Department of Computer Applications
4 Years BCA Structure
Pattern: 2025-26

RSCOE

Dr. Rinku Dulloo
Chairman BOS

Dr. Avinash Badadhe
Dean Academics

Dr. Santosh Bhosle
Director

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Dean Academics

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Department of Computer Applications

Vision

"To progress as a center of brilliance in computing education producing globally proficient professionals contributing to the betterment of the society."

Mission

1. To educate students in the basic standards of Software Engineering
2. To educate students to become successful professionals
3. To propel students for research and entrepreneurship

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Program Outcomes (POs)

PO1: Computational Knowledge: Apply knowledge of computing fundamentals and domain knowledge.
PO2: Problem Analysis: Identify, formulate and solve complex computing problems reaching substantiated conclusions.
PO3: Development of Solutions: Design and evaluate solutions for complex computing problems with appropriate consideration.
PO4: Investigations of complex Computing problems: Use research-based knowledge and research methods for analysis and interpretation of data, and synthesis of the information to provide valid conclusions
PO5: Modern Tool Usage: Create, identify and apply appropriate techniques, resources, and modern computing tools to complex computing activities.
PO6: Professional Ethics: Understand and commit to professional ethics and cyber regulations for professional computing practices.
PO7: Life-long Learning: Identify the need and have the ability, to engage in independent learning as a computing professional.
PO8: Project management and finance: Understand and apply computing, management principles to manage multidisciplinary projects
PO9: Communication Efficacy: Communicate effectively with the computing community, and with society.
PO10: Societal and Environmental Concern: Understand and assess societal, environmental, health, safety,legal, and cultural issues
PO11: Individual and Team Work: Function effectively in diverse teams and in multidisciplinary environments.
PO12: Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity.

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Program Specific Outcomes (PSOs):

Upon successful completion of UG BCA Program, the students will attain following

Program Specific Outcomes:

PSO1: Professional Skills-

To provide an opportunity to work effectively with teams and group with better communication skills in written and oral form. Also, to develop an appreciation of ethics and social awareness needed and with this to develop master for successful career and leadership position

PSO2: Problem-Solving Skills-

To prepare the students for technical and managerial skills necessary to design and implement computer applications to conduct open ended problem solving and applying critical thinking

PSO3: Professional Career and Entrepreneurship-

The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and zest for the higher studies and research and entrepreneurship

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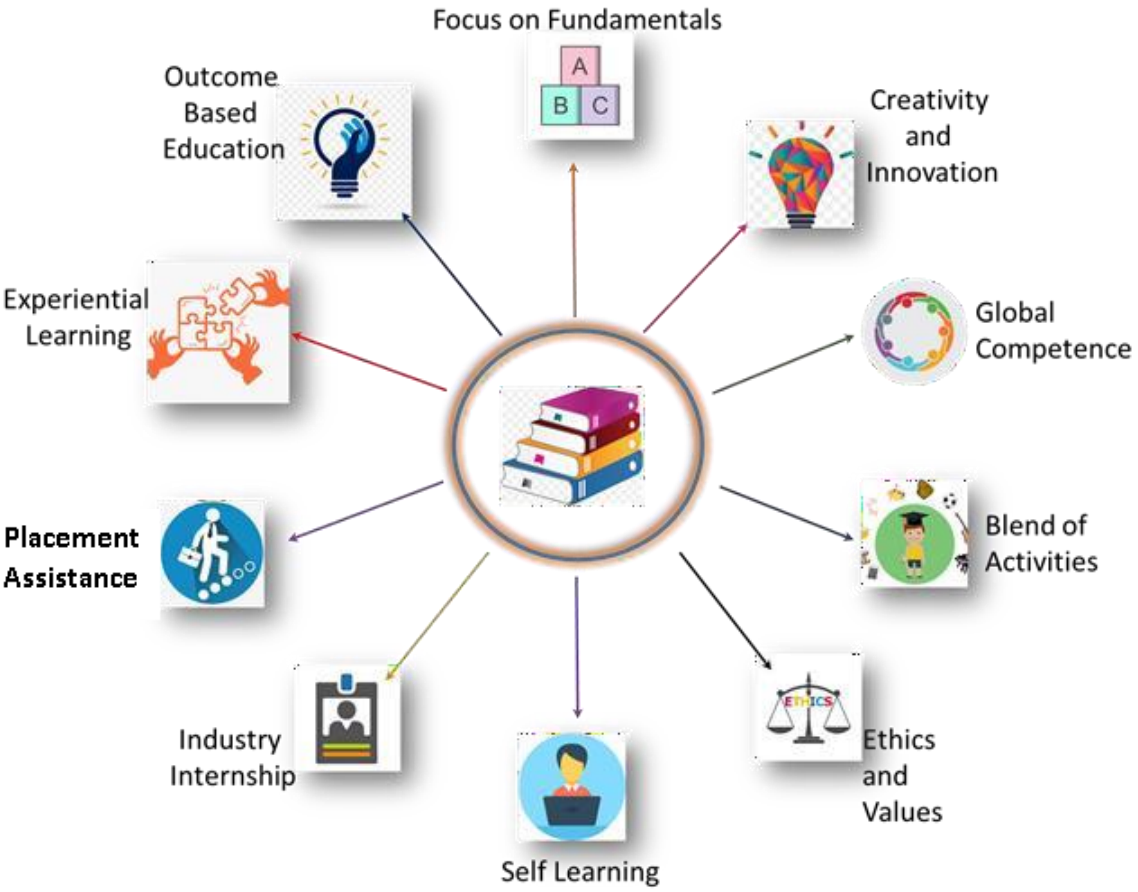
Highlights of the Syllabus

Curriculum of BCA is designed in consultation with



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Everybody knows Technology but "Application makes a Difference"

- The curriculum of BCA is designed in a way such that, students will get knowledge of most trending and "in use" industrial technologies and practices by the time they complete their post-graduation. Keeping this goal in mind updates the curriculum as and when required.
- BCA curriculum is designed to build a strong basic and clear all the fundamental concepts.
- Bridge course is introduced during the induction program for two weeks to learn basic concepts.
- Mini Projects- To understand the importance of working in teams and being part of collective success, we have incorporated Mini projects in each semester where student will work together and implement it.
- Human Values Course- RSCOE focus on the all-around development of our students. This includes refining their technical skills as well as their personal development. Human Values courses will teach them how to handle stressful situations, ethics of a professional and how to give back to the society. This will also motivate them to join the various CSR activities conducted by the company they join and help in achieving the different organizational goals of the company they join.
- Electives offered on emerging technologies. Students can opt any one as per his/her choice.
- Online Professional certification courses are enabled curriculum for all students.
- Language Proficiency – English and softt skills are included in curriculum.
- In order to make students ready for placement, gateway to industry course is given where basic aptitude and technical concepts are introduced.
- Professional communication skills course help students to develop over all personality and groom them.

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Bachelor of Computer Applications(BCA)

Semester-I

Course Code	Course Type	Course Name	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		
					ISE (20)	MSE (30)	ESE (50)			Total
BCA1101T	CC	Database Management System	3	-	20	30	50	-	100	**3**
BCA1101L		Database Management System Lab	-	4	ISCE:60		40	100	100	**2**
BCA1102T		Software Engineering	3	-	20	30	50	-	100	**3**
BCA1103T		Fundamentals of Computer	3	-	20	30	50	-	100	**3**
BCA1104T	SEC	C Programming	3	-	20	30	50	-	100	**3**
BCA1104L		C Programming Lab	-	4	ISCE:60		40	100	100	**2**
HSCA1201T	AEC	Professional English Communication	2	-	20	30	50	-	100	**2**
HSCA1201L		Professional English Communication		2	ISCE: 30		20	50	50	**1**
HSCA1202L	MDC	Indian Knowledge System	2	-	ISCE: 50		50	-	100	2
		Total	**16**	10				**250**	**850**	21

Course Type Abbreviations

SEC: Skill Enhancement Course **CC :** Core Course

AEC : Ability Enhancement Course **MDC:** Multi Disciplinary Course

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Bachelor of Computer Applications (BCA)

Semester-II

Course Code	Course Type	Course Name	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA1105T	CC	Advance Database Management System	3	-	20	30	50	-	100	3
BCA1105L		Advance Database Management System Lab	-	4	ISCE:60		40	100	100	2
BCA1106T		Mathematics I	3	-	20	30	50	-	100	3
BCA1107T		Operating System	3	-	20	30	50	-	100	3
BCA1108T	SEC	Advance C Programming	3	-	20	30	50	-	100	3
BCA1108L		Advance C Programming Lab	-	4	ISCE:60		40	100	100	2
HSCA1203T	VEC	Environmental Studies	3	-	20	30	50	-	100	3
BCA1109L	CoC	Co-curricular I	-	2	ISCE:50			50	50	1
		Total	**15**	**10**				**250**	**750**	20

Course Type Abbreviations

SEC: Skill Enhancement Course **CoC :** Co-curicullar Course

VEC : Value Education Course **CC :** Core Course

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CoC- List of Co – curricular –I

1. Social development activities: Organize cultural events,Volunteering for social work
2. Educational activities: Projects in exhibitions,Extempore
3. Recreational activities:Seminars,Workshops,Industrial visits
4. Physical development focused activities:Yoga,National cadets corps (NCC),Sports competitions, Meditation
5. Culture and value-based activity: Annual day, Cultural festivals
6. Arts and craft-based activities: Photography, Poster drawing

List of Exit Courses after completion of Semester I and II

1. Exit option is available for students those who have earned the total 41 credits at the End of Second Semester.

2. Student who wants to avail the exit option after second year have to earn additional 4 credits from the list of courses shown below.

