Course Outcome (CO)	
CO1	Enhance the ability to solve problems using system approaches, critical and innovative thinking and technology to create solutions.
CO2	Understand the purpose and the process of code in python.
CO3	Understand the basics of python programming like variable and operators.
CO4	Acquire programming skills in core python programming using Control Statements
DETAILED SYLLABUS	

1. **Arrays**
   a. Write a program to create, display, append, insert and reverse the order of the items in the array.
   b. Write a program to add, transpose and multiply two matrices.

2. **Python Maps , Filters & Generators:**

   a. Accept two lists, one list represents temperatures in Fahrenheit and another list represents temperatures in Celsius. Perform map operations Fahrenheit-Celsius and Celsius-
      Fahrenheit using lambda

   b. Create a Fibonacci sequence that contains 'N' terms, and filter only even terms using lambda

   c. Write a program to find the number of rows in a text file using Generator and yield.

   d. Find Sum of Squares of 1 to n numbers using Generator Expressions.

3. **Python - Regular Expressions:** Let's take a password as a combination of alphanumeric characters along with special characters, and check whether the password is valid or not with the help of a few conditions.

   Conditions for a valid password are:

   ▪ Should have at least one number.

   ▪ Should have at least one uppercase and one lowercase character.

   ▪ Should have at least one special symbol.

   ▪ ***********Should be between 6 to 20 characters long.

   Input : Gvpce12#   Output : Password is valid.
   Input : asd123

   Output : Invalid Password !!

4. **Programs on Packages:**
   a. Create two packages one with name "Arithmetic" that contains all arithmetic related operations and another with name "interest" that contains operations that implement simple and compound interests
   b. Create the directory name called "Cars" inside this directory create sub-directories "BMW", "Audi" and "Nissan" and inside these sub directories create the corresponding python files that maintain the corresponding Car models, prices, and Manufacturing years. Create "view.py" in "Cars" that takes a particular Car name and outputs the corresponding details.

5. **Programs on Numpy-1:**
   a) Write a Python Program to demonstrate numpy arrays creation using array () function.
   b) Write a python program to demonstrate use of ndim, shape, size, dtype.
   c) Python program to demonstrate basic slicing, integer and Boolean indexing.
   d) Write a python program to find min, max, sum, cumulative sum of array.

6. **Programs on Numpy-2:**
   a. Create two single dimensional NumPy arrays, one is height, and another is weight, calculate BMI (weight/height**2) and keep all BMI values in another NumPy Array. Calculate mean, median, and standard deviation of BMI values.
   b. Integrate the above height and weight arrays as single 2D NumPy array, and show slicing of elements, apply sum() and sort() operations on each row of the 2D NumPy array

7. **Programs on Pandas and Data Visualization:**
   a. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:

      i. Apply head () t r a n s a c t i o n to the pandas data frame

      ii. Perform various data selection operations on Data Frame

   b. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib.

8. Matplotlib -1

a. Write a Python program to draw a line using given axis values with suitable label in the x axis , y axis and a title.

b. Write a Python program to plot several lines with different format styles in one command using arrays.

c. Write a Python program to draw a line using given axis values taken from a text file, with

suitable label in the x axis, y axis and a title.

9. Matplotlib-2

a. Write a Python programming to display a bar chart of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

b. Write a Python program to display a horizontal bar chart of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++ Popularity: 22.2, 17.6, 8.8,

8, 7.7, 6.7

10. Matplot-3

a. Write a Python program to create a bar plot of scores by group and gender. Use multiple X values on the same chart for men and women.

Sample Data:

Means (men) = (22, 30, 35, 35, 26)

Means (women) = (25, 32, 30, 35, 29)

b. Write a Python programming to create a pie chart with a title of the popularity of programming Languages.

Sample data:

Programming languages: Java, Python, PHP, JavaScript, C#, C++

Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7

Syllabus

BCA (AI) 2nd Year
IIIrd Semester

BCAA201: E-COMMERCE & DIGITAL MARKETING		
Course Outcome (CO)		
CO1	To know about E-Commerce in context to Digital Marketing	
CO2	To understand about different modes of digital marketing with their influences.	
CO3	Construct the E-Banking-Concept, operations, online fund transfer-RTGC, ATM,	
CO4	Explain the Artificial intelligence and virtual Reality in Digital Marketing	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Digital Marketing: Evolution of digital Marketing, Traditional vs Digital Marketing, Digital Marketing Channels, Digital Marketing Plan, Digital Marketing Strategy, Digital Marketing Application and Benefits, Digital Marketing in India.	8
II	The Consumer and Digital Marketing: Consumer Behaviour on internet, Impact of Digital Technology on Consumer Behaviour, Attributes of online buying behavior, Marketing Intelligence from user's online data understanding consumer demands, brand building on web	8
III	Social Media Marketing: Social Networking, Objectives of Social Media Strategy , Building social media strategy, Types of Social media marketing , Facebook marketing , LinkedIn marketing, Instagram marketing , You tube Marketing, Twitter Marketing,	8
IV	Emerging Platforms of digital marketing: E-mail marketing, Mobile marketing, Video Marketing, Artificial intelligence and virtual Reality in Digital Marketing.	8
V	Introduction to E-Commerce: Meaning of electronic commerce, business applications of ecommerce, comparison with traditional commerce. Business Models in E-Commerce-e-shops, e-procurement, e-auctions, value chain integrators, information brokerage, telecommunication, collaboration platforms, etc.; Electronic payment system; E-Banking-Concept, operations, online fund transfer-RTGC, ATM, etc.,	8

Reference Books:

1. Gupta Seema (2020), Digital Marketing, Mc Graw Hill Publications.
2. Puthussery Antony (2020), Digital Marketing. Notion Press.
3. Bhatia Puneet (2019), Fundamentals of Digital Marketing, Pearson Publications.
4. Greenstein, Electronic Commerce, Tata McGraw Hill, New Delhi.
5. Norton, Peter: Introduction to Computer 4/E, Tata McGraw Hill (P) Ltd., New Delhi.

BCS213: AI FOR EVERYONE		
Course Outcome (CO)		
CO1	**Understand** the fundamental principles and applications of AI in different industries.	
CO2	**Explain** key AI techniques, including supervised and unsupervised learning, deep learning, and neural networks.	
CO3	**Analyze** ethical challenges and biases in AI systems and their impact on society.	
CO4	**Apply** AI-driven solutions in fields like healthcare, finance, and automation.	
CO5	**Critically evaluate** the benefits and risks associated with AI technologies.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**Introduction to AI (Concept + Hands-on):** What is AI? Understanding AI vs. Machine Learning vs. Deep Learning, AI in daily life: Smart assistants, AI in social media, AI in e-commerce, Prompt Engineering, Real Life Applications of AI. Tools: Explore AI-based tools (Google AI, ChatGPT , MetaAI,Gemini).	8
II	**Introduction to Machine Learning and Deep Learning:** Introduction to learning theory, Methods and Models.Supervised vs. Unsupervised Learning (Examples from real life), Reinforcement Learning, Introduction to ANN and Deep Learning.	9
III	**Computer Vision & Image Processing:** Introduction to Image processing and Computer Vision ?, Hardware used, Face Recognition, Object Detection, and AI-powered Cameras, How AI understands text & speech, AI in Chatbots, Sentiment Analysis, and AI-based Translation Practical	9
IV	**AI in Automation & Robotics:** AI-powered automation in businesses, How AI is used in robotics and smart homes, Ethical AI & Responsible AI, Bias in AI and fairness in decision-making, How to use AI responsibly.	8
V	**Mini AI Projects (Without Coding):** Hands-on Project Options: AI for Image Classification: Train an AI model to recognize objects Create an AI Chatbot: Use Dialog flow or Chatbot.com AI in Business: Automate tasks using AI-based productivity tools.	8

Suggested Readings:

1. **Software Engineering**, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
2. Software **2Engineering: A Primer**, Waman S Jawadekar, Tata McGraw-Hill, 2008
3. Software Engineering, **3Principles and Practices**, Deepak Jain, Oxford University Press.
4. Software Engineering1: **4Abstraction and modelling**, Diner Bjarne, Springer International edition, 2006.
5. Software **5Engineering2:** Specification of systems and languages, Diner Bjorner, Springer International edition 62006.
6. **Software Engineering** Principles and Practice, Hans Van Vliet, 3rd edition, John Wiley & 7Sons Ltd.
7. **7. Software Engineering3**: Domains, Requirements, and Software Design, D. Bjorner, 8Springer International Edition. 8. Introduction to Software Engineering, R. J. Leach, CRC Press.

BCAA203: Operating System and Unix Shell Programming		
Course Outcome (CO)		
CO1	Able to understand detailed introduction and types of OS	
CO2	Able to understand CPU scheduling.	
CO3	Able to understand Memory Management.	
CO4	Able to understand the basic Unix architecture, commands and utilities of the UNIX operating system and to work confidently in Unix/Linux environment and open systems	
CO5	Able to write simple and complex shell scripts to automate various tasks using shell programming	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Introduction: Operating system and function, the evolution of OS, Operating System services, OS Components. Operating Systems Types: Batch, Time Sharing, Multiprogramming, Multitasking, Multiprocessor, Distributed, Real Time, Network.	8
II	CPU Scheduling: Process concept, Process state transitions, schedulers (long term, short term, mid-term), Scheduling concept, Performance criteria, Scheduling algorithms, multiple processor scheduling.	8
III	Memory Management: Resident monitor, multiprogramming with fixed Partition, multiprogramming with variable partition, paging, segmentation, paged segmentation, virtual memory, demand paging, thrashing.	8
IV	Introduction: Introduction to Unix, Unix System Organization (The Kernel and the Shell), Files and Directories, Library Functions and System Calls, Editors (vi and ed).	8
V	Unix Shell Programming: Types of Shells, Shell Meta characters, Shell Variables, Shell scripts, Shell Commands, Unix Environment, Integer Arithmetic and String Manipulation, Special Command Line Characters, Decision Making and Loop Control, Controlling Terminal Input, Trapping Signals, Arrays.	8

Suggested Readings:

1. Peterson & Silberschatz, "Operating System Concepts", Addison-Wesley company
2. Tenenbaum, A.S., "Modern Operating System", PHI Publication
3. Parata, "Advanced Unix Programming guide", BPB.
4. Yashwant Kanitkar, "Unix Shell Programming", BPB.

BCAA205: WEB TECHNOLOGIES SERVICES USING PYTHON		
Course Outcome (CO)		
CO1	Classify the fundamental concepts of web technologies and client-server architecture.	
CO2	Develop web applications using the Flask framework and integrate them with databases.	
CO3	Design the RESTful APIs and handle JSON data effectively.	
CO4	Implement user authentication and authorization in web applications.	
CO5	Construct the responsive front-end interfaces and integrate them with back-end services.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Web Technologies & basics for Web Development** Overview of web technologies, Understanding client-server architecture, Introduction to HTTP/HTTPS protocols, Setting up the development environment, Review of Python fundamentals, Introduction to virtual environments and package management (pip).	9
II	**Overview of Web Frameworks & Flask Framework:** Introduction to web frameworks, Comparison of popular Python web frameworks (Flask, Django, FastAPI), Setting up a basic Flask application, Routing and URL handling, Request and response objects, Templating with Jinja2, Static files and media handling.	9
III	**Building RESTful APIs with Flask & Database Integration :** Understanding REST principles, Creating RESTful endpoints, Handling JSON data, Introduction to Flask-RESTful, Introduction to databases (SQL vs NoSQL), Using SQLite with Flask, Introduction to SQLAlchemy ORM, CRUD operations with a database.	9
IV	**User Authentication and Authorization & Frontend Integration:** Understanding user authentication, Implementing user registration and login , Securing routes and managing sessions, Introduction to Flask-Security, Introduction to HTML, CSS, and JavaScript, Using Bootstrap for responsive design, AJAX and Fetch API for asynchronous requests, Integrating frontend with Flask backend.	10
V	**Testing ,Debugging & Deployment, Hosting:** Importance of testing in web development, Writing unit tests with pytest, Debugging techniques in Flask applications, Using Flask's built-in debugger, Overview of deployment options (Heroku, AWS, DigitalOcean), Preparing the application for production, Environment variables and configuration management, Deploying a Flask application	10
Suggested Readings: 1. "Flask Web Development" by Miguel Grinberg 2. "Django for Beginners" by William S. Vincent		