3. These courses student have to complete within summer vacation after 1st Year.

4. After fulfilment as mentioned in 1 to 3 above, Students can earn **UNDER GRADUATE CERTIFICATE IN COMPUTER APPLICATION** and same will be issued by the Institute.

Sr. No.	Course code	Name	Credits
1	BCA2101T	Data Structure with C	3
2	BCA2104T	Web Technology	3

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Semester-III

Course Code	Course Type	Course Name	Teaching Scheme		Semester Examination Scheme of Marks					Credits
			TH	Lab	Theory				TOTAL	TOTAL
					ISE (20)	MSE (30)	ESE (50)	Laboratory		
BCA2101T	CC	Data Structure with C	3	-	20	30	50	-	100	3
BCA2101L		Data Structure with C Lab	-	4	ISCE:60		40	100	100	2
BCA2102T		Mathematics II	3	-	20	30	50	-	100	3
BCA2103T		Cloud Computing	3	-	20	30	50	-	100	3
BCA2104T	SEC	Web Technology	3	-	20	30	50	-	100	3
BCA2104L		Web Technology Lab	-	4	ISCE:60		40	100	100	2
HSCA2201T	HSSM	Universal Values & Ethics	2	-	20	30	50	-	100	2
HSCA2202T	IC	Indian Constitution	-	2	ISCE:30		20	50	50	1
	Total		**14**	**10**				**250**	**750**	**19**

Course Type Abbreviations

SEC: Skill Enhancement Course **CC :** Core Course

IC : Indian Constitution **HSSM :** Humanities Social Science and Management

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Semester-IV

Course Code	Course Type	Course Name	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA2105T	CC	Object Oriented Analysis Design	3	-	20	30	50	-	100	**3**
BCA2106T		Cyber Security & Cyber Law	3	-	20	30	50	-	100	**3**
BCA2107T		Design & Analysis of Algorithm	3	-	20	30	50	-	100	**3**
BCA2108T	SEC	C++ Programming	3	-	20	30	50	-	100	**3**
BCA2108L		C++ Programming Lab	-	4	ISCE:60		40	100	100	**2**
BCA2109T		Advance Web Technology	3	-	20	30	50	-	100	**3**
BCA2109L		Advance Web Technology (Mini Project) Lab	-	4	ISCE:60		40	100	100	**2**
BCA2110L	CoC	Co-curricular II	-	2	ISCE:50			50	50	**1**
	Total		**15**	**10**				**250**	**750**	**20**

Course Type Abbreviations

SEC : Skill Enhancement Course **CC :** Core Course

CoC : Co-curicullar Course

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CoC- List of Co – curricular –II

1. Social development activities: Organize cultural events,Volunteering for social work
2. Educational activities: Projects in exhibitions,Extempore
3. Recreational activities:Seminars,Workshops,Industrial visits
4. Physical development focused activities:Yoga,National cadets corps (NCC),Sports competitions, Meditation
5. Culture and value-based activity: Annual day, Cultural festivals
6. Arts and craft-based activities: Photography, Poster drawing

List of Exit Courses after completion of Semester III and IV

1. Exit option is available for students those who have earned the total 80 credits at the End of fourth Semester.

2. Student who wants to avail the exit option after second year have to earn additional 4 credits from the list of courses shown below.

3. These courses student have to complete within summer vacation after 2 nd Year.

4. After fulfilment as mentioned in 1 to 3 above, Students can earn **UNDER GRADUATE DIPLOMA IN COMPUTER APPLICATION** and same will be issued by the Institute.

Sr. No.	Course code	Name	Credits
1	BCA3103T	JAVA I	3
2	BCA3104T	Python Programming	3

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Semester-V

Course Code	Course Type	Course Name	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA3101T	CC	Software Testing	3	-	20	30	50	-	100	**3**
HSCA3201T		Innovation & Entrepreneurship	3	-	20	30	50	-	100	**2**
BCA3103T	SEC	JAVA I	3	-	20	30	50	-	100	**3**
BCA3103L		JAVA I Lab	-	4	ICSE:60		40	100	100	**2**
BCA3104T		Python Programming	3	-	20	30	50	-	100	**3**
BCA3104L		Python Programming Lab	-	4	ICSE:60		40	100	100	**2**
BCA3105T	DSE	Elective I	3	-	20	30	50	-	100	**3**
HSCA3202L	AEC	Soft Skills	-	4	ICSE:30		20	50	50	2
	Total		**15**	**12**	**-**		**380**	**250**	**750**	**20**

Course Type Abbreviations

SEC : Skill Enhancement Course **CC :** Core Course

DSE : Descipline Specific Elective **AEC** : Ability Enhancement Course

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Elective I	
Course	**Course Name**
BCA3105T-A	**Cloud Services**
BCA3105T-B	**Digital Forensic**
BCA3105T-C	**IOT**
BCA3105T-D	**Bootstrap Basics**

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Bachelor of Computer Applications (BCA)

Semester-VI(Track I)

Course Code	Course Type	Course	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
HS3201T	CC	Economics	2	-	20	30	50	-	100	2
BCA3106T		Research Methodology	3	-	20	30	50	-	100	3
BCA3107T	SEC	Project Management	3	-	20	30	50	-	100	3
BCA3108L	MP	Major Project	-	4	ISCE:60		40	100	100	3
BCA3109T	DSE	Elective II	3	-	20	30	50	-	100	3
BCA3110L	CoC	Co-Curricular III	-	2	ISCE:50			50	100	1
	Total		12	6	-			150	600	15

Course Type Abbreviations

SEC : Skill Enhancement Course **CC :** Core Course MP : Major Project

DSE : Descipline Specific Elective **AEC** : Ability Enhancement Course

Note : Major Project can be done in Python/Java/Web technology etc.

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Elective II	
Course	**Course Name**
BCA3109T-A	**DevOps**
BCA3109T-B	**Cyber Security Analysis**
BCA3109T-C	**Machine Learning**
BCA3109T-D	**Essentials of ReactJS**

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Bachelor of Computer Applications

(BCA)Semester-VI(Track II)

Course Code	Course	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
		TH	Lab	Theory			Laboratory		TOTAL
				ISE (20)	MSE (30)	ESE (50)			
BCA3106-I	Self Learning Course	-	-	ISCE:50		50	-	100	2
BCA3107-I	Industrial Internship	-	-	ISCE:200		200	-	400	12
Total				-				500	14

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CoC- List of Co – curricular –III

1. Social development activities: Organize cultural events,Volunteering for social work
2. Educational activities: Projects in exhibitions,Extempore
3. Recreational activities:Seminars,Workshops,Industrial visits
4. Physical development focused activities:Yoga,National cadets corps (NCC),Sports competitions, Meditation
5. Culture and value-based activity: Annual day, Cultural festivals
6. Arts and craft-based activities: Photography, Poster drawing

BACHELOR IN COMPUTER APPLICATION Degree will be awarded, if a student wishes to exit at the end of Third year.

Exit Criteria after Third Year of BCA Programme - The students shall have an option to exit after 3rd year of Computer Application Program and will be awarded with a Bachelor's in Computer Application.

Re-entry Criteria in to Fourth Year (Seventh Semester) The student who takes an exit after third year with an award of BCA may be allowed to re-enter in to Seventh Semester for completion of the BCA (Honours) or BCA (Honours with Research) Program as per the respective University / Admitting Body schedule after earning requisite credits in the Third year.

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Semester-VII (BCA(Honors))
Specialisation- AI and ML

Course Code	Course Type	Course	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA4101T-A	SEC	Basics of Artificial Intelligence	3	-	20	30	50	-	100	3
BCA4101L-A		Basics of Artificial Intelligence	-	4	ISCE:60		40	100	100	2
BCA4102T-A		Distributed Computing for AI	3	-	20	30	50	-	100	3
BCA4102L-A		Distributed Computing for AI	-	4	ISCE:60		40	100	100	2
BCA4103T-A	CC	Cognitive computing	3	-	20	30	50	-	100	3
BCA4104T-A		Natural Language Processing (NLP)	3	-	20	30	50	-	100	3
BCA4105T-A	CEP	Community Engagement Project		8	ISCE:120		80	200	200	4
		Total	12	16	-			400	800	20

Course Type Abbreviations

SEC : Skill Enhancement Course **CC :** Core Course

CEP- Community Engagement Project

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Semester-VII (BCA(Honors))
Specialisation- Data Science

Course Code	Course Type	Course	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA4101T-B	SEC	Python for Data Science	3	-	20	30	50	-	100	3
BCA4101L-B		Python for Data Science	-	4	ICSE:60		40	100	100	2
BCA4102T-B		Machine Learning	3	-	20	30	50	-	100	3
BCA4102L-B		Machine Learning	-	4	ICSE:60		40	100	100	2
BCA4103T-B	CC	Inferential Statistics	3	-	20	30	50	-	100	3
BCA4104T-B		Predictive Modelling	3	-	20	30	50	-	100	3
BCA4105-B	CEP	Community Engagement Project		8	ICSE:120		80	200	200	4
	Total		12	16	-			400	800	20

Course Type Abbreviations

SEC : Skill Enhancement Course **CC :** Core Course

CEP- Community Engagement Project

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Semester-VII (BCA(Honors))
Specialisation- Cyber Security

Course Code	Course Type	Course	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA4101T-C	SEC	Digital security and Forensics	3	-	20	30	50	-	100	3
BCA4101L-C		Digital security and Forensics	-	4	ICSE:60		40	100	100	2
BCA4102T-C		Network security	3	-	20	30	50	-	100	3
BCA4102L-C		Network security	-	4	ICSE:60		40	100	100	2
BCA4103T-C	CC	Fundamentals of cyber security	3	-	20	30	50	-	100	3
BCA4104T-C		Cyber Law and Regulations	3	-	20	30	50	-	100	3
BCA4105L-C	CEP	Community Engagement Project		8	ICSE:120		80	200	200	4
		Total	12	16	-			400	800	20

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Semester-VII (BCA(Honors))
Specialisation- Research

Course Code	Course Type	Course	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA4101T-D	SEC	Research Methodology	2	-	20	30	50	-	100	2
BCA4101L-D		Research Methodology		2	ICSE:60		40	100	100	2
BCA4102T-D		Advance Data Analytics	2	-	20	30	50	-	100	2
BCA4102L-D		Advance Data Analytics	-	4	ICSE:60		40	100	100	2
BCA4103-D		Mini Research Project		8	20	30	50	-	100	4
BCA4104L-D		Self Learning (Research)		4	ICSE:60		40	-	100	4
BCA4105L-D		Review Paper published / presented in UGC care		4	ICSE:60		40	-	100	2
		Total	4	22	-		-	200	700	18

Course Type Abbreviations

SEC : Skill Enhancement Course

Eligibility for admission to the UG Bachelor's Degree with Research: Minimum CGPA/CPI of 7.5 or minimum 75% after sixth semester for UG Bachelor's Degree

Note: In Advance Data Analytics Tools like Power BI, Tableau etc can be considered.

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Semester-VIII (BCA(Honors))
Specialisation- AI and ML/ Data Science/ Cyber Security

Course Code	Course Type	Course	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA4106		Self Learning Course(Swayam/ NPTEL/ Coursera)			ICSE:60		40	100	100	2
BCA4107	MP	Dissertation			ICSE:360		240		600	18
BCA4108	CoC	Co-Curricular IV	-	2	ISCE:50		50	-	100	1
	Total								700	21

Course Type Abbreviations

MP : Major Project

CoC- Co-curricular

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Semester-VIII (BCA(Honors))
Specialisation- Research

Course Code	Course Type	Course	Teaching Scheme		Semester Examination Scheme of Marks				Total	Credits
			TH	Lab	Theory			Laboratory		TOTAL
					ISE (20)	MSE (30)	ESE (50)			
BCA4106-R		Self Learning Course(Swayam/ NPTEL/ Coursera)			ICSE:60		40	100	100	2
BCA4107-R	MP	Dissertation			ICSE:360		240		600	18
BCA4108-R	CoC	Co-Curricular IV	-	2	ISCE:50		50	-	100	1
	Total							100	700	21

Course Type Abbreviations

MP : Major Project

CoC- Co-curricular

Eligibility for admission to the UG Bachelor's Degree with Research: Minimum CGPA/CPI of 7.5 or minimum 75% after sixth semester for UG Bachelor's Degree

Note: The Self Learning Course(Swayam/ NPTEL/ Coursera will be related to research only)

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Total Marks	5950
Total credits SEC	35
Total Credits Core Course	54
Total Credits Ability/Skill Enhancement	11
Total Credits Value Added Course	03
Total Credits Major Project	12
Total Credits Multi-Disciplinary Elective course	02
	117

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Chairman BOS

Dr. Avinash Badadhe
Dean Academics

Dr. Santosh Bhosle
Director

F. Y. BCA
Academic Year – 2025-2026 Semester -I
[BCA1101T]: Database Management System

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites: Basic knowledge of computer operations,systems and data.

Course Objective:

1. Creation of Database and functions of Database Management System.
2. Database models, SQL and database operations, this creates a strong foundation for application database design.
3. Making aware of current databases used in industry.

Course Outcome:

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

CO1. Understand file structure concepts, organization and applications.
CO2. Understand the database management system ,users and structure.
CO3. Understand and implement the data models and relationship.
CO4. Understand the relational database design concepts
CO5. Implement use of SQL in querying database.
CO6. Understand the concept of normalization and normal forms.

Course Contents

UNIT-I	**File Structure and Organisation**	**05 Hours**

Introduction, Logical and Physical Files: File, File Structure, Logical and Physical File Definitions, Basic File Operations: Opening Files, Closing Files, Reading and Writing, Seeking ,File Organization-Field and Record structure in file, Record Types, Types of File Organisation: Files of Unordered Record, File of Ordered Record, Hash Files, Overview of Indexes: Dense Index ,Sparse Index.

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UNIT-II	Database Management System	06 Hours
Introduction, Definition of DBMS,File Processing System VS DBMS: Limitation,Comparision,Advantages and Disadvantages of DBMS ,Users of DBMS: Database Designers, Application Programmer, Sophisticated Users, End Users,Capabilities of good DBMS,Overall System Structure.		
UNIT-III	**Data Models**	**10 Hours**
Introduction, Data Models: Object Based Logical Model,Record Based Logical Model: Relational Model,Network model,Hierarchical Model,Entity Relationship Model: Entity Set,Attribute,Relational Set,Entity Relationship Diagram,Extended features of ERD		
UNIT-IV	**Relational Databases**	**08 Hours**
Introduction, Terms : Relation,Tuple,Attribute,Cordinality,Degree,Domain Keys: Super Key, Candidate Key, Primary Key, Foreign Key Relational Algebra: Operations : Select, Project, Union, Difference, Intersection,Cartesian Product.		
UNIT-V	**SQL(Structured Query Language)**	**08 Hours**
SQL Commands and Queries: History, Basic Structure, SQL , Commands, DML Commands , Simple Queries, Nested Queries, Aggregate Functions, Clauses		
UNIT-VI	**Relational Database Design**	**08 Hours**
Normalization: Introduction, Anomalies of un-normalized databases, Normalization, Normal Form: 1 NF,2 NF,3 NF,BCNF with cases.		
Text Books: **T1.** AviSilberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Sixth Edition. **T2.** Introduction to Database Systems, C,J Date, 8/e , Pearson, 2008.		
Reference Books: **R1.**Database Systems Concepts by Henry Korth and A.Silberschatz. **R2.**An Introduction to Database Systems by Bipin Desai. **R3.**File Structure by Micheal J.Folk,Greg,Riccardi. **R4.**Teach Yourself SQL in 14 days by Jeff Parkins and Bryan Morgan.		