BAS213: MATHEMATICS-III		
Course Outcome (CO)		
CO1	Recalls limit continuity & differentiation.	
CO2	Describe various theorems of calculus.	
CO3	Recall proper and improper integrals.	
CO4	Compute multiple integrals.	
CO5	Interpret vector calculus.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Differential Calculus-I Review of limit, continuity and differentiability, uniform continuity, Sequences and series, limsup, liminf, convergence of sequences and series of real numbers, absolute and conditional convergence, Successive differentiation, Leibnitz"s theorem for the nth derivative of the product of two function.	8
II	Differential Calculus-II Mean value theorem, Maclaurin"s & Taylor"s expansion of functions, Functions of several variables, limit and continuity, partial derivatives and differentiability, gradient, directional derivatives, chain rule, Taylor"s theorem, maxima and minima and the method of Lagrange multipliers, curve tracing.	9
III	Integral Calculus Riemann integral, fundamental theorem of integral calculus, applications of definite integrals, improper integrals, beta and gamma functions.	9
IV	Multiple Integrals Double Integration: Evaluation of Double Integral (In Cartesian and Polar form), change of order of integration, Jacobian and change of variables. Triple integrals: Triple integration, change to spherical- Coordinates, calculation of volume, surface area, mass.	8
V	Vector Calculus Vector differentiation, scalar and vector point function, Geometric meaning of gradient, Equation of normal line and normal plane, Equation of tangent line and tangent plane, Directional derivative, Divergence of vector function and its interpretation, Curl and their physical interpretation, Line integral, Surface integral, Volume integral, Gauss and Stokes" theorems with applications.	8

Suggested Readings:

1. Dass, H.K; Introduction to Engg. Mathematics, Vol-I, S.Chand
2. Bali, N. P.; Engg. Mathematics Vol-I, Laxmi Publication
3. Grewal, BS; Engg. mathematics Vol-I, Khanna Publication
4. Vashishtha, A.R.; Engg. Mathematics Vol-I, PragatiPrakashan

BCAA271: OS AND SHELL PROGRAMMING LAB		
Course Outcome (CO)		
CO1	To Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks.	
CO2	To accomplish typical personal, office, technical, and software development tasks.	
CO3	To Analyze system performance and network activities. Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.	
CO4	Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.	
CO5	Implement the Unix utilities to successfully write a program	
DETAILED SYLLABUS		
Sr. N.	**Topic**	**Hours**
	Practical based on Basic Unix Commands: 1. Introduction to Unix, Unix architecture 2. Features of Unix, Internal & External Commands 3. Basic unix commands: pwd, cd, mkdir, rmdir, ls, help, man, whatis **Practical based on File Management:** 1. Unix file system 2. File Permission 3. File Handling Commands **Practical based on process Management:** 1. Process basics 2. Process and Threads 3. Process States, PID,PPID and other commands **Practical Based on Filters:** 1. Simple filters 2. pr, head, tail, tr, grep commands 3. cut, paste, sort, nl commands **Practical Based on Shell Scripting:** 1. Shell script 2. Execution of shell scripts. 3. Using command line arguments, loops , condition	

Reference Books:

 Text book/s*
   1. Sumitabha Das, "Unix Concepts and Applications", Tata McGraw Hill.

 Other References
   1. Unix Shell programming by Stephen G. Kochan and Patric Wood
   2. Unix and shell programming by Richard F. Gilberg and Behrouz A. forouzan

BCAA273: WEB TECHNOLOGIES SERVICES USING PYTHON LAB		
Course Outcome (CO)		
CO1	Understand the fundamentals of web development and Python-based web frameworks.	
CO2	Develop dynamic and interactive web applications using Python.	
CO3	Implement client-server communication and API development.	
CO4	Integrate databases with Python-based web applications.	
	Deploy and manage web applications effectively using cloud and containerization technologies.	

DETAILED SYLLABUS

Sr. N.	Topic	Hours
	Introduction to Web Technologies and Python: 1. Overview of web technologies and protocols (HTTP, HTTPS, REST, etc.) 2. Setting up Python for web development 3. Installing and using Flask/Django framework **HTML, CSS, and JavaScript Basics for Web Development:** 1. Creating simple webpages using HTML and CSS 2. Enhancing interactivity with JavaScript 3. Integrating Bootstrap for responsive design **Flask/Django Basics:** 1. Setting up a Flask/Django project 2. Creating and handling routes 3. Rendering templates using Jinja2 (Flask) or Django templates **Form Handling and User Authentication:** 1. Handling form submissions using Flask/Django 2. Implementing user authentication (login, logout, and session management) 3. Using Flask-WTF/Django Forms for secure input validation **Database Connectivity:** 1. Introduction to databases (SQLite, MySQL, PostgreSQL) 2. Connecting a Flask/Django app to a database using SQLAlchemy/Django ORM 3. Performing CRUD operations	

RESTful API Development:

1. Creating RESTful APIs using Flask-RESTful/Django REST Framework
2. Handling API requests (GET, POST, PUT, DELETE)
3. Consuming APIs using Python requests module

Frontend and Backend Integration:

1. AJAX and Fetch API for asynchronous requests
2. Fetching and displaying API data using JavaScript
3. Building a simple Single Page Application (SPA) with Flask/Django as the backend

Web Application Security:

1. Implementing authentication and authorization
2. Preventing SQL injection, XSS, and CSRF attacks
3. Using security libraries like Flask-Security/Django Allauth

Deployment and Cloud Integration:

1. Deploying a web application on Heroku, AWS, or PythonAnywhere
2. Containerizing applications using Docker
3. Configuring web servers (Gunicorn, Nginx, Apache)

Advanced Topics and Project Development:

1. Implementing WebSockets for real-time communication
2. Using Celery for background tasks and scheduling
3. Developing a mini-project using Flask/Django with database integration

Reference Books:

1. Flask Web Development: Developing Web Applications with Python – Miguel Grinberg
2. Django for Beginners – William S. Vincent
3. Python Web Development with Django – Jeff Forcier, Paul Bissex, Wesley Chun

Syllabus

BCA (AI) 2nd Year
IVth Semester

BCAA202: OOPs CONCEPT WITH JAVA		
	Course Outcome (CO)	
CO1	Understand the basic concepts of object-oriented modelling and designing.	
CO2	Write, compile, run, and test simple object-oriented Java programs.	
CO3	Understand the use of inheritance, arrays and Interface in java	
CO4	Implement the concept of exception handling, threads and packages.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Object-Oriented Analysis:** Introduction to Object Oriented Concepts, Data Modeling, Origin of Object-Oriented Design, Object Oriented Design Concepts, Object Oriented Design methods, Class and object definition, Annotation for Object-Oriented Design, Implementation of Detail Design. **Java Basic :** JAVA environment, JAVA program structure, Tokens, Statements, JVM, Constant and Variables, Data Types, Declaration of variables, Scope of variables, Symbolic constants, Type Casting.	8
II	**Operators:** Arithmetic, Relational, Logical assignments, Increment and Decrement, Conditional, Bitwise, Special, Expressions and its evaluation. **Object and Class Concept:** Defining a Class, Adding variables and Methods to classes, Creating Objects, Accessing Class Members, Constructors and Types of constructors, Methods Overloading, Static Members, and Nesting of Methods.	8
III	**Inheritance:** Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract Methods and Classes. **Arrays:** One Dimensional and Two Dimensional, Strings, Wrapper Classes. **Interface:** Defining Interface, Extending Interface, Implementing Interface, Accessing Interface Variable.	8
IV	**Package:** System Packages, Using System Package, Adding a Class to a Package, Hiding Classes; **Exception Handling:** Concepts of Exceptions, Types of Exception, Try and Catch keyword, Nested Try and Catch; **Threads:** Creating Threads, Extending Threads Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority and Synchronization.	8
V	**GUI Application Development:** Introduction to AWT, AWT controls Java Applet, Layout Managers, Menus, Images, Graphics, Event Handling, Swing, Containers, Panes, Frames, Dialogue boxes, working with image.	8

<u>Suggested Readings:</u>

Text Books:
1. E. Balagurusamy, "Programming in Java", TMH Publications.

Reference Books:
1. Peter Norton, "Peter Norton Guide to Java Programming", Techmedia Publications.
2. Naughton, Schildt, "The Complete Reference JAVA 2", TMH.

BCAA204: INTRODUCTION TO INTERNET OF THINGS		
Course Outcome (CO)		
CO1	Classify the fundamentals of IoT, its architecture, and applications.	
CO2	Identify and use IoT hardware, networking components, and communication protocols.	
CO3	Organize the IoT data handling techniques and security challenges.	
CO4	Develop IoT applications using programming and cloud platforms.	
CO5	Evaluate case studies and emerging technologies in IoT.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to IoT:** Definition, Characteristics, and Evolution of IoT, IoT Architecture & Layers, IoT vs. Traditional Embedded Systems, IoT Communication Models & Protocols, IoT Ecosystem and Applications (Smart Homes, Healthcare, Agriculture, Smart Cities, etc.)	**8**
II	**IoT Hardware & Networking:** Sensors, Actuators, and Microcontrollers (Raspberry Pi, Arduino), IoT Communication Technologies: Wi-Fi, Bluetooth, Zigbee, LoRa, NB-IoT, IoT Connectivity: IPv6, MQTT, CoAP, HTTP, Edge Computing and Fog Computing in IoT, Power Management in IoT Devices	**8**
III	**IoT Protocols & Data Handling:** IoT Protocols: MQTT, CoAP, AMQP, HTTP; Cloud Computing for IoT, IoT Data Processing & Storage (Big Data & NoSQL Databases), Security & Privacy Issues in IoT, IoT Middleware and IoT Platforms (AWS IoT, Google IoT Core, Azure IoT)	**8**
IV	**IoT Application Development & Security:** IoT Programming (Python for IoT, Node.js), IoT Operating Systems (Contiki, RIOT, FreeRTOS), Security Challenges in IoT (Threats, Authentication, Cryptography), Blockchain for IoT Security, IoT Testing & Debugging Tools	**8**
V	**Case Studies & Future Trends in IoT:** IoT Applications in Smart Cities, Agriculture, Healthcare, Industry 4.0; AI and Machine Learning for IoT, Digital Twin Technology in IoT, Future Trends in IoT (5G & Beyond, Quantum IoT), Ethical & Social Implications of IoT	**8**

Suggested Readings:

1. "Internet of Things: A Hands-On Approach" – By Arshdeep Bahga & Vijay Madisetti
2. "Internet of Things (IoT): Principles, Paradigms and Applications" – By Rajkumar Buyya & Amir Vahid Dastjerdi
3. "The Internet of Things: Connecting Objects to the Web" – By Hakima Chaouchi
4. "Internet of Things (IoT) with Raspberry Pi and Arduino" – By Rajesh Singh & Anita Gehlot
5. "IoT and Smart Cities: Advances in Green Computing" – By Pradeep Tomar & Gurjit Kaur

BCAA206: MACHINE LEARNING TECHNOLOGY USING PYTHON		
Course Outcome (CO)		
CO1	Classify the basic theory underlying machine learning, types, and the process.	
CO2	Describe the data and visualize univariate, bivariate, and multivariate data using statistical techniques and dimensionality reduction.	
CO3	Demonstrate the various machine learning algorithms such as similarity-based learning, regression, decision trees, and clustering.	
CO4	Explain the learning theories, probability-based models.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Machine Learning**: Need for Machine Learning, Machine Learning Explained, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Application. Introduction, Big Data Analytics and Types of Analytics, Big Data Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization, Bivariate Data and Multivariate Data.	8
II	**Understanding Data**: Multivariate Statistics, Essential Mathematics for Multivariate Data, Overview of Hypothesis, Feature Engineering and Dimensionality Reduction Techniques. **Basics of Learning Theory**: Introduction to Learning and its Types, Introduction to Computation Learning Theory, Design of a Learning System, Introduction to Concept Learning, Induction Biases, Modelling in Machine	8
III	**Similarity-based Learning**: Introduction to Similarity or Instance-based Learning, Nearest-Neighbor Learning, Weighted K-Nearest-Neighbor Algorithm, Nearest Centroid Classifier, Locally Weighted Regression (LWR). **Regression Analysis**: Introduction to Regression, Introduction to Linearity, Correlation, and Causation, Introduction to Linear Regression, Validation of Regression Methods, Multiple Linear Regression, Polynomial Regression, Logistic Regression.	8
IV	**Models Based on Decision Trees:** Introduction to Decision Tree, Decision Tree for Classification, Impurity Measures for Decision Tree Construction, Properties of Decision Tree Classifier (DTC), Applications in Breast Cancer Data, Regression Based on Decision Tress. **Bayesian Learning:** Introduction to Probability-based Learning, Fundamentals of Bayes Theorem, Classification Using Bayes Model.	8
V	**Clustering**: Introduction to Clustering, Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering. **Reinforcement Learning**: Overview and Scope of Reinforcement Learning, Components of Reinforcement Learning, Q-Learning. **Python Basics**: Entering Expressions into the Interactive Shell, Data Types, String Concatenation and Replication, Flow control: Boolean Values, Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(), Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Scopes, The global Statement, Exception Handling,	8

Suggested Readings:
1. S Sridhar and M Vijayalakshmi, "Machine Learning", Oxford University Press, 2021.
2. M N Murty and Ananthanarayana V S, "Machine Learning: Theory and Practice", Universities Press (India) Pvt. Limited, 2024.
3. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education, 2013.
4. Miroslav Kubat, "An Introduction to Machine Learning", Springer, 2017.

BCAA218: AI FOR DEVELOPERS		
Course Outcome (CO)		
CO1	Understand fundamental AI concepts and their applications.	
CO2	Develop and implement machine learning models using Python.	
CO3	Apply AI techniques in natural language processing and computer vision.	
CO4	Integrate AI tools in software development processes.	
CO5	Explore advanced AI applications in real-world scenarios.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Artificial Intelligence: Definition and Scope of AI, History and Evolution of AI, AI vs. Machine Learning vs. Deep Learning, Applications of AI in Software Development, AI Ethics and Responsible AI.	**8**
II	Machine Learning for Developers: Supervised, Unsupervised, and Reinforcement Learning, Data Preprocessing and Feature Engineering, Model Selection and Evaluation Metrics, Popular ML Libraries: Scikit-Learn, TensorFlow, PyTorch, Implementing ML Models in Python.	**8**
III	Natural Language Processing (NLP) and Computer Vision: NLP Basics: Tokenization, Stemming, Lemmatization,	**8**
IV	Sentiment Analysis and Chatbot Development, Image Processing and Feature Extraction, CNNs for Image Recognition (Introduction to OpenCV, TensorFlow), AI-based Object Detection and Face Recognition.	**8**
V	AI in Software Development: AI-powered Code Generation (GitHub Copilot, ChatGPT API), Automated Testing and Debugging using AI, AI in DevOps: CI/CD Automation, Performance Monitoring, AI-based Security: Intrusion Detection and Threat Analysis, AI and Cloud Computing (AWS AI, Azure AI, Google AI).	**8**

Reference Books:

1. "Artificial Intelligence: A Guide for Thinking Humans" – Melanie Mitchell
2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" – Aurélien Géron
3. "Deep Learning for Coders with fastai & PyTorch" – Jeremy Howard, Sylvain Gugger
4. "Pattern Recognition and Machine Learning" – Christopher M. Bishop
5. "Artificial Intelligence: A Modern Approach" – Stuart Russell, Peter Norvig

BCAA208: INTRODUCTION TO AI AND ML AND DATA SCIENCE (EL)		
Course Outcome (CO)		
CO1	Describe the Artificial Intelligence, Historical background.	
CO2	Explain the Introduction to Machine Learning and its importance, and its types of Machine Learning.	
CO3	Design the Data Science and the role of data Scientist.	
CO4	Discuss the Advanced Machine Learning techniques: Support Vector Machines (SVM), Neural Networks, Convolutional Neural Networks (CNN) etc.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Artificial Intelligence:** Definition and scope of Artificial Intelligence, Historical background and milestones in AI development, Various branches of AI: symbolic AI, statistical AI, etc., Applications of AI in different fields like healthcare, finance, gaming, etc., Ethical considerations and societal impact of AI.	**8**
II	**Fundamentals of Machine Learning:** Introduction to Machine Learning and its importance, Types of Machine Learning: Supervised, Unsupervised, and Reinforcement Learning, Basic concepts: features, labels, training data, etc., Popular Machine Learning algorithms: Linear Regression, Logistic Regression, Decision Trees, k- Nearest Neighbors, etc., Evaluation metrics for Machine Learning models: accuracy, precision, recall, F1-score, etc.	**8**
III	**Machine Learning Techniques:** Data preprocessing techniques: handling missing data, feature scaling, feature encoding, etc., Model selection and hyperparameter tuning, Cross-validation techniques, Ensemble methods: Bagging, Boosting, Random Forests, etc., Introduction to deep learning and neural networks	**8**
IV	**Introduction to Data Science:** What is Data Science and why it is important? Role of Data Scientist and skills required, Data acquisition: sources of data, data formats, data cleaning, etc., Exploratory Data Analysis (EDA): statistical analysis, data visualization techniques, Introduction to libraries/tools: NumPy, Pandas, Matplotlib, Seaborn, etc.	**8**
V	**Advanced Topics and Applications:** Advanced Machine Learning techniques: Support Vector Machines (SVM), Neural Networks, Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), etc., Natural Language Processing (NLP) and its applications, Introduction to Big Data technologies: Hadoop, Spark, etc., Case studies and real-world applications in various domains, Future trends and career prospects in AI, ML, and Data Science.	**8**

Suggested Readings:

Reference Books:
1. Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig.
2. Introduction to Machine Learning" by Ethem Alpaydin.
3. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett.

BCAA210: DATA WAREHOUSING AND DATA MINING (EL)		
Course Outcome (CO)		
CO1	Classify the functionality of the various data mining and data warehousing component	
CO2	Demonstrate the limitations of various data mining and data warehousing models	
CO3	Explain the analyzing techniques of various data	
CO4	Describe different methodologies used in data mining and data ware housing	
CO5	Compare different approaches of data ware housing and data mining with various technologies	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**UNIT – I Data Warehouse**: Introduction to Data Ware House, Differences between operational data base systems and data Ware House, Data Ware House characteristics, Data Ware House Architecture and its components, Extraction-Transformation-Loading, Logical (MulitDimensional), Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; FactLess-Facts, Dimension Table characteristics; Fact-Less-Facts, Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP	9
II	**UNIT -II Introduction to Data Mining**: Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing- Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation , Data Transformation; Measures of similarity and dissimilarity-Basics	8
III	**UNIT – III Association Rules:** Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation, APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.	9
IV	**UNIT -IV Classification:** Problem definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision trees-Decision Tree Construction, Methods for expressing attribute test conditions, Measures for Selecting the Best split, Algorithm for Decision tree Induction, Naïve-Bayes Classifier, Bayesian Belief Networks; K-nearest neighbor classification-Algorithm and characteristics	8
V	**UNIT – V Clustering:** Problem Definition, Clustering overview, Evaluation of clustering algorithms, Partitioning clustering K-Means Algorithm, K-Means Additional Issues, PAM Algorithm, Hierarchical Clustering-Algorithm- Agglomerative Methods and Divisive Methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and weakness, Outlier Detection	8

Suggested Readings:

1. Data Mining Introductory and advanced topics -Margaret H Dunham. Pearson education.
2. Data Mining Techniques - Arun K Pujari. University Press.
3. Data Warehousing in the Real World- Sam Aanhory & Dennis Murray Pearson in Edn Asia. .
4. .Data Warehousing Fundamentals-Paulraj Ponnaiah Wiley student Edition The Data Warehouse Life cycle Tool kit-Ralph Kimball Wiley student edition

BCAA212: SOCIAL MEDIA ANALYTICS (EL)		
Course Outcome (CO)		
CO1	To define concept of social media and social media analytics.	
CO2	Understand Network fundaments, models and making connections.	
CO3	To understand the web analytics tools and techniques.	
CO4	To understand the Facebook Analytics & Network analysis.	
CO5	To know about the Applications in Advertising and Game Analytics.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**Introduction to Social Media Analytics (SMA):** Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas.	**8**
II	**Network fundamentals and models:** The social networks perspective – nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization. **Making connections:** Link analysis. Random graphs and network evolution. Social Contexts: Affiliation and identity.	**8**
III	**Web analytics tools and techniques:** Click stream analysis, A/B testing, online surveys, Use of Google Analytics; Web crawling and Indexing; Natural Language Processing Techniques for Micro-text Analysis. **LinkedIn Analytics:** An overview of LinkedIn, Benefits of LinkedIn Network, Building connections of LinkedIn, Using LinkedIn for analytics.	**8**
IV	**Facebook Analytics:** Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB, Use of Facebook Business Manager; Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc.	**8**
V	Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification. Applications in Advertising and Game Analytics (Use of tools like Unity30 / PyCharm). Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration.	**8**

Reference Books:

1. Mathew Ganis, Avinash Koihrkar , Social Media Analytics , IBM Press , 2015 / 1st.
2. Jim Sterne, Social Media Metrics, Wiley ,Latest.
3. Oliver Blanchard ,Social Media ROI ,Que Publishing ,Latest.
4. Marshall Sponder, Gorah F. Khan ,Digital Analytics for Marketing ,Routledge ,2017 / 1st.
5. Marshall Sponder ,Social Media Analytics ,McGraw Hill ,Latest.
6. Tracy L. Tuten, Michael R. Solomon ,Social Media Marketing ,Sage ,2018 / 3rd.
7. Gohar F. Khan ,Creating Value With Social Media Analytics ,CreateSpace Independent, Publishing ,2018 / 1st.

BCAA214: BIG DATA ANALYTICS (EL)		
Course Outcome (CO)		
CO1	Define the Big Data and its analytics in the real world.	
CO2	Contrast the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.	
CO3	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.	
CO4	Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Data Analytics:** Sources and nature of data, Classification of data (structured, semi-structured, unstructured), Characteristics of data, Introduction to Big Data platform, Need of data analytics, Evolution of analytic scalability, Analytic process and tools, Analysis vs reporting, Modern data analytic tools, Applications of data analytics. Data Analytics Lifecycle: Need, key roles for successful analytic projects, Various phases of data analytics lifecycle – discovery, Data preparation, model planning, model building, Communicating results, operationalization	**8**
II	**Data Analysis:** Regression modelling, Multivariate analysis, Bayesian modelling inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis & nonlinear dynamics, Rule induction, neural networks: learning and generalisation, Competitive learning, Principal component analysis and neural networks, Fuzzy logic: extracting fuzzy models from data, Fuzzy decision trees, Stochastic search methods.	**8**
III	**Mining Data Strems:** Introduction to streams concepts, Stream data model and architecture, Stream computing, Sampling data in a stream, Filtering streams, Counting distinct elements in a stream, Estimating moments, Counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – real time sentiment analysis, Stock market predictions.	**8**
IV	**Frequent Itemsets & Clustering**: Mining frequent itemsets, Market based modelling, Apriori algorithm, Handling large data sets in main memory, Limited pas algorithm, Counting frequent item sets in a stream, Clustering techniques: hierarchical, K-means, Clustering high dimensional data, CLIQUE and Proclus, Frequent pattern based clustering methods, Clustering in non-Euclidean space, Clustering for streams & parallelism.	8
V	**Framework & Visualization:** Frame Works and Visualization: MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. Introduction to R – R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.Introduction to Hive, Hive architecture, Hive data types, Hive file format, Hive Query Language (HQL), User-Defined Function (UDF) in Hive;	8

Suggested Readings:
1. Seema Acharya, Subhashini Chellappan, "Big Data Analytics", 1st Edition, Wiley, 2015.
2. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions".
3. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 4.Tom White, "HADOOP: The definitive Guide", 3rd Edition, O Reilly, 2012.

FBCA216: COMPUTER ARCHITECTURE(EL)		
Course Outcome (CO)		
CO1	Identify various components of computer and their interconnection	
CO2	Identify basic components and design of the CPU: the ALU and control unit	
CO3	Compare and select various Memory devices as per requirement.	
CO4	Compare various types of IO mapping techniques	
CO5	Critique the performance issues of cache memory and virtual memory	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**UNIT - I: STRUCTURE OF COMPUTERS:** Computer types, Functional units, Basic operational concepts, VonNeumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data representation, Fixed and Floating point, Error detection and correction codes. COMPUTER ARITHMETIC: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations.	8
II	**UNIT - II: BASIC COMPUTER ORGANIZATION AND DESIGN**: Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC	9
III	**UNIT - III: REGISTER TRANSFER AND MICRO-OPERATIONS**: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit. MICRO-PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.	9
IV	**UNIT - IV**: MEMORY SYSTEM: Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging, Secondary Storage, RAID.	8
V	**UNIT – V INPUT OUTPUT**: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA. MULTIPROCESSORS: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.	8

Suggested Readings:
1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.
2. William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy
3. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,
4. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill