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Academic Year – 2025-2026 Semester -I
[BCA1101L]: Database Management System Lab

Teaching Scheme: PR: - 04 Hours/Week	Credit TH: 02	Examination Scheme: ISCE : 60 Marks End Sem. Exam : 40 Marks Total : 100 Marks

Course Prerequisites: Basic knowledge of computer operations,systems and data.

Course Objective:

1.Creation of Database and functions of Database Management System.
2. Database models, SQL and database operations, this creates a strong foundation for application database design.
3. Making aware of current databases used in industry.

Course Outcome:

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

CO1: Develop conceptual schema of database using conceptual model. Implement logical scheme of database.

CO2: Create and manage database with all integrity constraints. Perform various DDL and DML operations.

CO3: Understanding and Managing the data types .

CO4: Perform various queries by different conditions in where clause

CO5: Create views databases.

CO6: Create indexes on databases.

Lab Contents

Guidelines for Assessment

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Continuous assessment of laboratory work is done based on overall performance and Laboratory assignments performance of student. Each Laboratory assignment assessment will assign grade / marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.	
List of Laboratory Assignments/Experiments (to be covered)	
1	Introduction to SQL – DDL, DML, DTL basic data types.
2	Create Database, select database, Drop database.
3	Create Table, Drop table, Insert Query, Select Query.
4	Operators, Expressions, where clause, AND & OR clauses.
5	Update Query/Delete Query, Like clause, Limit Clause.
6	Order By, Group By, With Clause, Having Clause, Distinct keyword.
7	Constraints.
8	Functions : Date & Time, String, Functions, Aggregate Functions.
9	Alter Command.
10	Views , Indexes.

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Academic Year – 2025-2026 Semester -I
[BCA1102T]: Software Engineering

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites: Understanding of different systems.

Course Objective:

1. To understand the basic view of software Engineering.
2. To provide an idea of using various process models in the software industry according to given circumstances.
3. To understand requirement specification and engineering for software development.
4. To understand and evaluate software design and coding techniques in software development process.
5. To understand and manage the effective quality management in software development process.

Course Outcome:

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

CO1: Conceptualize the system engineering and its elements.
CO2: Able to describe key activities in software development and the role of software modeling.
CO3:Students will be able to implement various lifecycle activities like Analysis, Design, Implementation, Testing and Maintenance while software development process.
CO4: Students will able to do requirement analysis and specification process for software development.
CO5: Students will understand the quality assurance and testing of software for successful implementation of software application.

Course Contents

UNIT-I	Overview of System Engineering	06 Hours

Introduction to System, Over View of System Design, Business System Concepts, Characteristics of a System Elements of a System, Types of Systems.

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UNIT-II	Introduction to Software Engineering	06 Hours
Definition of Software ,Characteristics of Software , Software Application Domain , Definition of Software Engineering , Need for software Engineering , Mc Call's Quality factors .		
UNIT-III	**Software Development Methodologies**	**06 Hours**
Introduction, Activities of SDLC, Different Approaches and Models for System Development: Waterfall Model, Prototyping Model, Spiral Model, Win-win Spiral model, RAD		
UNIT-IV	**Requirement Analysis**	**08 Hours**
Introduction to Requirement Analysis, Requirement Anticipation , Knowledge and Qualities of System Analyst, Role of a System Analyst, Activities involved in requirement analysis , Requirement Gathering, Feasibility study, Fact Finding Techniques.		
UNIT-V	**Software Requirement Specification**	**08 Hours**
Introduction of (SRS), Structure and contents of SRS, IEEE standard format for SRS, Case study.		
UNIT-VI	**Software Design and Testing**	**10 Hours**
Introduction to Software Design , Levels of software Design , Design activities, User Interface design , Command line interface ,Graphical User interface ,Case studies. Introduction to Testing, Test characteristics, Types of testing.		
Text Books: T1.System Analysis And Design By Elias M. Awad T2.SoftwareEngineering–Apractitioner's approach by Roger S. Pressman, 9th Edition		
Reference Books: R1.Systems Analysis and Design Methods-SIE by Jeffrey Whitten (Author), Lonnie Bentley (Author) R2.Shooman, "Software Engineering Design, Reliability and Management" McGraw Hill 198 R3. Fairley "Software Engineering Concepts" McGraw—Hill Series, New York R4. Software Engineering, Ian Sommerville, seventh edition, Pearson education		

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F. Y. BCA
Academic Year – 2025-2026 Semester -I
[BCA1103T]: Fundamentals of Computer

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites: Basic knowledge of computer, operations and problem solving concepts.

Course Objective:

1. To understand basics of computer and working with OS.
2. To develop Skills to understand with Digital Logic Fundamentals & Number System and CPU.
3. To acquire basic programming skills like flowcharts and Algorithms.
4. To apply computing in problem solving.

Course Outcome:

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

CO1 Understanding of System Components: Students will demonstrate a comprehensive understanding of computer system components, including CPU, memory hierarchy, input/output systems, and their interactions.

CO2 Knowledge of Computer Organization: Students will gain knowledge of various I/O Devices and its usage

CO3 Proficiency in Digital Logic Fundamentals & Number System: Students will demonstrate proficiency in computer arithmetic, Digital Logic Fundamentals & Number System.

CO4 Knowledge of Central Processing Unit: Students will gain knowledge of CPU components and their functions of CPU

CO5 Knowledge of Memory Systems: Students will gain knowledge of Input / Output interfaces.

Course Contents

UNIT-I	**Introduction to Problem Solving and Programming Fundamentals**	**7 Hours**

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Introduction to problem solving using computers, Problem solving steps, Algorithms – definition, characteristics, examples, advantages and limitations of algorithms, Pseudo code – notations, examples, advantages and limitations, Comparison among algorithm, flowchart, and pseudo code		
UNIT-II	**Flowcharts and Programming Tools**	**7 Hours**
Flowcharts – symbols, rules, examples, Importance of visual representation in programming, Differences between algorithm and flowchart, Common tools used for flowchart and pseudo code development, Case studies on simple problems using flowchart and pseudo code		
UNIT-III	**Basics of Computer Organization and Hardware Components**	**7 Hours**
Block diagram of computer system, Types of computers and their features, Data organization: bits, bytes, word, data types, I/O devices – types and working, Types of programming languages and their uses		
UNIT-IV	**Digital Logic Fundamentals & Number System**	**7 Hours**
Number systems – binary, decimal, octal, hexadecimal; Interconversion among number systems, Binary arithmetic: addition, subtraction, multiplication, division; Boolean algebra and logic gates, Combinational circuits: adder, multiplexer, decoder; Sequential circuits: flip-flops, counters		
UNIT-V	**Central Processing Unit (CPU)**	**7 Hours**
CPU components and their functions (ALU, control unit, registers); Types of registers and their uses, Instruction Set Architecture (ISA), Types of instruction formats, RISC vs CISC (basic concept only)		
UNIT-VI	**Memory Hierarchy and Management**	**7 Hours**

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Memory types: RAM, ROM, Cache ; Memory hierarchy and organization, Cache memory mapping: direct, associative, set-associative; Virtual memory: concept, paging, segmentation ; Differences between logical and physical memory
Text Books: **T1** "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy **T2** "Computer Architecture: A Quantitative Approach" by John L. Hennessy and David A. Patterson **T3** "Structured Computer Organization" by Andrew S. Tanenbaum **T4** "Computer Systems: A Programmer's Perspective" by Randal E. Bryant and David R. O'Hallaron
Reference Books: **R1** "Modern Operating Systems" by Andrew S. Tanenbaum and Herbert Bos **R2** "Computer Organization and Architecture: Designing for Performance" by William Stallings

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F. Y. BCA
Academic Year – 2025-2026 Semester -I
[BCA1104T]: C Programming

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites: Basic knowledge of computer operations and understanding of fundamental programming concepts.

Course Objective:

1. To familiarize with the basics of programming concepts, and develop a solution using C programming language.
2. To understand structured programming approach.

Course Outcome:

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

CO1: Construct algorithms and flowcharts to represent logic.
CO2 : Understand the Fundamentals of C Programming.
CO3 : Implement Control Structures in C Programs.
CO4: Utilize Functions for Modular Programming.
CO5: Operate with Arrays and Perform Array-based Operations.
CO6: Manage Strings and Perform String Operations in C.