BCAA280: OOPS CONCEPT WITH JAVA LAB		
Course Outcome (CO)		
CO1	Demonstrate Java environment and executing Java Programs	
CO2	Understand and formulate the problems in basic programming constructs	
CO3	Applying OOP concepts to solve real world problems	
CO4	Implement inheritance and polymorphism features of Java	
CO5	Implementing multithreading to enhance efficiency and handle run time errors	
DETAILED SYLLABUS		
Sr. N.	**Topic**	**Hours**
	Experiments: 1. WAP in Java to print Hello and explore the difference between print() and println() 2. WAP in Java with two classes create an object of first class and call into another class (having main method) 3. WAP in Java to find product of two numbers. 4. WAP in Java product of two numbers (Input by the user) 5. WAP in Java to illustrate the concept of local, instance and static variable 6. WAP in Java to count the total number of vowels and consonants in a string. 7. WAP in Java input a string and check whether it is palindrome or not. 8. WAP in Java to implement implicit and explicit type casting 9. WAP in Java to implement various operators in java 10. WAP in Java to check whether the given number is prime or not. 11. WAP in Java for constructor overloading. 12. WAP in Java for method overloading 13. WAP in Java for method overriding 14. WAP in Java to find the factorial of a given number. 15. WAP in Java to show run time polymorphism (up casting) 16. WAP in Java for access specifiers (all four) 17. WAP in Java to implement the single dimension array 18. WAP in Java to copy the elements from one array to another array 19. WAP in Java to perform the addition and multiplication in 2-D array 20. WAP in Java to print the duplicate elements of an array. 21. WAP in Java to find the sum of each row and each column of a matrix 22. WAP in Java to sort the elements of an array in ascending/ descending order using Bubble Sort and Insertion sort. 23. WAP in Java for simple inheritance 24. WAP in Java for Final keyword 25. WAP in Java for super keyword 26. WAP in Java to create package (user defined) 27. WAP in Java for abstract method, class	

| | 28. WAP in Java for interface
29. WAP in Java multiple inheritance
30. WAP in Java for exception handling by using try, catch and finally
31. WAP in Java for throw and throws exception
32. WAP in Java to throw your own exceptions
33. WAP in Java to reading and writing through console class.
34. WAP in Java how to create thread using Thread Class.
35. WAP in Java how to create thread using runnable interface.
36. WAP in Java to implement the multithreading. | |

BCAA282: MACHINE LEARNING TECHNOLOGY LAB		
Course Outcome (CO)		
CO1	Understand the fundamentals of machine learning and deep learning using TensorFlow.	
CO2	Implement data preprocessing and feature engineering for ML models.	
CO3	Develop and train various machine learning models using TensorFlow.	
CO4	Design and optimize deep neural networks for real-world applications.	
CO5	Deploy and evaluate machine learning models in production environments.	
DETAILED SYLLABUS		
Sr. N.	**Topic**	**Hours**

	Introduction to TensorFlow:
	    1. Install and set up TensorFlow
	    2. Basic operations and tensors in TensorFlow
	    3. Performing mathematical computations using TensorFlow
	Data Preprocessing and Feature Engineering:
	    1. Loading datasets using TensorFlow and Pandas
	    2. Data cleaning and handling missing values
	    3. Feature scaling and normalization
	Building and Training a Simple Linear Regression Model:
	    1. Implement a simple linear regression model using TensorFlow
	    2. Train the model and evaluate its performance
	    3. Visualize results using Matplotlib
	Implementing Classification Models:
	    1. Logistic regression for binary classification
	    2. Implementing decision trees using TensorFlow
	    3. Evaluating model performance using accuracy, precision, and recall
	Neural Networks using TensorFlow:
	    1. Building a feedforward neural network
	    2. Training a neural network using TensorFlow and Keras
	    3. Optimizing neural networks using activation functions and optimizers
	Convolutional Neural Networks (CNNs):
	    1. Implementing CNNs for image classification
	    2. Using pre-trained models (e.g., VGG16, ResNet)
	    3. Fine-tuning CNN models for custom datasets
	Recurrent Neural Networks (RNNs) and LSTMs:
	    1. Building an RNN for time series forecasting
	    2. Implementing LSTMs for sequential data processing
	    3. Training and evaluating sequence models
	Natural Language Processing (NLP) using TensorFlow:
	    1. Text preprocessing (tokenization, stemming, lemmatization)
	    2. Implementing sentiment analysis using RNNs/LSTMs
	    3. Training a Transformer-based model for NLP tasks	

	Model Evaluation and Hyperparameter Tuning:	
	1. Using TensorFlow callbacks for model training 2. Performing hyperparameter tuning with Keras Tuner 3. Implementing cross-validation for ML models **Model Deployment and Productionization:** 1. Saving and loading trained models 2. Deploying models using TensorFlow Serving 3. Using TensorFlow Lite for mobile and edge devices	
Reference Books: 1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow – Aurélien Géron 2. Deep Learning with Python – François Chollet 3. TensorFlow for Deep Learning – Bharath Ramsundar & Reza Bosagh Zadeh 4. Python Machine Learning – Sebastian Raschka & Vahid Mirjalili **5.** Neural Networks and Deep Learning – Michael Nielsen		

Syllabus

BCA (AI) 3rd Year
Vth Semester

BCAA301: DATA STRUCTURES AND ALGORITHMS USING JAVA		
Course Outcome (CO)		
CO1	Define the basic terminology about data structures.	
CO2	Ability to implement logical thinking problems.	
CO3	Demonstrate the Programming experience of sorting the numbers in ascending or descending order.	
CO4	Describe the experience graph related problems in real world.	
DETAILEDSYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introductory Concepts** -Algorithm Constructs, Complexity analysis of algorithms (Big O notation) , **OO design**: Abstract Data Types (ADTs), Basic Data Structures, Arrays, Stacks, Queues, Circular Queues, Link lists.	**8**
II	**Searching Algorithms-**The Sequential Search, Analysis of Sequential Search, The Binary Search, Analysis of Binary Search,	**8**
III	**Introduction to sorting**- Selection sort , Insertion sort , Bubble sort , Heap sort , Merge sort , Quick sort , Analysis of sorting algorithms.	**8**
IV	**Graphs and Applications-**, Introduction to graph theory, Graph Terminology ,Different types of Graphs ,Representation of Graphs, Adjacency Matrix , Adjacency List , **Graph Traversal Algorithms** (Breadth First Search, Depth First Search) Shortest Path, Level Setting: Dijkstra's algorithm, Level Correcting: All-pairs shortest path, Floyd-War shall algorithm, Spanning Trees o Minimum spanning tree algorithms, Prim's algorithm, Kruskal's Algorithm.	**8**
V	**Algorithm Designs**- Analysis of different type of Algorithms, Divide and Conquer Algorithm, Greedy algorithm, Dynamic Programming algorithm, Branch-and-bound algorithms.	**8**

Suggested Reading:

1. Problem Solving: Best Strategies to Decision Making, Critical Thinking and Positive Thinking by Thomas Richards / Kindle Edition
2. Data Abstraction and Problem Solving with Java: Walls and Mirrors by Janet Prichard , Frank M. Carrano / Pearson
3. Object-oriented Analysis and Design Using UML - An Introduction to Unified Process and Design Patterns by Mahesh P. Matha / PHI
4. Introduction to Algorithms by Cormen, Leiserson, Rivest and Stein

BCAA303: DATA SCIENCE AND ANALYTIC		
Course Outcome (CO)		
CO1	Understand the fundamentals of Data Science and its applications.	
CO2	Perform data preprocessing and data manipulation using Python libraries.	
CO3	Visualize datasets using appropriate tools and perform Exploratory Data Analysis.	
CO4	Apply statistical techniques and probability distributions for data-driven decision-making.	

DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Data Science: Definition, Applications, and Data Science Lifecycle, Python for Data Science: Introduction, Installation, and IDEs (Jupyter Notebook, VS Code), Python Libraries for Data Science: NumPy, Pandas, Matplotlib, Seaborn, SciPy, Handling Data in Python: Importing, Exporting, and Manipulating Datasets, Data Wrangling: Data Cleaning, Handling Missing Values, and Data Transformation.	8
II	Data Visualization and Exploratory Data Analysis (EDA): Importance of Data Visualization in Analytics, Matplotlib and Seaborn for Data Visualization, Types of Data Visualization: Bar Charts, Histograms, Box Plots, Scatter Plots, Heatmaps, Exploratory Data Analysis: Understanding Data Distributions and Relationships, Feature Engineering: Feature Selection and Feature Extraction.	8
III	Statistical Data Analysis and Probability Distributions: Descriptive Statistics: Measures of Central Tendency and Dispersion, Inferential Statistics: Hypothesis Testing (t-test, Chi-Square Test, ANOVA), Probability Distributions: Normal, Binomial, Poisson, and Exponential Distributions, Correlation and Regression Analysis, Introduction to Time Series Analysis.	8
IV	Machine Learning for Data Science: Introduction to Machine Learning: Supervised vs. Unsupervised Learning, Regression Models: Linear Regression, Multiple Regression, Classification Models: Logistic Regression, Decision Trees, Random Forest, SVM, Clustering Models: K-Means Clustering, Hierarchical Clustering, Model Evaluation: Accuracy, Precision, Recall, F1-score, ROC Curve.	8
V	Advanced Topics in Data Science & Real-world Applications: Deep Learning Basics: Introduction to Neural Networks and TensorFlow, Natural Language Processing (NLP) Fundamentals, Big Data Analytics: Introduction to Hadoop and Spark, Case Studies: Real-world Applications in Healthcare, Finance, and E-commerce, Data Science Project: End-to-End Implementation Using Python.	8

Reference Books:

1. Joel Grus ─ Data Science from Scratch: First Principles with Python, O'Reilly Media.
2. Jake VanderPlas ─ Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media.
3. Aurélien Géron ─ Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media.
4. Sebastian Raschka & Vahid Mirjalili ─ Python Machine Learning, Packt Publishing.
5. Tariq Rashid ─ Make Your Own Neural Network, CreateSpace Independent Publishing.

BCAA305: INTELLECTUAL PROPERTY RIGHTS (IPR)		
Course Outcome (CO)		
CO1	Understand the fundamentals and types of Intellectual Property Rights.	
CO2	Analyze the legal framework and policies related to IPR.	
CO3	Apply knowledge of patents, copyrights, and trademarks in real-world scenarios.	
CO4	Evaluate the economic and ethical aspects of IPR.	
CO5	Develop awareness about infringement, enforcement mechanisms, and the role of IPR in business and innovation.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Intellectual Property Rights: Concept and Scope of IPR, Types of Intellectual Property, Patents, Trademarks, Copyrights, Industrial Designs, Trade Secrets, Importance of IPR in Research, Business, and Industry, International Organizations and IPR: WIPO, WTO, TRIPS.	8
II	Patents and Patent Law: Meaning of Patents and its Types, Patentability Criteria: Novelty, Non-Obviousness, and Industrial Application, Patent Filing Process in India and Internationally, Rights of Patentees and Patent Infringement, Case Studies on Patents (Pharmaceutical, IT, and Technology Sectors).	8
III	Copyrights and Related Rights: Definition and Importance of Copyright, Copyright Protection and Registration Process, Rights of Authors and Copyright Owners, Fair Use, Public Domain, and Digital Copyright Issues, Copyright Infringement and Case Studies.	8
IV	Trademarks, Industrial Designs, and Geographical Indications, Definition and Importance of Trademarks, Types of Trademarks and Trademark Registration, Trademark Infringement and Protection, Industrial Designs: Scope, Registration, and Protection, Geographical Indications (GI) and their Economic Importance.	8
V	Trade Secrets, Cyber Law, and Emerging Trends in IPR, Trade Secrets: Definition and Protection Mechanisms, Cyber Law and Intellectual Property in the Digital Age, Open-Source Software and Licensing, IPR in Artificial Intelligence and Emerging Technologies, Ethical Issues in IPR and Case Studies.	8

Reference Books:

1. P. Narayanan – Intellectual Property Law
2. Wadehra B.L. – Law Relating to Intellectual Property
3. V.K. Ahuja – Law Relating to Intellectual Property Rights
4. Ganguli Prabuddha – Intellectual Property Rights: Unleashing the Knowledge Economy
5. Cornish W.R. & Llewelyn D. – Intellectual Property: Patents, Copyrights, Trademarks, and Allied Rights
6. Merges, Menell & Lemley – Intellectual Property in the New Technological Age
7. Bainbridge D. – Intellectual Property

	BCAA307: INTRODUCTION TO BLOCKCHAIN TECHNOLOGY (EL)	
	Course Outcome (CO)	
CO1	Classify the Growth of Blockchain technology, History of blockchain and Bitcoin	
CO2	Construct the Methods and Routes of decentralization, Decentralized organizations and platforms for decentralization.	
CO3	Define the Architecture, Life use cases of blockchain, Bitcoin digital keys and addresses, Limitations of Bitcoin.	
CO4	Organize Concept of Double Spending, Bitcoin Network and payments, Bitcoin Clients and APIs.	
CO5	List the Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, Design a distributed application, Blockchain applications.	
	DETAILED SYLLABUS	
Unit	**Topic**	**Proposed Lecture**
I	Discover Blockchain Technology: Blockchain, Growth of blockchain technology, Distributed systems, History of blockchain and Bitcoin, Types of blockchain.	**8**
II	Decentralization: Methods of decentralization, Routes of decentralization, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized organizations and platforms for decentralization.	**8**
III	Blockchain: Architecture, Versions, Variants, Use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications. Bitcoins: Introducing Bitcoin, Bitcoin digital keys and addresses, Transactions, Blockchain mining. Alternative Coins. Limitations of Bitcoin.	**9**
IV	Concept of blockchain: Concept of Double Spending, Hashing, Proof of work. Bitcoin Network and payments, Bitcoin network, Wallets, Bitcoin payments, Innovation in Bitcoin, Bitcoin Clients and APIs.	**8**
V	Introduction to Blockchain Platforms: Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, etc. Advantages and Disadvantages, EthereumvsBitcoin, Design a new blockchain, Potential for disruption, Design a distributed application, Blockchain applications.	**9**

Suggested Readings:

1. **"Mastering Blockchain"** – Imran Bashir
2. **"Blockchain Basics"** – Daniel Drescher
3. **"Blockchain Revolution"** – Don Tapscott & Alex Tapscott
4. **"The Basics of Bitcoins and Blockchains"** – Antony Lewis
5. **"Blockchain for Dummies"** – Tiana Laurence

	BCAA309: NATURAL LANGUAGE PROCESSING (EL)	
	Course Outcome (CO)	
CO1	Classify the sensitivity to linguistic phenomena and an ability to model them with formal grammars.	
CO2	Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems	
CO3	Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods	
CO4	Able to design, implement, and analyze NLP algorithms	
CO5	Able to design different language modeling Techniques.	