Course Contents

UNIT-I	**Problem Solving Aspects**	**05 Hours**

Introduction to problem solving using computers, Problem solving steps, Algorithms- definition, characteristics, examples, advantages and limitations, Flowcharts - definition, notations, examples, advantages and limitations, Comparison withalgorithms, Pseudo codes - notations, examples, advantages and limitations, Programming Languages as tools,

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programming paradigms, types of languages Converting pseudo-code to programs,Compilation process (compilers, interpreters), linking and loading, syntax and semantic errors,testing a program,Good Programming Practices (naming conventions , documentation, indentation).		
UNIT-II	**'C' Fundamentals**	**08 Hours**
History of 'C' language, Application areas, Structure of a 'C' program, 'C' Program development life cycle, Function as building blocks, 'C' tokens , Character set, Keywords, Identifiers ,Variables, Constants (character, integer, float, string, escape sequences, enumeration constant), Data Types (Built-in and user defined data types), Operators, Expressions, types of operators, Operator precedence and Order of evaluation, Character input and output, Formatted input and output.		
UNIT-III	**Control Structures**	**08 Hours**
Decision making structures: - if, if-else, switch and conditional operator, Loop control structures: - while, do while, for, Jump statements (control transfer statements viz. goto, break, continue, return)		
UNIT-IV	**Functions**	**08 Hours**
Concept of function, Advantages of Modular design, Standard library functions, User defined functions: - declaration, definition, function call, parameter passing (by value), return statement, Recursive functions, Scope of variables and Storage classes.		
UNIT-V	**Storage Classes**	**08 Hours**
Lifetime and visibility of variables ,Automatic storage class ,External storage class , Static storage class Register storage class .		
UNIT-VI	**Arrays**	**08 Hours**
Concept of array, Types of Arrays – One and Multidimensional array,Array Operations - declaration, initialization, accessing array elements, Memory representation of two-dimensional array (row major and column major) , Passing arrays to function, Array applications		
Text Books: T1. Let Us C by Yashavant Kanetkar		

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T2. C Programming by K.R. Venugopal and Sudeep R. Prasad
Reference Books: **R1.**C: The Complete Reference by Herbert Schildt **R2.** Programming in ANSI C by E. Balagurusamy Programming in C: A Practical Approach by Ajay Mittal

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F. Y. BCA
Academic Year – 2025-2026 Semester -I
[BCA1104L]: C Programming Lab

Teaching Scheme: PR: - 04 Hours/Week	Credit TH: 02	Examination Scheme: ISCE : 60 Marks End Sem. Exam : 40 Marks Total : 100 Marks

Course Prerequisites: Basic knowledge of computer operations and understanding of fundamental programming concepts.

Course Objective:

1. To familiarize with the basics of programming concepts, and develop a solution using C programming language.
2. To understand structured programming approach.

Course Outcome:

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

LO1: Write and execute basic C programs demonstrating program structure and syntax.
LO2: Use appropriate C tokens, input/output functions to perform formatted and unformatted data operations.
LO3: Develop control structure-based programs using conditional and iterative statements.
LO4: Create and test programs using modular approaches through user-defined and recursive functions.
LO5: Demonstrate the effect of storage classes and scope rules in various programming scenarios.
LO6: Implement programs using arrays for data manipulation, including searching, sorting, and matrix operations.

Lab Contents

Guidelines for Assessment

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Continuous assessment of laboratory work is done based on overall performance and Laboratory assignments performance of student. Each Laboratory assignment assessment will assign grade / marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.	
List of Laboratory Assignments/Experiments (to be covered)	
1	Write and execute a simple C program to demonstrate the structure of a C program.
2	Implement programs to demonstrate the use of various C tokens.
3	Programs to handle character input and output operations.
4	Programs for formatted input and output.
5	Programs to implement decision-making structures (if, if-else, switch).
6	Programs to demonstrate loop control structures (while, do-while, for).
7	Programs to use break and continue statements within loops.
8	Programs to demonstrate nested structures and unconditional branching (goto statement).
9	Programs to use standard library functions and user-defined functions.
10	Implement recursive functions.
11	Programs to demonstrate scope of variables and storage classes.
12	Programs to declare, initialize, and access array elements.
13	Programs to perform operations on two-dimensional arrays.
14	Programs to demonstrate memory representation of two-dimensional arrays.
15	Programs for passing arrays to functions.
16	Array applications such as finding maximum and minimum, counting occurrences, linear search, sorting, and matrix operations.

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Text Books: T1. Let Us C by Yashavant Kanetkar T2. C Programming by K.R. Venugopal and Sudeep R. Prasad
Reference Books: R1. C: The Complete Reference by Herbert Schildt R2. Programming in ANSI C by E. Balagurusamy R3. Programming in C: A Practical Approach by Ajay Mittal

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Academic Year – 2025-2026 Semester - I

[**HSCA1201]:** Professional English Communication

Teaching Scheme: TH:- 02 Hours/Week PR:- 02 Hours/Week	Credit TH: 02 PR: 01	Examination Scheme: Theory In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Practical In Sem Evaluation : 30 Marks End Sem. Exam : 20 Marks Total : 150 Marks

Course Prerequisites: Basic knowledge of high school English..

Course Objective:

Prepare students to communicate effectively in a global professional environment using English.

Course Outcome:

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

CO1: Adapt and use vocabulary for sentence formation.

CO2: Read , listen and comprehend professionally.

CO3: Write and analyze various forms of communication(emails and reports).

CO4: Effectively communicate at different levels of hierarchy.

Course Contents

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UNIT-I	Reading	14 Hours
Introduction to the course, 2, Reading comprehension / Skimming		
UNIT-II	**Listening and Speaking**	**14 Hours**
Group discussion, Interview techniques, Vocabulary; Process of communication, Verbal and non-verbal communication		
UNIT-III	**Writing**	**14 Hours**
Writing: principles and practice, Summary / Essay / Report writing		
UNIT-IV	**Other forms of communication**	**14 Hours**
Phonetics; Presentation, Presentation 2, Email; Communication via social media, Common errors; American vs. British English		

Lab Contents

Guidelines for Assessment

Continuous assessment of laboratory work is done based on overall performance and Laboratory assignments performance of student. Each Laboratory assignment assessment will assign grade / marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

List of Laboratory Assignments/Experiments (to be covered)

1	Email writing
2	Multiple choice questions online assessment after completion of every unit to evaluate the understanding of the grammar
3	Grammar and vocabulary test
4	Group discussion

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5	Framing questions for interview
6	Writing Micro blog on given subject
7	Exercise on life skills and personality types
8	Spoken exercises to evaluate the learning in the conversational aspect of the language exercise
9	Report Writing
10	Presentation (Individual & Group)

Text Books:

1. M Ashraf Rizvi, Effective Technical Communication, McGraw Hill Education India, 2nd Ed., 2017.
2. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice, Oxford University Press India, 3rd Ed., 2015.

Reference Books:

1. Paul V Anderson, Technical Communication, Cengage Learning, 9th Ed., 2017.
2. Susan Thurman, Only Grammar Book You Will Ever Need, Adams, 2003.

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Academic Year – 2025-2026 Semester -I
[HSCA1202L]: Indian Knowledge System

Teaching Scheme: TH: - 02 Hours/Week	Credit TH: 02	Examination Scheme: ISCE : 50 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites: Historical background of India

Course Objective:

1. Understand the foundational concepts and key tenets of Indian knowledge systems.
2. Understand various philosophicaland spiritual traditions within the Indian context.
3. Examine the historical evolution of Indian literature, art, and science

Course Outcome:

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

CO1: Explain the foundational concepts of Indian Knowledge Systems (IKS), including the significance and structure of the Vedas, Purusharthas, and classifications like Shruti and Smriti.

CO2: Interpret key philosophical ideas from major Upanishads and analyze their relevance to contemporary knowledge and ethical reflection.

CO3: Classify the Astika and Nastika schools of Indian philosophy and evaluate their contributions to the foundation of Indian education and moral reasoning.

CO4: Analyze ancient Indian approaches to leadership, governance, and management principles through texts like the Arthashastra and Mahabharata.

CO5: Evaluate Indian perspectives on health, wellness, and psychology, including the role of Yoga and the mind-body consciousness model.

CO6: Identify and describe ancient Indian contributions to science, engineering, and technology, including innovations in mathematics, metallurgy, architecture, and irrigation.