	DETAILED SYLLABUS	
Unit	**Topic**	**Proposed Lecture**
I	**UNIT - I Finding the Structure of Words**: Words and Their Components, Issues and Challenges, Morphological Models Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches	**8**
II	**UNIT - II Syntax Analysis**: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues	**8**
III	**UNIT - III Semantic Parsing:** Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.	**8**
IV	**UNIT - IV Predicate**-Argument Structure, Meaning Representation Systems, Software.	**8**
V	**UNIT - V Discourse Processing:** Cohension, Reference Resolution, Discourse Cohension and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, LanguageSpecific Modeling Problems, Multilingual and Crosslingual Language Modeling	**8**

Suggested Readings:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni,
2. Pearson Publication Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

BCAA311: SOFT COMPUTING (EL)		
Course Outcome (CO)		
CO1	Classify the knowledge of soft computing concepts and he can apply them for practical applications.	
CO2	Design suitable Neural Network for real time problems.	
CO3	Discuss the appropriately use fuzzy rules and reasoning to develop decision making and expert systems.	
CO4	Formulate the importance of optimization techniques and genetic programming.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**Introduction:** Soft Computing, Differences between Soft Computing and Hard Computing, Requirements of Soft Computing, Applications of Soft Computing; Introduction to Artificial Intelligence, Models of Artificial Neural Network, Feed forward artificial neural networks, Perceptron and Multilayer Perceptron neural networks, Radial basis function artificial neural networks, Recurrent neural networks, Modular neural networks.	8
II	**Learning Rules and Various Activation Functions:** Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule, Widrow, Hoff Learning Rule, Correlation Learning Rule, Winner take All Learning Rule, Associative Memories.	8
III	**Introduction to Fuzzy System:** Fuzzy System, Fuzzy Logic, Fuzzy Sets and Crisp Sets, Evolution of Fuzzy System, Fuzzy Set Operations, Fuzzy to Crisp Conversion, Inference in Fuzzy Logic, Fuzzy Rule Base, Fuzzy Knowledge Base, Fuzzyfication and Defuzzyfication.	
IV	**Genetic Algorithm-I:** Genetic Algorithm, Basic Concept, Working Principle of Genetic Algorithm, Flow Chart of Genetic Algorithm, Genetic Representation (Encoding), Initialization and Selection.	8
V	**Genetic Algorithm-II:** Genetic Representations, (Encoding), Genetic Operators, Mutation, Generational Cycle.	8

Suggested Readings:

Reference Books
1. S. Rajsekaran& G.A. VijayalakshmiPai, "Neural Networks,Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India,2003
2. Anderson, James, "Introduction to Neural Networks", PHI Publication, Delhi, India
3. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press, USA,2005.
4. Simon Haykin,"Neural Networks and Learning Machines" Prentice Hall of India, 2005, Third Edition.

BCAA313: INFORMATION SECURITY & CYBER LAWS (EL)		
Course Outcome (CO)		
CO1	Sketch the structure, mechanics and evolution of various crime threats	
CO2	Discuss the information systems from external attacks by developing skills in enterprise security, wireless security and computer forensics.	
CO3	Contrast the risks involved while sharing their information in cyber space and numerous related solutions like sending protected and digitally signed documents	
CO4	Identify the Digital Signature and Electronic Signature, Digital Certificate.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Definitions**: Protection, Security, risk, threat, vulnerability, exploit, attack, confidentiality, integrity, availability, non-repudiation, authentication , authorization, codes, plain text, encryption, decryption, cipher text, key, ciphers, Symmetric and asymmetric 19 cryptography, Public key , private key ,Crypt analysis,, Cyber forensics. Substitution cipher (Caesar), Transposition cipher (Rail-Fence).	**8**
II	Risk analysis, process, key principles of conventional computer security, security policies, data protection, access control, internal vs external threat, security assurance, passwords, access control, computer forensics and incident response.	**8**
III	CYBER ATTACKS (definitions and examples): Denial-of-service attacks, Man-in-the middle attack, Phishing, spoofing and spam attacks, Drive-by attack, Password attack, SQL injection attack, Cross-site scripting attack, Eavesdropping attack, Birthday attack, Malware attacks, Social Engineering attacks.	**8**
IV	Brief Introduction of handling the attacks described in UNIT 3. Firewalls, logging and intrusion detection systems, e-mail security, security issues in operating systems, ethics of hacking and cracking.	**8**
V	**Definitions:** Digital Signature and Electronic Signature, Digital Certificate **i.[Section 43]** Penalty and compensation for damage to computer etc. **ii.[Section 65]** Tampering with computer source documents. **iii.[Section 66A]** Punishment for sending offensive messages through communication service etc. **iv.[Section 66B]** Punishment for dishonestly receiving stolen computer resource or communication device. **v.[Section 66C]** Punishment for identity theft. **vi.[Section 66D]** Punishment for cheating by impersonation by using computer resource. **vii. [Section 66E]** Punishment for violation of privacy. **viii.[Section 66F]** Punishment for cyber terrorism. **xii.[Section 72]** Breach of confidentiality and privacy.	**8**

Suggested Readings:

1. Merkow, M., & Breithaupt, J.(2005) Information Security Principles and Practices. 5th edition. Prentice Hall.
2. Snyder, G.F. (2010). Network Security, Cengage Learning.
3. Whitman, M. E. & Mattord, H. J. (2017) Principles of Information Security. 6th edition. Cengage Learning.

FBCA371: DATA STRUCTURE ALGORITHMS USING JAVA LAB		
Course Outcome (CO)		
CO1	Understand and apply fundamental data structures (arrays, stacks, queues, linked lists) using Java.	
CO2	Implement non-linear data structures like trees and graphs.	
CO3	Analyze algorithm efficiency using sorting and searching techniques.	
CO4	Solve real-world problems using appropriate data structures.	
CO5	Demonstrate proficiency in memory management and pointer manipulation in Java.	
DETAILED SYLLABUS		
S.No.	**Topic**	**Hours**
	Arrays and Linked Lists 1. Array Implementation of Stack 2. Array Implementation of Queue 3. Singly Linked List: Creation, Insertion, Deletion 4. Doubly Linked List Operations 5. Circular Linked List Operations **Stack and Queue Applications** 1. Infix to Postfix Conversion using Stack 2. Postfix Expression Evaluation using Stack 3. Implement Circular Queue using Array and Linked List 4. Palindrome Checker using Stack **Trees** 1. Binary Tree Creation and Traversals (Inorder, Preorder, Postorder) 2. Binary Search Tree (BST): Insertion, Deletion, Search 3. Find Height/Depth of a Binary Tree 4. Count Leaf Nodes and Non-leaf Nodes in a Tree **Searching and Sorting** 1. Linear Search and Binary Search 2. Bubble Sort, Insertion Sort, Selection Sort 3. Quick Sort Implementation 4. Merge Sort Implementation **Graphs (Optional for Basic Labs)** 1. Graph Representation using Adjacency Matrix and List 2. Depth-First Search (DFS) and Breadth-First Search (BFS)	

Suggested Readings:

5. Problem Solving: Best Strategies to Decision Making, Critical Thinking and Positive Thinking by Thomas Richards / Kindle Edition
6. Data Abstraction and Problem Solving with Java: Walls and Mirrors by Janet Prichard , Frank M. Carrano / Pearson
7. Object-oriented Analysis and Design Using UML - An Introduction to Unified Process and Design Patterns by Mahesh P. Matha / PHI

BCAA373: DATA SCIENCE AND ANALYTIC LAB		
Course Outcome (CO)		
CO1	Understand and apply NumPy arrays and their operations for data handling.	
CO2	Perform data preprocessing and transformation using NumPy functions.	
CO3	Implement mathematical and statistical computations using NumPy.	
CO4	Handle multi-dimensional arrays and perform matrix manipulations.	
CO5	Use NumPy for real-world data analytics problems.	
DETAILED SYLLABUS		
S.No.	**Topic**	**Hours**
	Introduction to NumPy and Arrays: 1. Write a Python program to create a NumPy array and display its properties. 2. Implement slicing and indexing operations on a given NumPy array. 3. Write a program to iterate over NumPy arrays using nditer(). **Array Operations and Broadcasting:** 1. Write a program to perform element-wise arithmetic operations on two NumPy arrays. 2. Implement broadcasting with arrays of different shapes. 3. Demonstrate array concatenation and splitting operations. **Linear Algebra with NumPy:** 1. Write a program to create a matrix and perform basic matrix operations. 2. Compute the determinant and inverse of a given matrix. 3. Find eigenvalues and eigenvectors of a given matrix. 4. Solve a system of linear equations using NumPy. **Statistical and Mathematical Functions:** 1. Compute mean, median, variance, and standard deviation of a dataset. 2. Generate random numbers using different probability distributions. 3. Find correlation and covariance between two datasets. **Real-World Data Analysis using NumPy:** 1. Load a dataset using NumPy and perform data preprocessing. 2. Compare the performance of NumPy arrays and Python lists in large data operations. 3. Use NumPy with Pandas and Matplotlib for basic data analysis and visualization.	
Suggested Readings: 1. Wes McKinney, Python for Data Analysis, O'Reilly Media, 2017. 2. Jake VanderPlas, Python Data Science Handbook, O'Reilly Media, 2016. 3. Mark Lutz, Learning Python, O'Reilly Media, 2013. 4. David Cournapeau & Travis Oliphant, Guide to NumPy, 2nd Edition. 5. Joel Grus, Data Science from Scratch, O'Reilly Media, 2019.		

BCAA375: (INTERNSHIP)/ MINOR PROJECT LAB		
Course Outcome (CO)		
CO1	Identify project/research problems; understand information and grasp meaning; translate knowledge into new context; use information, methods, concepts, and theories of fundamental topics in computer science in new situations (Knowledge, Comprehension);	
CO2	Apply computer science principles and practices to a real-world problem; demonstrate in-depth knowledge in the area of the project they have undertaken; solve problems using required knowledge and skills; implement and test solutions/algorithms (Application and Evaluation);	
CO3	Identify potential solutions/algorithms for the project problem; see patterns and modularize the problem, recognize hidden meanings and identify components, show proficiency in software engineering principles (Analysis);	
CO4	Apply a software development methodology currently practiced in industry to produce software system in a rigorous and systematic way using different software life cycle phases (specification, architecture, design, implementation, validation, documentation) (Synthesis);	
CO5	Show evidence (group collaboration, regular meetings, email communications, significant knowledge and skills contributions, etc.) of working productively as an individual and in a team on a project that produces a significant software product (Team Work);	
CO6	Show evidence of competency in oral and written communications skills through oral presentations (project presentation, department seminar or conferences, client interactions), technical reports and/or published research papers in conferences and/or journals (Communications);	
CO7	Use modern techniques, skills and tools necessary for computer science practices relevant to the project they undertake; use techniques in recent research papers to solve problems (Lifelong Learning).	
DETAILED SYLLABUS		
Sr. N	**Topic**	**Hours**
	LAB: Besides completing the subject/Lab assignments, the students will be required to complete one mini project as follows: **MINI-PROJECT in VB, VC++ or Java under Linux(UNIX)/Windows** **In addition to completing Mini-Project, the students will be doing the exercises** provided by the respective teachers in their class rooms. The individual	

	teachers who are teaching the courses will be responsible for completing their respective lab assignments.	
	Some of the representative areas/problems may include the following:	
	Developing Window Based Applications using recent technologies using .NET Platform or Java Technologies like Java Servlet, Java Beans, COM, CORBA etc.	
	Students should learn languages such as PROLOG or LISP to solve the Laboratory exercises.	
	An expert system shell such as IITM rule be used to create a small expert system for, say, troubleshooting moped, VCR etc. Some suggested experiments are : Tour of India, Stable marriage problem, Game playing (such as bridge), coin change problem etc.	