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Course Contents		
UNIT-I	**Introduction to Indian Knowledge Systems and Vedic Corpus**	**05 Hours**
Overview of Indian Knowledge system with Ancient Indian Knowledge in Action. Purpose of IKS, Vedic Period : Vedas & their Significance, Purpose of Vedas, Types of Vedas, Mantras, Brahmans, Aranyankas, Shruti and Smritis, Four Purusharthas In Vedas		
UNIT-II	**Glimpses of Upanishads**	**07 Hours**
Upnishads- Isha, Kena, Katha, Prashan, Mundaka, Mandukya, Tattiriya, Aitareya, Chhandogya, Brihadaranyaka		
UNIT-III	**Wisdom through Smrutis and Foundation of Indian Education**	**08 Hours**
Classification of Indian philosophy with Unique features - Astika Schools : Nyaya, Vaisheshika, Sankhya, Yoga, Mimamsa, Vedanta Nastika Schools: Buddhism, Jainism, Cārvāka		
UNIT-IV	**From Arthashastra to Mahabharata: Indigenous Principles of Governance and Leadership**	**05 Hours**
Glimpses of Kautilyas Arthashastra (Mind map on Statecraft, leadership and ethics, and Governance. for better management), Management Principles from Mahabharata.		
UNIT-V	**Health wellness and Psychology**	**03 Hours**
Introduction wellness through Indian medical system, Glimpses of Yoga Shastra, Mind body consciousness complex .Ancient Indian approach to psychology, Contributions of Yoga to the world		
UNIT-VI	**Foundational concepts for Science, Engineering and Technology through IKS**	**02 Hours**
Ancient Indian Mathematics and its contribution to the world. Metallurgy (Iron and steeling India and alloys). The great Indian Architecture and Irrigation systems.		
Guidelines for Assessment		
Assessment is a continuous assessment based on submission of the quizzes, presentations,		

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Attendance and understanding	
List of Assignments	
1	Participation in class discussions and activities
2	Unit wise quizzes to assess understanding of concepts
3	Group Presentations for exploring a specific aspect of Indian knowledge systems

Text Books:

1. An Introduction to Indian Knowledge Systems: Concepts and Applications, B Mahadevan, V R Bhat, and Nagendra Pavana R N; 2022 (Prentice Hall of India).
2. Indian Knowledge Systems: Vol I and II, Kapil Kapoor and A K Singh; 2005 (D.K. Print World Ltd).

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Academic Year – 2025-2026 Semester -II
[BCA1105T]: Advance Database Mangement System

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites: Basics of Database Management System.

Course Objective:

1. Creation of Database and functions of Database Management System.
2. Transaction processing , data storage , SQL and database operations, this creates a strong foundation for application database design.
3. Making aware of current databases used in industry.

Course Outcome:

CO1. Understand database storage and accessibility of data..
CO2. Implement the relational database design with SQL .
CO3. Understand test databases and its use .
CO4. Learn the concept of transaction processing, protocol
CO5. Learn the new emerging concepts and applications in database.
CO6. Learn the new graph database concepts and applications in database.

Course Contents

UNIT I	Data Storage and Querying	8 Hours

Data Storage and Querying:- RAID – File Organization – Organization of Records in Files – Indexing and Hashing: Basic concept, Ordered Indices, B+ tree Index Files: Structure of a B+-Tree (structure only, algorithms not needed) - B tree index files – Static Hashing – Dynamic Hashing – Query Processing: Overview - Selection Operation.

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UNIT II	**Advance SQL**	**8 Hours**
Introduction ,Objectives ,Basics Concepts of SQL ,History of SQL, The Form of a basic SQL Query ,SQL Statements , Data Manipulation Language (DML) ,Viewing the Structure of a Table , SQL SELECT Statements, Using SQL for Web Site ,SQL SYNTAX ,The SQL SELECT Statement , INSERT statement, UPDATE statement ,Joining tables ,Arithmetic Operations ,Operator Precedence		
UNIT III	**Text Databases**	**6 Hours**
Text databases: Information retrieval - overview, Relevance ranking using terms and hyperlinks, synonyms, homonyms, ontologies, Indexing of documents, measuring retrieval effectiveness, web search engines, Information retrieval and structured data.		
UNIT IV	**Transaction Processing**	**8 Hours**
Transaction processing and Error recovery - Concepts of transaction processing, ACID properties, concurrency control, Serializability, locking based protocols, Timestamp based protocols, recovery and logging methods.		
UNIT V	**Distributed Database**	**7 Hours**
What is Distributed Database System? Types of Distributed Database Systems. Advantages and Disadvantages of Distributed Databases. Components of Distributed Database Systems .Current Trends in Distributed Databases		
UNIT VI	**Graph Databases**	**8 Hours**
Graph based database: What is graph based database, comparison of relational and graph based database. GraphDB vs. NOsql. Overview of open source graph database like Neo4g etc. APIs and graph query- programming languages. Databases on the Web and Semi Structured Data, Unstructured , structured data .		
Text Books: 1. Data mining and knowledge discovery handbook, Second edition , Springer, ODED MAIMON, LIOR ROKACH 2. T2. Data Mining Introductory and advanced topics- Margaret Dunham, Prentice Hall		
Reference Books: R1. Alexis Leon, Mathews Leon, (leon press), Database Management System. R2. AviSilberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Sixth Edition		

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R3. Data Ware housing: Concepts, Techniques, Products and Applications, C.S.R. Prabhu, Prentice Hall of India, 2001
R4. Vikram Vaswani , MySQL™ : The complete reference
R5. Berg Craig, SQL for beginners: SQL made easy: A step-by-step guide to SQL programming for the Beginner, Intermediate and Advance users

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F. Y. BCA
Academic Year – 2025-2026 Semester -II
[BCA1105L]: Advance Database Mangement System Lab

Teaching Scheme: PR: - 04 Hours/Week	Credit TH: 02	Examination Scheme: ISCE : 60 Marks End Sem. Exam : 40 Marks Total : 100 Marks

Course Prerequisites: Basic understanding of data and its operations.

Course Objective:

1. Creation of Database and functions of Database Management System.
2. SQL and database operations, this creates a strong foundation for application database design.

Course Outcome:

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

CO1. Develop conceptual schema of database, manage database with all integrity constraints. Perform various DDL and DML operations.
CO2. Implement the relational database design with SQL , where clause, operators, operations.
CO3. Create sub-queries and nested queries on databases.
CO4: Create Joins and its types.
CO5: Create views, indexes on databases.
CO6. Graph database concepts and applications in database.

Course Contents

Guidelines for Assessment

Assessment is a continuous assessment based on submission of the quizzes, presentations, Attendance and understanding

List of Assignments

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1	Introduction to SQL – DDL, DML, DTL basic data types.
2	Create Database, select database, Drop database.
3	Create Table, Drop table, Insert Query, Select Query.
4	Operators, Expressions, where clause, AND & OR clauses.
5	Update Query/Delete Query, Like clause, Limit Clause.
6	Order By, Group By, With Clause, Having Clause, Distinct keyword.
7	Constraints, Joins.
8	Functions : Date & Time, String, Functions, Aggregate Functions.
9	Alter Command.
10	Nested queries , sub-queries.
11	Views , Indexes.
12	Graph Database operations .
13	ER Model cases.

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Academic Year – 2025-2026 Semester -II
[BCA1106T]: Mathematics I

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites:

Course Objective:

1. The understand mathematical concepts.
2. To implement concepts of mathematics in computer applications.
3. To understand the data and information representation using Mathematical
4. To understand analysis of problem statements for problem solving using Mathematical

Course Outcome:

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

CO1: Provide a basic understanding of fundamental mathematical concepts such as sets, functions, matrix algebra, and discrete mathematics.

CO2: This course enables the students to use mathematical models and techniques to analyze and understand problems in computer science.

CO3: This course demonstrates how the mathematical principles give succinct abstraction of computer science problems and help them to efficiently analyze.

CO4: This course demonstrates how to Study continuity, limits, derivatives, and integrals to understand function behavior.

CO5: Define functions, determine injectivity, surjectivity, and bijectivity, and perform operations on functions including composition and inverse.

CO6 : Execute addition, subtraction, multiplication, transposition, and scalar multiplication of matrices.

Course Contents

UNIT-I	Set Theory and Logic	08 Hours

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Set Theory and Logic– Set Theory, need for Sets, Representation of Sets, Set Operations, Venn Diagram, cardinality of set, Types of Sets – Bounded and Unbounded Sets, Countable and Uncountable Sets, Finite and Infinite Sets, Infinite Sets, power set, Mathematical Induction and Strong Mathematical Induction. Propositional Logic- logic, Propositional Equivalences, Application of Propositional Logic Translating English Sentences, Proof by Mathematical Induction.		
UNIT-II	**Relations**	**07 Hours**
Relations: Properties, n-ary Relations and Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings, partitions, Hasse Diagram, Lattices, Chains and Anti-Chains, Transitive Closure and Warshall's Algorithm		
UNIT-III	**Counting**	**07 Hours**
Counting - The Basics of Counting, rule of Sum and Product, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, The Pigeonhole Principle.		
UNIT -IV	**Functions**	**07 Hours**
Functions -properties of functions (domain, range), composition of functions, surjective (onto), injective (one-to- one) and bijective functions, inverse of functions. Some useful functions for Computer Science: Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor functions.		
UNIT-V	**Elementary Graph Theory**	**08 Hours**
Graph Theory -Basic terminologies of graphs, connected and disconnected graphs, subgraph, paths and cycles, complete graphs, digraphs, weighted graphs, Euler and Hamiltonian graphs. Trees, properties of trees, concept of spanning tree. Planar graphs. Definitions and basic results on the topics mentioned		
UNIT-VI	**Matrix Algebra**	**08 Hours**
Matrix Algebra -Types of matrices, algebra of matrices–addition, subtraction, and multiplication of matrices, determinant of a matrix, symmetric and skew-symmetric matrices, orthogonal matrix, rank of a matrix, inverse of a matrix, applications of matrices to solve system of linear equations, Eigen values and Eigen vectors, Caley-Hamilton theorem.		

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Text Books:

T1.Kenneth H. Rosen, Discrete Mathematics And Its Applications, Tata McGraw-Hill, Isbn 978-0-07- 288008-3, 7th Edition.
T2. L Liu, "Elements Of Discrete Mathematics", Tata Mcgraw-Hill, Isbn 10:0-07-066913-9..

ReferenceBooks:

R1. Trivedi, K.S., " Probability, Statistics, Design Of Experiments And Queuing Theory, With Applications Of Computer Science", Prentice Hall Of India, New Delhi
R2. C L Liu, "Elements Of Discrete Mathematics", Tata Mcgraw-Hill, Isbn 10:0-07-066913-9.
R3. Kulkarni, M.B., Ghatpande, S.B. And Gore, S.D., "Common Statistical Tests" Satyajeet Prakashan, Pune
R4. J.N. Kapur And H.C. Saxena, "Mathematical Statistics", S. Chand Publications, 20th Ed.
R5. John P. D'angelo & Douglas B. West, "Mathematical Thinking–Problem Solving And Proofs" Prentice Hall, 2nd Ed..

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F. Y. BCA
Academic Year – 2025-2026 Semester -II
[BCA1107T]: Operating System

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites:

Course Objective:

1. 1. To Learn and understand the fundamentals of Operating Systems.
2. To Learn principles of modern operating systems

Course Outcome:

CO1:Basic knowledge of operating system and Concept of Process and process scheduling.
CO2: Implement disk scheduling, memory management, CPU Scheduling.
CO3: Explain the file structure, file system, directory system.
CO4: Identify system Parameter, used to evaluate system performance.
CO5: Storage structure and secondary data storage management and concepts.
CO6: Overall computer system functioning,security by Operating system

Course Contents

UNIT-I	Basics of Operating Systems	6 Hours

Introduction: Basics of Operating Systems: Definition — Generations of Operating systems — Types of Operating Systems, Batch, multiprocessing, multitasking, timesharing, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems — Concept of Virtual Machine, concept OS Design, BASH Shell scripting: Basic shell commands, shell as a scripting language. Concept of Open source operating systems with examples e.g. Linux, Android

UNIT-II	Process Management & CPU Scheduling	6 Hours

Processes: Definition, Process Relationship Process states, Process State transitions, Process

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Control Block, Context switching, Process scheduling, Inter-process Communication: Inter-process Communication, IPC types, IPC in Client-Server, RTOS.CPU Scheduling: Definition, Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only) , Scheduling algorithms : Preemptive and Non-preemptive , FCFS — SJF — RR		
UNIT-III	**Process Synchronization And Deadlock**	**8 Hours**
Synchronization concept , Synchronization Requirement Critical Section Problem & Solutions(only Semaphore and Monitors) Deadlock concepts Deadlock prevention & avoidance with single instance and multiple instances of resources ,Deadlock Detection with single instance and multiple ,instances of resources ,Numerical exercise based on Deadlock ,Deadlock Recovery.		
UNIT-IV	Memory Management	**8 Hours**
Basic Memory Management: Definition, Logical and Physical address map, Memory allocation: Contiguous Memory allocation — Fixed and variable partition — Internal and External fragmentation and Compaction, Paging: Principle of operation — Page allocation — Hardware support for paging, Protection and sharing — Disadvantages of paging. Virtual Memory: Basics of Virtual Memory — Hardware and control structures — Locality of reference, Page fault, Working Set, Dirty page/Dirty bit —Demand paging (Concepts only)		
UNIT-V	I/O Management & Secondary Storage	**6 Hours**
Principles of I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers , Device drivers , Device independent I/O software , Secondary- Storage Structure: Disk structure ,concept of Disk scheduling algorithm.		
UNIT-VI	**Protection and Security**	**6 Hours**
Goals and principles of protection Domain of protection and access control Access matrix and its implementation Security threats: Program, system, and network threats Cryptography, user authentication, and security defenses Protection and security in Linux and Windows.		

Text Books:

T1. Operating System Principles (7th International Edition)Peter Baer Galvin, Greg Gagne Abraham Silverschatz
T2. Operating Systems : Design and Implementation - Andrew S. Tanenbaum

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Reference Books:
R1. Operating System : Achyut Godbole,TMH,2ndEd R2. Operating System : Galvin,Wiley,8th Ed.
R3. System Programming & OS : D.M. Dhamdhere, TMH,2ndEd
R4. Red Hat Bible Core Fedora Linux : Christopher Negus (Wiley Pub.)
R5. Operating System : Andrew Tanenbaum, PHI,3rd Ed.
R6. Operating Systems: Internals and design Principles, W. Stallings, Pearson Ed., LPE, 6th edition.

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Academic Year – 2025-2026 Semester -II
[BCA1108T]: Advance C Programming

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Prerequisites: Basic knowledge of C Programming.

Course Objective:

1. To enhance the understanding of advanced C programming constructs such as pointers, dynamic memory, and file handling.
2. To develop the ability to implement modular, memory-efficient, and structured C programs using practical problem-solving approaches.

Course Outcome:

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

CO1: Understand the significance of pointers

CO2: Understand and implement the mechanism of Dynamic memory allocation

CO3: Design and implement applications using arrays and strings

CO4: Define and manipulate user defined types for organizing complex data

CO5: Design applications using sequential and random access file processing

CO6: Understand and apply pre-processor directives

UNIT-I	Pointers	10 Hours

Introduction to Pointers,Declaration, definition, initialization, dereferencing, Pointer arithmetic, Relationship between Arrays & Pointers- Pointer to array, Array of pointers, Multiple indirection (pointer to pointer),Functions and pointers- Passing pointer to function, Returning pointer from function, Function pointer

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UNIT-II	**Dynamic Memory Management**	**06 Hours**
Memory allocation and de-allocation using malloc(), calloc(), realloc() and free() functions , Memory leakage, Dangling pointer		
UNIT-III	**Strings**	**08 Hours**
String Literals, string variables, declaration, definition, initialization, Syntax and use of predefined string functions, Array of strings, Strings and Pointers, Command line arguments		
UNIT-IV	**Structures and Unions**	**08 Hours**
Defining a structure, Declaring structure variable, Accessing structure elements, Initializing structures, Assignment statements used with structures, Passing structures as arguments to a function, Array of structures, Pointers to structures, Nested Structures, Defining unions and accessing the elements		
UNIT-V	**File Handling**	**08 Hours**
Introduction to streams,Types of files, Operations on text files, Standard library input/output function, Random access to files.		
UNIT-VI	**Pre-Processor Directives**	**04 Hours**
Features of C Preprocessor, Macro expansion, File inclusion, Conditional Compilation Directives, Macros versus functions		
Text Books: T1. Let us C by Yashavant Kanetkar T2. C Programming by K.R. Venugopal and Sudeep R. Prasad		
Reference Books: R1. C: The Complete Reference by Herbert Schildt R2. Programming in ANSI C by E. Balagurusamy R3. Programming in C: A Practical Approach by Ajay Mittal		

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Academic Year – 2025-2026 Semester -II
[BCA1108L]: Advance C Programming Lab

Teaching Scheme: PR: - 04 Hours/Week	Credit TH: 02	Examination Scheme: ISCE : 60 Marks End Sem. Exam : 40 Marks Total : 100 Marks

Course Prerequisites: Basic knowledge of C Programming

Course Objective:

1. To enhance the understanding of advanced C programming constructs such as pointers, dynamic memory, and file handling.
2. To develop the ability to implement modular, memory-efficient, and structured C programs using practical problem-solving approaches.