Suggested Readings:

1. Robert Lafore, "Object Oriented Programming in C++", Pearson
2. R. Brown, "Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework", Wiley Publishing, Inc.
3. Ivan Bayross, "Oracle", BPB
4. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.

Syllabus

BCA (AI) 3rd Year
VIth Semester

BCAA302: ARTIFICIAL NEURAL NETWORKS		
Course Outcome (CO)		
CO1	Understand the learning and generalisation issue in neural computation.	
CO2	Understand the basic ideas behind most common learning algorithms for multilayer perceptrons, radial-basis function networks, and Kohonen self-organising maps.	
CO3	Apply neural networks to classification and recognition problems.	
CO4	Implement common learning algorithms using an existing package.	
CO5	To understand complex value of neural network and complexity analysis	
DETAILED SYLLABUS		
Unit	Topic	**Proposed Lecture**
I	**Introduction of Neural Networks**: History, Artificial and biological neural networks, Historical notes, human Brain, neuron Model, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.	**8**
II	**Data processing:** Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.	**8**
III	**Multilayered network architecture**: Introduction, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.	**8**
IV	**Kohonen Self-Organising Maps:** Recurrent network and temporal feed-forward network, implementation with BP, self-organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.	**8**
V	**Complex valued NN and complex valued BP**:Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing, Complexity analysis of network models, Soft computing, Neuro-Fuzzy-genetic algorithm, Integration.	**8**
Reference Books:		

1. J.A Anderson, "An introduction to neural networks", MIT
2. Hageen Demuth Beale,"Neyral Network Design" Cengage Learning.

BCAA304: ARTIFICIAL INTELLIGENCE IN BUSINESS		
Course Outcome (CO)		
CO1	Define the AI and the role it can play to deliver benefits for your organization.	
CO2	Identify potential applications of AI in practice.	
CO3	Explain the main capabilities of AI and the core technologies that help deliver them.	
CO4	Describe the implications of AI for business strategies.	
CO5	Know where the AI technologies are heading within the next few years.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction**: Introduction to AI, 'Winters' and 'summers' of AI, Machine learning, Deep learning. Supervised vs unsupervised learning, Business challenges and opportunities to deployment of AI, Deployment of AI solutions within your organization.	**8**
II	**Learning to Know Your Customers Through NLP:** Introduction to natural language processing, The NLP pipeline, From text to data, Applications of NLP, Overfitting. Evaluation metrics, Decision trees, Business challenges and opportunities to deployment of NLP, Opportunities for deployment of NLP within your organization.	**8**
III	**Enhancing the Customer Experience Through NLG:** Introduction to natural language generation (NLG), Turing test, Difficulties in applying NLG, Application of NLG, Knowledge structures and rules, Rules vs learning. Business challenges and opportunities for deployment of NLG, Opportunities for deployment of NLG within your organization.	**8**
IV	**Search and Data Mining:** Introduction to search and recommendation systems, Internet search, page rank, knowledge graph, Ethical implications and responsibilities. Applications of data mining, Personalization, Micro-segmentation , Business challenges and opportunities for deployment of data mining, Opportunities for deployment of data mining within your organization	**8**
V	**AI in your Organization and Future Directions:** Selecting a process, Matching problems to solutions, choosing an algorithm for a given problem, Introducing AI into your organization, Current status, Business strategy, Organization position within AI capability model, AI heat map. AI as a service, new opportunities or hype? Cost benefit of deep learning, Ethics of AI deployment, Ethical framework in place within your organization, Deployment of an AI solution within your organization.	**8**

Suggested Readings:

Text Books
1. Artificial Intelligence By Example by Denis Rothman.
2. Applied Artificial Intelligence: A Handbook For Business Leaders by Mariya Yao, Adelyn Zhou, and Marlene Jia.

Reference Books
1. Artificial Intelligence for Dummies by John Paul Mueller and Luca Massaron.
2. AI for People and Business by Alex Castrounis.

BCAA380: MAJOR PROJECT LAB		
Course Outcome (CO)		
CO1	To help students develop openness to new ideas in computer science, develop the ability to draw reasonable inferences from observations and learn to formulate and solve new computer science problems using analytical and problem-solving skills;	
CO2	To help students develop the ability to synthesize and integrate information and ideas, develop the ability to think creatively, develop the ability to think holistically and develop the ability to distinguish between facts and opinion;	
CO3	To help students acquire the necessary competences to build a real-life software system by completing different software life cycle phases (like, specification, architecture, design, implementation, validation, documentation, etc);	
CO4	To help students develop the ability to work individually and as part of a team, develop a commitment to accurate work, develop management skills, improve speaking and writing skills, improve the ability to follow directions, instructions and plans, and improve the ability to organize and use time effectively;	
CO5	To help students develop a commitment to personal achievement, the ability to work skillfully, informed understanding of the role of science and technology, a lifelong love of learning, and cultivates a sense of responsibility for one's own behavior and improves self-esteem/self-confidence.	
DETAILED SYLLABUS		
Sr. N	**Topic**	**Hours**
	Course Content This course consists of the development of a realistic application, representative of a typical real-life software system or to carry a research based project in an area related to CS & IT. 1. The students are expected to propose, analyze, design, develop, test and implement a real life software system using recent technologies. 2. In case of a research based project, the students are required to follow a proper research methodology to propose a solution (in terms of a model/ framework/ algorithm, etc) of a research problem related to computer science and IT. 3. The student will deliver oral presentations, progress reports, and a final report. A. Depending on the topic of the project and the chosen software development methodology, the following themes may be addressed to some extent: Software development methodologies, static (products) and dynamic aspects (processes);	

Requirement analysis (goals, use cases), software architectures, architectural styles and patterns, model-driven engineering(MDE);

- Programming techniques, software development environments, refactoring;
- Software validation through unit tests, integration tests, functional and structural tests, and code reviews.
- Project management, planning, resource estimation, reporting.
- Version management by using a version management tool.
- Examples of kinds of systems to be developed are distributed systems, client/server systems, web based systems, secure systems, mobile systems, adaptable systems, optimizations of existing systems or data-intensive systems, etc.

B. Typical process **of research based problems** may include, selection of a research topic followed by an extensive literature survey with an aim to find the research gap. Proposing a solution based on the findings (i.e., research gap) and publishing the research work.

Suggested Readings:

1. Robert Lafore, "Object Oriented Programming in C++", Pearson
2. R. Brown, "Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework", Wiley Publishing, Inc.
3. Ivan Bayross, "Oracle", BPB
4. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.

Syllabus

BCA (AI) 4th Year
VIIth Semester

BCAA401: INTRODUCTION TO RESEARCH METHODOLOGY		
Course Outcome (CO)		
CO1	Define the basic framework of research process.	
CO2	Formulate hypotheses or suggested solutions.	
CO3	List the various sources of research design, information for literature review and data collection.	
CO4	Discuss the different sampling techniques	
CO5	Construct disciplined research under supervision in an area of their choosing	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Research:** Meaning of Re-search, Retracing the path, Importance of re-search. Philosophies, and the language of research theory building Theoretical background of a research philosophy. The meaning of methodology (structured definition and examples). Understanding research terminologies i.e., Concepts, Constructs, Variables, and Definitions etc.	8
II	**Problems and Hypotheses:** Identifying research problem, State-of-the-Art, The problem definition lifecycle. Meaning/Definition of a hypothesis. Real world examples. Testing and Verification of Hypothesis.	8
III	**Research design:** Experimental and Non-experimental research design. Field research, Survey Research, Survey outcomes. Methods of data collection – Secondary data collection methods, qualitative methods of data collection, and Survey methods of data collection.	8
IV	**Sampling Techniques:** Research Population and Sample. Target Population, Accessible Population. Sampling techniques – The nature of sampling, Probability sampling design. Nonprobability sampling design, Determination of sample size.	8
V	**Data Analysis & Report Generation:** Types of Data Sources, Web Data, Survey Data. Data attributes, Discrete vs. Continuous Data attributes. Mean, Median, Mode; Range, Quartile, Variance, SD, Interquartile Range	8

Suggested Readings:
Text book(s):
1. Bryman, Alan & Bell, Emma (2011). Business Research Methods (Third Edition), Oxford University Press.
2. Kerlinger, F.N., & Lee, H.B. (2000). Foundations of Behavioural Research (Fourth Edition), Harcourt Inc.
3. Rubin, Allen & Babbie, Earl (2009). Essential Research Methods for Social Work, Cengage Learning Inc., USA.

Other References:
4. Chawla, Deepak & Sondhi, Neena (2011). Research methodology: Concepts and cases, Vikas Publishing House Pvt. Ltd. Delhi.
5. Pawar, B.S. (2009). Theory building for hypothesis specification in organizational studies, Response Books, New Delhi.
6. Neuman, W.L. (2008). Social research methods: Qualitative and quantitative approaches, Pearson Education.

BCAA403: ANDROID APPLICATION DEVELOPMENT	
Course Outcome (CO)	

CO1	Ability to use an open source and Linux-based Operating System for mobile devices such as smart phones and tablet computers.	
CO2	Define the application development for mobile devices	
CO3	Demonstrate the Programming experience of Android application development	
CO4	Describe the SQLite Database in Application development	

DETAILEDSYLLABUS		
Unit	**Topic**	**Proposed Lecture**
1	**Introduction to ANDROID**: What is Android? Features of Android, Android Applications, Android: Environment Setup, Architecture, Applications, Components, Hello world Example, Organizing & accessing the resources, Activities, Services, Broadcast receivers, Content providers, Fragments, Intents & Filters.	8
2	**Android – UI Layouts**, UI Controls, Event Handling, Styles & Themes, Custom Components, Drag & Drop, Notifications, Location-Based Services, Sending e-mail, Sending SMS, Phone Calls, Publishing Android application, Alert Dialog.	8
3	**Android – Animations**, Audio Capture, Audio Manager, Autocomplete, Bluetooth, Camera, Clipboard, Custom Fonts, Data Backup, Developer Tools, Emulator, Facebook Integration, Gestures, Google Maps, Image Effects, Image Switcher, Internal Storage, Jetplayer	8
4	**Android – Loading Spinner**, Localization, Login Screen, Media Player, Multitouch, Navigation, Network Connection, PHP/MySql, Progress Circle, Progress Bar Using Progress Dialog, Push Notification	8
5	**Android – SDK Manager**, Sensors, Session Management, Sqlite Database, Support Library, Testing, UI Design, UI Patterns, UI Testing, Android – Webview	8

Suggested Reading:

1. Android Application Development, Black Book, Dreamtech Press
2. Android Programming: The Big Nerd Ranch Guide, 4th Edition by Bill Phillips, Chris Stewart, Kristin Marsicano, Brian Gardner (O'REILLY)
3. Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition by John Horton
4. Jerome DiMarzio, "Beginning Android Programming with Android Studio", 4 thEdition.
5. Pradeep Kothari, "Android Application Development (With Kitkat Support)", Black Book 2014.

BCAA405: COMPUTER VISION (EL)		
Course Outcome (CO)		
CO1	Classify the fundamental concepts and techniques in computer vision.	
CO2	Implement basic image processing and manipulation techniques using OpenCV.	
CO3	Detect and describe features in images and match them across different images.	
CO4	Demonstrate the object detection and image classification using deep learning frameworks. Analyze video data for motion detection and tracking.	

DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**Introduction to Computer Vision:** Overview of computer vision and its applications, History and evolution of computer vision, Key challenges in computer vision. **Image Processing Fundamentals**: Understanding digital images (pixels, color spaces), Image representation and manipulation, Basic image processing techniques (filtering, transformations), Introduction to OpenCV.	9
II	**Feature Detection and Description**:Key point detection (Harris, SIFT, SURF),Feature descriptors (ORB, BRIEF), Matching features between images, Applications of feature detection. **Image Segmentation**: Introduction to image segmentation techniques, Thresholding methods, Edge detection (Canny, Sobel), Region-based segmentation (Watershed, GrabCut).	9
III	**Object Detection:** Overview of object detection techniques, Traditional methods (Haar cascades, HOG), Introduction to deep learning for object detection (YOLO, SSD), Implementing object detection with pre-trained models. **Image Classification**: Understanding image classification tasks, Convolution Neural Networks (CNNs) basics Transfer learning and fine-tuning pre-trained models, implementing image classification using TensorFlow/Keras.	10
IV	**Video Analysis:** Introduction to video processing, Motion detection and tracking, Optical flow and background subtraction, Applications in surveillance and activity recognition. **3D Vision and Depth Estimation**: Understanding 3D vision concepts, Stereo vision and depth perception, Structure from motion (SfM), Applications in robotics and augmented reality	10
V	**Image Generation and Enhancement:** Introduction to Generative Adversarial Networks (GANs), Image super-resolution techniques, Image inpainting and style transfer, Applications in art and design. **Advanced Topics in Computer Vision**: Overview of current research trends, Explainable AI in computer vision, Ethical considerations and biases in computer vision, Real-world case studies	10

Suggested Readings:
1. "Learning OpenCV" by Gary Bradski and Adrian Kaehler
2. "Deep Learning for Computer Vision with Python" by Adrian Rosebrock.
3. "Computer Vision: Algorithms and Applications" by Richard Szeliski (2011).
4. "Computer Vision: Models, Learning, and Inference" by Simon J. D. Prince (2012).
5. "Multiple View Geometry in Computer Vision" by Richard Hartley and Andrew Zisserman (2004).