Course Outcome:

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

LO1: Demonstrate the use of pointers, pointer arithmetic, and pointer-to-function to manage memory and function calls effectively.

LO2: Implement dynamic memory allocation and deallocation using standard C functions to build memory-efficient programs.

LO3: Use predefined string functions, pointers with strings, and command line arguments for handling string-based operations.

LO4: Construct and manipulate user-defined data types such as structures and unions, including nested and pointer-based structures.

LO5: Develop file handling programs using standard library functions for sequential and random access to text and binary files.

LO6: Apply preprocessor directives like macros, conditional compilation, and file inclusion to enhance code modularity and readability.

Course Contents

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Guidelines for Assessment	
Assessment is a continuous assessment based on submission of the quizzes, presentations, Attendance and understanding	
List of Assignments	
1	Programs to implement the concept of pointer
2	Programs to explore different operations on pointers
3	Programs based on pointer to functions
4	Programs to understand the concept of dynamic memory allocation
5	Programs to implement the concept of realloc() function
6	Program to use dynamic memory allocation concept for the 1-D arrays
7	Programs to declare, define, and initialize string variables
8	Programs to use predefined string functions for various operations on strings
9	Programs based on command line arguments.
10	Programs to define and initialize a structure variable
11	Programs based on array of structures
12	Programs to perform various operations on structure, passing structure to a function and pointer to a structure
13	Programs based on union and various applications of union
14	Writing programs to read and write operations on a textual file
15	Implementing the File copy programs
16	Programs based on binary file
17	Programs to demonstrate the use of preprocessor directives
18	Programs to create and implement user defined header files with file inclusion directive

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Academic Year – 2025-2026 Semester -II

[HSCA1203T]: Environmental Studies

Teaching Scheme: TH: - 03 Hours/Week	Credit TH: 03	Examination Scheme: In Sem. Evaluation : 20 Marks Mid Sem. Exam : 30 Marks End Sem. Exam : 50 Marks Total : 100 Marks

Course Objective:

1. Understand the foundational concepts and key tenets of Indian knowledge systems
2. Understand various philosophical and spiritual traditions within the Indian context.
3. Examine the historical evolution of Indian literature, art, and science..

Course Outcome:

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

CO1: Recollect the ancient Indian rich heritage through philosophy, science, spirituality and health. CO2: Explain wisdom and moral framework to shape management skills , interpersonal and social interaction patterns required in every step of life's journey.

CO3: Develop collaborative learning to solve socio economical and Environmental problems.

Course Contents

UNIT-I	Introduction to environmental Studies	4 Hours

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

UNIT-II	Ecosystems	8 Hours

What is an ecosystem?, Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems , Forest ecosystem , Grassland ecosystem , Desert ecosystem , Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries

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UNIT-III	Natural Resources : Renewable and Non-renewable Resources	10 Hours
Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts conflicts overwater (international & inter state). Energy resources : Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies		
UNIT-IV	Biodiversity and Conservation	10 Hours
Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots . India as a mega-biodiversity nation; Endangered and endemic species of India , Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.Ecosystem and biodiversity services : Ecological, economic, social, ethical, aesthetic and informational value		
TextBooks: T1. Environmental Science- Bharti Public T2. Introduction to Environmental Science- G. Tyler Miller, Scott Spool man. T3. A Text Book Of Environmental Science by P. C. J		
ReferenceBooks: R1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt. R2. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge R3. Odum, E.P., Odum, H.T. & Andrews. 1971. Fundamentals of Ecology. Philadelphia: Saunders		

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Academic Year – 2025-2026 Semester -II
[BCA1109L]: Co-curricular I

Teaching Scheme: 02 Hours / Week	Credit : 01	Examination Scheme: Continous Assessment throughout semester : 50 Marks

Course Objective:

To provide students the opportunity to better explore their interests and to groom overall personality, apart from academic ability.

Course Outcome:

CO1: Broaden students' breadth of knowledge and horizons.
CO2: Stimulate out of the box thinking, self-reflection, and self-understanding to promote their individual growth.
CO3: Build solid foundation for "Whole Person Education" which will nurture and foster the holistic development .

Course Contents

List of Extra curricular activities :

1. Leadership Work and Positions
2. Sports and Athletic Participation
3. Academic Clubs and Teams/ Professional student chapters
4. Artistic and Creative Pursuits
5. Volunteering and Community Service
6. Internships

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Rules & Regulations:

- All the first year students should enroll in one of the Extra-Curricular Activities
- Students opting for Sports / Games / Yoga / Martial Arts / Dance can continue the same activity in the I/II/III/IV/V/VI/VII/VIII semester or can choose another activity
- Every week, any day last 2 hours are given for Cocurricular activity.
- Minimum of 50% attendance is required for these activities.
- In-charge faculty coordinator monitor the students and take the attendance.
- At the end of the year the attendance is submitted to the Attendance Committee and finally to the Exam Section.
- Students are given grades credits in the final memorandum.

Guideline for grading Co/Extra-Curricular Activity

- RSCOE shall organized various competitions through its various clubs(governed by either by Student Affairs pr Department) during the semester and academic year.
- All UG students shall choose at least ONE activity/event from the group of Co-curricular and Extra-curricular activities happening on campus or off campus during the semester. The student shall take active part in the activity, take part in competitions and earn grade points.
- On registering for a particular activity, the performance of a student shall be continuously monitored by the Faculty-in-charge.

RSCOE plans club activities into three categories.

1. Art Club
2. Technical Club
3. Sports and Games
4. SWAYAM

- Art club include various clubs related to liberal arts, music, performing arts etc.
- Technical club include chapters of professional societies like SAE,ASRAE,ISHRAE,CSI,RSI,IEEE, ISTE, IET, Department Associations, Shashwat (socio-technical club),Rotaract, ASCE,ICI etc.
- National Service Scheme (NSS) and Similar activities such as Unnat Bharat, Social Work, Blood donation etc.
- SWAYAM portal offers some self-paced courses related with YOGA such as Physical Activity (YOGA) (योग) or approved by Dean concern.

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- Participation in competitions, winning prizes, representing institute on state, national and international level etc shall get weightage as mentioned in the Annexure I and rubrics for same ids designed
- All competition to which Academic credit is concerned, shall have set of guidelines and rubrics defined by the department or Student Affair or concern faculty in charges.
- Few examples of Competition/Activity and is given in Annexure II

Annexure I: Assessment Rubrics:
Table A Rubrics for Assessment for Clubs Sports and cultural events(@UG Level)

		Clubs/Activity				Marks *	Grade point	Letter Grade
	Art clubs Technical Clubs Sports Any other competition/activity defined by institute/ department.	**NSS/NCC/Unnat Bharat Abhiyan**	**Participation in events outside of the institutes**	**SWAYAM Courses(only4 week course approved Dean concern)**	**Leadership & Management of clubs/activities/ Student Professional Societies/Institute Festival & Technical Events etc**			
Achievement level	I Prize winner, II Prize Winner, III winner	Best NSS/NCC Volunteer Awardee (State/National level) / Participation in Republic Day Parade Camp/International Youth Exchange Programme, Supported by certification	I Prize winner, II Prize Winner, III Prize Winner	As reflected in grade sheet	Top level management	50-45	10	O
	Active Participation (High)	Active Participation (High)	Selection in such events supported By		Middle level management	40-35	9	A+
						35-30	8	A

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			certification					
Active Participation (Medium)	Active Participation (Medium)			Lower-level management	30-25	7	B+
					25-20	6	B
Active Participation (low)	Active Participation (low)				20-15	5	C
					12	4	P
Not participate	Not participate	-		-	0	0	F

*Various clubs different marking system, however, it can be scaled down to 50 and assign credit accordingly.

Table B Rubrics for Assessment for Professional Society/Hacathons events (@FY Level)

10 pts=1 credits

Sr No	Category	International			National			State			Inter college	In-house
1	Organizer	8 pts			5 pts			4 pts			3 pts	2 pt
2	Participants	Shortlisted for final round=5	Shortlisted for second round =4	Shortlisted for first round =3	Shortlisted for final round =4	Shortlisted for second round =3	Shortlisted for first round= 2	Shortlisted for final round= 3	Shortlisted for second round =2	Shortlisted for first round =1	2	1
3	Winner	Rank 1 = 10	Rank 2= 9	Rank 3= 8	Rank 1 = 9	Rank 2= 9	Rank 3= 7	Rank 1 = 8	Rank 2= 7	Rank 3= 6	7,6,5	7,6,5

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