BCAA407: FUNDAMENTALS OF DATA PRIVACY (EL)	
Course Outcome (CO)	

CO1	Classify the fundamental concepts and importance of data privacy.	
CO2	Identify and explain key legal frameworks and regulations related to data privacy.	
CO3	Construct the ethical considerations and Conduct Privacy Impact Assessments (PIAs) and assess privacy risks.	
CO4	Develop incident response plans for data breaches & Evaluate privacy-enhancing technologies and their applications.	

DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Data Privacy & Key Concepts:** Definition and importance of data privacy, Historical context and evolution of data privacy, Overview of data privacy issues in the digital age, Personal data vs. sensitive data, Data subjects and data controllers, Data processing and data lifecycle, Privacy by design and by default.	9
II	**Legal Frameworks and Regulations in Data Privacy** Overview of global data privacy laws (GDPR, CCPA, HIPAA, etc.), Key principles of GDPR (transparency, purpose limitation, data minimization), Understanding consent and user rights, Data collection methods and practices, Data storage and security measures, Data sharing and third-party data processing, Privacy notices and user agreements.	9
III	**Ethical Considerations in Data Privacy & Privacy Impact Assessments (PIAs)** Ethical implications of data collection and usage, Balancing privacy with innovation and business needs, Case studies of data breaches and ethical failures, Understanding the purpose and process of PIAs, Conducting a PIA: steps and best practices, Tools and frameworks for assessing privacy risks	10
IV	**Data Breaches and Incident Response** Types of data breaches and their implications, Legal obligations in the event of a data breach, Developing an incident response plan, Case studies of notable data breaches, Overview of privacy-enhancing technologies (PETs), Encryption, anonymization, and pseudonymization, Tools for managing data privacy (DLP, consent management platforms).	9
V	**Future Trends and Emerging Technologies in Data Privacy** Data privacy in IoT (Internet of Things), Understanding cross-border data transfers, Mechanisms for lawful data transfers (Standard Contractual Clauses, Privacy Shield), Challenges and best practices for international compliance, Evolving regulatory landscape, The role of data privacy in corporate governance, Emerging trends and technologies impacting data privacy.	10

Suggested Readings:
1. "Data Privacy: A Runbook for Engineers" by T. J. McCarthy
2. "Privacy and Data Protection Law" by Paul M. Schwartz and Daniel J. Solove.
3. "Data Privacy" by Nishant Bhajaria (2021).
4. "Cyber Privacy: Who Has Your Data and Why You Should Care" by April Falcon Doss (2020).
5. "Consumer Privacy and Data Protection, Fourth Edition" by Daniel J. Solove (2021).

BCAA409: STORAGE AREA NETWORK (EL)

Course Outcome (CO)		
CO1	Classify the fundamentals of SAN, its components, and architecture.	
CO2	Demonstrate the various SAN technologies and communication protocols.	
CO3	Implement SAN management techniques and security best practices.	
CO4	Define the SAN performance and troubleshoot issues in storage networks.	

	DETAILED SYLLABUS	
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Storage Area Networks:** Overview of Storage Systems, Need for Storage Area Networks (SAN), Types of Storage (DAS, NAS, SAN, Cloud Storage), SAN vs. NAS vs. DAS, SAN Architecture & Components (HBAs, Switches, Storage Arrays)	**8**
II	**SAN Technologies & Protocols:** Fibre Channel (FC) and FC Topologies, iSCSI (Internet Small Computer System Interface), Fibre Channel over Ethernet (FCoE), InfiniBand and NVMe over Fabrics, SAN Zoning and LUN Masking	**8**
III	**SAN Management & Security:** SAN Deployment & Configuration, Storage Virtualization in SAN, Data Deduplication & Compression, SAN Security Threats & Solutions, SAN Backup and Disaster Recovery	**8**
IV	**SAN Performance & Troubleshooting:** SAN Performance Metrics & Monitoring, Bottleneck Identification & Optimization, SAN Troubleshooting Tools & Techniques, Storage Tiering & Load Balancing, Case Studies of Enterprise SAN Implementations	**8**
V	**Emerging Trends in SAN & Cloud Storage:** Software-Defined Storage (SDS), Hyper-Converged Infrastructure (HCI), Cloud Storage & Hybrid Cloud Solutions, AI & Machine Learning in Storage Optimization	**8**

Suggested Readings:

1. "Storage Area Networks" – Meeta Gupta
2. "Data Storage Networking" – Nutan Kumar Panda
3. "Cloud Computing and Storage" – Rashmi Nanda
4. "Storage Networking: Self-Study Guide" – Ramesh Chandra
5. "Storage Networking Fundamentals" – Marc Farley

BCAA4011: MOBILE COMPUTING (EL)		
Course Outcome (CO)		
CO1	Define the Mobile Application Development and Deployment about Android programming from basics to building mobile applications for digital world.	
CO2	Explain state of art techniques in wireless communication.	
CO3	Differentiate the CDMA, GSM. Mobile IP, WImax	
CO4	Demonstrate program for CLDC, MIDP let model and security concerns	
CO5	Contrast the various services and network facilities provided by android platform.	
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**INTRODUCTION:** Mobile Computing – Mobile Computing Vs Wireless Networking – Mobile Computing Applications – Characteristics of Mobile Computing – Structure of Mobile Computing Applications - MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.	**8**
II	**MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER**: Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – Route Optimization - Overview of TCP/IP – Architecture of TCP/IP – Adaptation of TCP Window – Improvement in TCP Performance.	**8**
III	**MOBILE TELECOMMUNICATION SYSTEMS:** Global Systems for Mobile Communication (GSM)- General Packet Radio Service (GPRS)- Universal Mobile Telecommunication System (UMTS).	**8**
IV	**MOBILE AD-HOC NETWORKS**: Ad-Hoc basic concepts – Characteristics- Applications Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular Ad-Hoc Networks (VANET)- MANET Vs VANET – Security.	**8**
V	**MOBILE PLATFORMS AND APPLICATIONS**: Mobile Device Operating Systems – Special Constrains and Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone, M-commerce –Structure –Pros & Cons – Mobile Payment System – Security Issues.	**8**
Suggested Readings:		

1. Ashok Talukder, Roopa Yavagal, Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2nd Edition, Tata McGraw Hill, 2010.
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003

BCAA471: ANDROID APPLICATIONS DEVELOPMENT LAB

Course Outcome (CO)		
CO1	Design and develop Android applications using various UI components.	
CO2	Implement event handling and manage activity lifecycles.	
CO3	Use databases and APIs for data storage and retrieval.	
CO4	Develop applications with networking capabilities and security features.	
CO5	Deploy and test Android applications on different devices.	

DETAILED SYLLABUS		
Sr. N	Topic	Hours
	Introduction to Android Development: 1. Installation and setup of Android Studio 2. Creating a simple "Hello World" application 3. Understanding project structure and manifest file **UI Components and Layouts:** 1. Create an interactive UI with different views 2. Implementing event handling in a login form 3. Creating a simple calculator app **Activities, Intents, and Fragments:** 1. Creating a multi-activity application with explicit intent 2. Using implicit intent for calling, messaging, and opening web pages 3. Implementing a simple fragment-based application **Storage, Databases, and Networking:** 1. Storing user preferences using Shared Preferences 2. Creating a SQLite-based application for storing user details 3. Fetching and displaying JSON data from an API **Advanced Topics and Deployment:** 1. Implementing a background service 2. Sending push notifications using Firebase 3. Deploying an Android app on an emulator and a real device	

Suggested Readings:

1. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Chris Stewart
2. "Head First Android Development" by Dawn Griffiths & David Griffiths
3. "Professional Android" by Reto Meier
4. "Android Application Development for Dummies" by Donn Felker
5. "Android Design Patterns and Best Practices" by Kyle Mew

	BCAA473: RESEARCH METHODOLOGY LAB	
Course Outcome (CO)		
CO1	Identify and formulate research problems with an understanding of research design.	
CO2	Conduct systematic literature reviews using reliable sources and databases.	
CO3	Apply appropriate methodologies, tools, and techniques for data collection and analysis.	
CO4	Demonstrate academic integrity, ethical considerations, and proper citation practices.	
CO5	Draft high-quality research proposals, papers, and technical reports.	
DETAILED SYLLABUS		
Sr. N	**Topic**	**Hours**
1	Introduction to Research: Definition, types, and significance of research. Research process: Problem identification, objectives, hypothesis. Research ethics and plagiarism.	
2	Literature Review: Importance and sources of literature. Using digital libraries: IEEE Xplore, Springer, Scopus, Google Scholar. Reference management tools: Mendeley, Zotero, EndNote.	
3	Research Design and Methodology: Qualitative vs Quantitative research. Sampling methods, data collection tools, surveys, experiments. Case studies and simulation methods.	
4	Data Analysis and Tools: Statistical analysis basics: Mean, median, mode, standard deviation. Tools: Excel, SPSS, R, Python (pandas, matplotlib). Interpretation and visualization of data.	
5	Research Documentation and Writing: Research paper structure: Abstract, Introduction, Methodology, Results, Discussion, Conclusion. Technical report writing. Referencing styles: APA, IEEE, MLA.	
6	Research Communication: Preparing presentations and posters. Publishing in journals, conferences. Handling peer review and revision.	

Suggested Readings:

1. C.R. Kothari, Research Methodology: Methods and Techniques, New Age International, 2004.
2. Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, SAGE Publications, 2019.
3. Jonathan Schwabish, Better Data Visualizations, Columbia University Press, 2021.
4. Robert V. Labaree, Research Guides and Academic Databases, USC Libraries.
5. Eliot Freidson, Professional Powers: A Study of the Institutionalization of Formal Knowledge, University of Chicago Press.

	BCAA475: MINOR PROJECT	
Course Outcome (CO)		
CO1	Identify project/research problems; understand information and grasp meaning; translate knowledge into new context; use information, methods, concepts, and theories of fundamental topics in computer science in new situations (Knowledge, Comprehension);	
CO2	Apply computer science principles and practices to a real-world problem; demonstrate in-depth knowledge in the area of the project they have undertaken; solve problems using required knowledge and skills; implement and test solutions/algorithms (Application and Evaluation);	
CO3	Identify potential solutions/algorithms for the project problem; see patterns and modularize the problem, recognize hidden meanings and identify components, show proficiency in software engineering principles (Analysis);	
CO4	Apply a software development methodology currently practiced in industry to produce software system in a rigorous and systematic way using different software life cycle phases (specification, architecture, design, implementation, validation, documentation) (Synthesis);	
CO5	Show evidence (group collaboration, regular meetings, email communications, significant knowledge and skills contributions, etc.) of working productively as an individual and in a team on a project that produces a significant software product (Team Work);	
CO6	Show evidence of competency in oral and written communications skills through oral presentations (project presentation, department seminar or conferences, client interactions), technical reports and/or published research papers in conferences and/or journals (Communications);	
CO7	Use modern techniques, skills and tools necessary for computer science practices relevant to the project they undertake; use techniques in recent research papers to solve problems (Lifelong Learning).	
DETAILED SYLLABUS		
Sr. N	**Topic**	**Hours**
	LAB: Besides completing the subject/Lab assignments, the students will be required to complete one mini project as follows: **MINI-PROJECT in VB, VC++ or Java under Linux(UNIX)/Windows** **In addition to completing Mini-Project, the students will be doing the exercises** provided by the respective teachers in their class rooms. The individual	

teachers who are teaching the courses will be responsible for completing their respective lab assignments.	
Some of the representative areas/problems may include the following:	
Developing Window Based Applications using recent technologies using .NET Platform or Java Technologies like Java Servlet, Java Beans, COM, CORBA etc.	
Students should learn languages such as PROLOG or LISP to solve the Laboratory exercises.	
An expert system shell such as IITM rule be used to create a small expert system for, say, troubleshooting moped, VCR etc. Some suggested experiments are : Tour of India, Stable marriage problem, Game playing (such as bridge), coin change problem etc.	

Suggested Readings:

1. Robert Lafore, "Object Oriented Programming in C++", Pearson
2. R. Brown, "Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework", Wiley Publishing, Inc.
3. Ivan Bayross, "Oracle", BPB
4. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.

Syllabus

BCA (AI) 4th Year
VIIIth Semester

BCAA402: AUGMENTED REALITY (AR) & VIRTUAL REALITY (VR)		
Course Outcome (CO)		
CO1	Understand the basic concepts and applications of AR and VR.	
CO2	Identify different AR & VR hardware and software technologies.	
CO3	Develop basic AR & VR applications using popular frameworks.	
CO4	Apply user interaction techniques in AR & VR experiences.	
CO5	Analyze future trends, challenges, and career opportunities in AR & VR.	
DETAILEDSYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to AR & VR :**Overview of Augmented Reality (AR) & Virtual Reality (VR); Differences Between AR, VR, and Mixed Reality (MR); History and Evolution of AR & VR Technologies; Applications of AR & VR in Various Fields (Gaming, Healthcare, Education, Retail, etc.); Basic Hardware & Software Components of AR & VR	**8**
II	**AR & VR Devices and Technologies :**AR Hardware: Mobile Devices, Smart Glasses (Microsoft HoloLens, Magic Leap); VR Hardware: Head-Mounted Displays (HMDs), VR Controllers, Motion Tracking Sensors; Input Devices: Haptic Devices, Hand Tracking, Eye Tracking; AR Development Technologies: ARCore (Google), ARKit (Apple), Vuforia; VR Development Technologies: Unity3D, Unreal Engine, WebVR	**8**
III	**AR & VR Development Basics :**Introduction to AR Development (Using Unity & AR SDKs); Introduction to VR Development (Basic Scene Creation in Unity/Unreal); Understanding 3D Environments, 3D Models, and Interactions; Rendering & Graphics in AR & VR; Introduction to Scripting for AR & VR (Basic C# for Unity)	**8**
IV	**AR & VR Applications & User Interaction :**User Interface (UI) & User Experience (UX) Design for AR & VR; Gesture-Based Interaction and Voice Commands; Tracking & Navigation in AR & VR (SLAM, GPS-Based, Marker-Based); AR in Mobile Applications (AR Filters, AR Shopping, AR Navigation); VR Simulations & Training Applications	**8**
V	**Future Trends & Challenges in AR & VR :**Emerging Trends: AI in AR/VR, 5G & AR/VR, Metaverse; Ethical Considerations in AR & VR (Privacy, Security, Health Risks); Challenges in AR & VR Development; Career Opportunities in AR & VR Development; Case Studies: Popular AR/VR Applications (Pokémon GO, Oculus Quest, Google Lens)	**8**

Suggested Readings:

1. Prof. K. S. Ramaswamy – Augmented and Virtual Reality: The Next Big Thing in Tech
2. Dr. B. R. Mamatha & Dr. P. Sharmila – Augmented Reality and Virtual Reality: Emerging Technologies
3. Arun Solanki & Basant Agarwal – Augmented and Virtual Reality in Industry 4.0
4. Ramesh Bang, Pramod Kumar & Rajkumar – Virtual Reality and Augmented Reality in Industry
5. Tushar Sharma – Augmented Reality & Virtual Reality with Unity and Unreal

BCAA404: CLOUD COMPUTING (EL)		
Course Outcome (CO)		
CO1	Classify the concepts, applications, principles and implementation of cloud computing.	
CO2	Define the Cloud Computing Architecture, Cloud Virtualization, Cloud Programming Models, Cloud security and applications.	
CO3	Explain the theoretical concepts but also strongly focuses on practical skill-based learning.	
CO4	Designing, implementing and managing the issues of cloud computing in their personal as well professional life.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Cloud Computing:** Overview of Cloud Computing, Evolution of Cloud Computing, Characteristics of Cloud Computing, Types of cloud and its Cloud services, Benefits and challenges of cloud computing, Applications cloud computing, Cloud Storage, Cloud services requirements, Cloud and dynamic infrastructure, Cloud adoption.	8
II	**Cloud Computing Architecture:** Cloud reference model, Platform as service, Software as a service, Infrastructure as service, Cloud deployment models, public clouds, Private clouds, Community cloud, Hybrid clouds, Cloud design and implementation using SOA, security, trust and privacy.	8
III	**Cloud Virtualization Technology:** Overview of Virtualization techniques, Types of Virtualizations, Implementation Levels of Virtualization Structures, Virtualization benefits, Server virtualization, hypervisor management software, virtual infrastructure requirements	8
IV	**Map Reduce:** Introduction to parallel computing, Map-reduce model, Applications of map reduce, Parallel efficiency of Map Reduce, MapReduce infrastructure, Introduction to Security, Cloud Security challenges and Risks, Software-as-a-Service Security, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control.	8
V	**Cloud platforms and applications:** Web services, App Engine, Azures Platform, Aneka, Open challenges, Scientific applications, Business and Consumer applications	8

Suggested Readings:

1. Dr. Kumar Saurabh, Cloud Computing.
2. Raj Kumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing.

BCAA406: DIGITAL IMAGE PROCESSING (EL)		
Course Outcome (CO)		
CO1	To become familiar with digital image fundamentals.	
CO2	To get exposed to simple image enhancement techniques in Spatial and Frequency domain	
CO3	To learn concepts of degradation function and restoration techniques	
CO4	To study the image segmentation and representation techniques.	
CO5	To become familiar with image compression and recognition method	

	DETAILED SYLLABUS	
Unit	**Topic**	**Proposed Lecture**
I	**DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	8
II	**IMAGE ENHANCEMENT :** Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	8
III	**IMAGE RESTORATION :** Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	8
IV	**IMAGE SEGMENTATION:** Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	8
V	**IMAGE COMPRESSION AND RECOGNITION:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.	8

Suggested Readings:

1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing Pearson, Third Edition, 2010 2. Anil K. Jain,Fundamentals of Digital Image Processing Pearson, 2002.
2. Kenneth R. Castleman,Digital Image Processing Pearson, 2006.
3. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
4. D,E. Dudgeon and RM. Mersereau,Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.

BCAA408: CYBER ANALYTICS (EL)		
Course Outcome (CO)		
CO1	Students after completing this module will be able to understand the basic terminologies related to cyber security and current cyber security threat landscape.	
CO2	After completion of the module, students will have complete understanding of the cyber-attacks that target computers, mobiles and persons.	
CO3	Students after completing this module will be able to understand the legal framework that exist in India for cyber crimes	
CO4	After completing this module, students will understand the aspects related to personal data privacy and security.	
CO5	Students after completing this module will understand the main components of cyber security plan.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.	8
II	Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.	8
III	Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.	8
IV	Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.	8
V	Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.	8

Suggested Readings:

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security ", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.

	BCAA410: DEEP LEARNING (EL)	
	Course Outcome (CO)	
CO1	Understand the fundamentals of deep learning.	
CO2	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems	
CO3	Illustrate the strength and weaknesses of many popular deep learning approaches.	
CO4	Understanding the working of Convolutional Neural Networks and RNN in decision making.	
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** What is a Neural Network?, The Human Brain, Models of a Neuron, Neural Networks Viewed As Directed Graphs, Feedback, Network Architectures, Rosenblatt‟s Perceptron: Introduction, Perceptron, The Perceptron Convergence Theorem, Relation Between the Perceptron and Bayes Classifier for a Gaussian Environment.	**8**
II	**Multilayer Perceptrons:** Introduction, Batch Learning and On-Line Learning, The Back-Propagation Algorithm, XOR Problem, Heuristics for Making the Back- Propagation Algorithm Perform Better, Back Propagation and Differentiation.	**8**
III	**Regularization for Deep Learning:** Parameter Norm Penalties - L2 Parameter Regularization, Dataset Augmentation, Semi-Supervised Learning. Optimization for Training Deep Models: Challenges in Neural Network Optimization – Ill Conditioning, Local Minima, Plateaus, Saddle Points and Other Flat Regions.	**8**
IV	**Convolution neural networks:** The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Convolutional Networks and the History of Deep Learning.	**8**
V	**Sequence Modeling:** Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to- Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Long Short-Term Memory and Other Gated RNNs	**8**
Suggested Readings:		

<u>**Suggested Readings:**</u>

1. "Deep Learning " by François Chollet (Indian Edition)
2. Deep Learning: A Practitioner's Approach" by Adam Gibson and Josh Patterson (Indian   Edition)
3. Python Deep Learning" by Ivan Vasilev, Daniel Slater, and others (Indian Edition)

BCAA480: AUGMENTED REALITY (AR) AND VIRTUAL REALITY (VR) LAB

Course Outcome (CO)		
CO1	Understand the fundamental concepts of AR and VR technologies.	
CO2	Develop interactive AR/VR applications using Unity, Unreal Engine, and relevant SDKs.	
CO3	Implement AR/VR interaction techniques and optimize performance.	
CO4	Integrate AR/VR applications with AI, IoT, and cloud technologies.	
CO5	Analyze and design innovative solutions using AR/VR for various industries.	

DETAILED SYLLABUS

Sr. N	Topic	Hours
	Introduction to AR and VR: 1. Setting up Unity/Unreal Engine for AR/VR development. 2. Creating a simple VR environment in Unity. **Augmented Reality Development:** 1. Developing an AR application using Vuforia/ARCore. 2. Implementing real-world object tracking in AR. 3. Gesture-based interaction in an AR application. **Virtual Reality Development:** 1. Creating a simple VR scene with navigation and interaction. 2. Implementing teleportation and hand interactions in VR. 3. Developing a small interactive VR game. **AR/VR Application Development:** 1. Building a simple AR-based educational application. 2. Creating an industry-based VR training simulation. 3. Developing a collaborative VR environment. **Future Trends and Research in AR/VR:** 1. Research paper presentation on an AR/VR topic. 2. Prototype an AR/VR concept with a final project. 3. Evaluate and test AR/VR applications using UX feedback.	

Suggested Readings:

1. Alan B. Craig – Understanding Augmented Reality: Concepts and Applications (Morgan Kaufmann)
2. Steven M. LaValle – Virtual Reality (Cambridge University Press)
3. Tony Parisi – Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile (O'Reilly)
4. Dietrich Paulus & Tobias Hollerer – Augmented Reality: Principles & Practice (Addison-Wesley)
5. Grigore C. Burdea & Philippe Coiffet – Virtual Reality Technology (Wiley)

BCAA482: DISSERTATION/MAJOR PROJECT LAB		
Course Outcome (CO)		
CO1	To help students develop openness to new ideas in computer science, develop the ability to draw reasonable inferences from observations and learn to formulate and solve new computer science problems using analytical and problem-solving skills;	
CO2	To help students develop the ability to synthesize and integrate information and ideas, develop the ability to think creatively, develop the ability to think holistically and develop the ability to distinguish between facts and opinion;	
CO3	To help students acquire the necessary competences to build a real-life software system by completing different software life cycle phases (like, specification, architecture, design, implementation, validation, documentation, etc);	
CO4	To help students develop the ability to work individually and as part of a team, develop a commitment to accurate work, develop management skills, improve speaking and writing skills, improve the ability to follow directions, instructions and plans, and improve the ability to organize and use time effectively;	
CO5	To help students develop a commitment to personal achievement, the ability to work skillfully, informed understanding of the role of science and technology, a lifelong love of learning, and cultivates a sense of responsibility for one's own behavior and improves self-esteem/self-confidence.	
DETAILED SYLLABUS		
Sr. N	**Topic**	**Hours**
	Course Content This course consists of the development of a realistic application, representative of a typical real-life software system or to carry a research based project in an area related to CS & IT. 4. The students are expected to propose, analyze, design, develop, test and implement a real life software system using recent technologies. 5. In case of a research based project, the students are required to follow a proper research methodology to propose a solution (in terms of a model/ framework/ algorithm, etc) of a research problem related to computer science and IT. 6. The student will deliver oral presentations, progress reports, and a final report. A. Depending on the topic of the project and the chosen software development methodology, the following themes may be addressed to some extent: Software development methodologies, static (products) and dynamic aspects (processes);	

Requirement analysis (goals, use cases), software architectures, architectural styles and patterns, model-driven engineering(MDE); • Programming techniques, software development environments, refactoring; • Software validation through unit tests, integration tests, functional and structural tests, and code reviews. • Project management, planning, resource estimation, reporting. • Version management by using a version management tool. • Examples of kinds of systems to be developed are distributed systems, client/server systems, web based systems, secure systems, mobile systems, adaptable systems, optimizations of existing systems or data-intensive systems, etc. **B.** Typical process **of research based problems** may include, selection of a research topic followed by an extensive literature survey with an aim to find the research gap. Proposing a solution based on the findings (i.e., research gap) and publishing the research work.	

Suggested Readings:

5. Robert Lafore, "Object Oriented Programming in C++", Pearson
6. R. Brown, "Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework", Wiley Publishing, Inc.
7. Ivan Bayross, "Oracle", BPB
8. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.