



**Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur 440033**

**Scheme and Syllabus
Bachelor of Computer Applications**

**Submitted by
Board of Studies
Computer Science**

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FYUGP-Scheme I-VIII Semester
Bachelor of Computer Applications (Honors/Research)
(Bachelor of Computer Applications)
Four Year (Eight Semester Degree Course)

THE OBJECTIVES OF THE PROGRAM:

1. The primary objective of this program is to provide a foundation of computing principles for effectively using information systems and enterprise software.
2. It helps students analyze the requirements for system programming and exposes students for information systems.
3. This programme provides students with options to specialize in various software system.
4. To produce outstanding Computer Scientists who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves.
5. To provide opportunity for the study of modern methods of information processing and its applications.
6. To develop among students the programming techniques and the problem-solving skills through programming.
7. To prepare students who wish to go on to further studies in computer science and related subjects.
8. To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

1. Discipline knowledge: Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity.
2. Problem Solving: Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
3. Design and Development of Solutions: Ability to design and development of algorithmic solutions to real world problems.
4. Programming a computer: Exhibiting strong skills required to program a computer for various issues and problems of day-to-day scientific applications.
5. Application Systems Knowledge: Possessing a minimum knowledge to practice existing computer application software.
6. Communication: Must have a reasonably good communication knowledge both in oral and writing.
7. Ethics on Profession, Environment and Society: Exhibiting professional ethics to maintain the integrality in a working environment and have concern on societal impacts due to computer-based solutions for problems.
8. Lifelong Learning: Should become an independent learner. So, learn to learn ability.
9. Motivation to take up Higher Studies: Inspiration to continue educations towards advanced studies on Computer Science.

**GENERAL COURSE
STRUCTURE
&
CREDIT DISTRIBUTION**

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GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hrs. Practical (P) per week	1 Credit

B. Course Code and definition:

Course Code	Definitions
TH	Theory
TU	Tutorial
P	Practical
DSC	Discipline Specific Courses
CC	Co-Curricular Courses
AEC	Ability Enhancement Courses
MDE	Multi-Disciplinary Elective course
IKS	Indian Knowledge System
VAC	Value added Courses
VEC	Value Education Courses
SEC	Skill Enhancement courses
DSE	Discipline Specific Elective
OE	Open Elective
OJT	On the Job Training
RP	Research Project

Course Name: Bachelor of Computer Applications, Bachelor of Computer Applications (Honors) and Bachelor of Computer Applications (Honors with Research)

Eligibility:

- 1) A student having a valid CET Score in BCA-CET or any other equivalent CET score and other norms laid down by AICTE/DTE from Time-to-time regarding admission process. **AND**
- 2) Any other Equivalent Examination of any State in (10+2) pattern with Science subjects, English and

other Modern Indian Languages together **with Mathematics** or an examination recognized as equivalent thereto in such subjects and with such standards of attainments as may be prescribed.

Course Level/Duration/System:

Undergraduate / Three or Four years/6 or 8 Semesters with multiple entry and exit. The following option will be made available to the students joining BCA Research Program:

- **One year:** Under Graduate Certificate in Computer Applications
- **Two years:** Under Graduate Diploma in Computer Applications
- **Three years:** Bachelor of Computer Applications (BCA)
- **Four years:** Bachelor of Computer Applications with Honors: BCA (Honors) or Bachelor of Computer Applications Honors with Research: BCA (Honors with Research)

Minimum Eligibility Criteria: Minimum eligibility criteria for opting the course in the fourth year will be as follows:

1. **BCA (Honors with Research):** Minimum 75% marks or equivalent CGPA in BCA Degree upto 6th Semester.
2. **For BCA (Honors):** BCA Degree

Note: The students who are eligible for BCA (Honors with Research) shall have choice to pursue either BCA (Honors) or BCA (Honors with Research).

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SEMESTER WISE CREDIT DISTRIBUTION: Semester wise credit distribution of proposed BCA [BCA (Honors) and BCA (Honors with research)] program:

Semester	Discipline Specific Courses (DSC)	Ability Enhancement Courses (AEC)	Multi-Disciplinary Elective Course (MDE)	Indian Knowledge System (IKS)	Value Education Courses (VEC)	Skill Enhancement courses (SEC)	Value Added Course (VAC)	Discipline Specific Elective (DSE)	Co-Curricular Course (CC)	On the Job Training (OJT)	Research Project (RP)	Total
I	7	2	-	2	2	5	-	-	2			20
II	10	-	-		2	8	-	-	-			20
III	13	0	0		0	5	2	0	-			20
IV	15	0	0		0	4	1	0	-			20
V	2	0	0		0	-	-	15		4		21
VI	4	1	0		0	-	-	10			4	19
BCA (Honors)												
VI I	5	0	3		0	4		8				20
VI II						8		12				20
BCA (Honors with Research)												
VI I	12							8				20
VI II	20											20

3 Years BCA Program	Total Credits = 120
4 Years BCA (Honors) and BCA (Honors with Research)	Total Credits = 160

Note: Students can take extra credit course from their own department or from other department/university as per the Admitting Body / University norms.

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INDUCTION PROGRAM

Induction program (Mandatory)	
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none">• Physical Activity• Creative Arts• Universal Human Values• Literary• Basic of Information and Communication Technology• Proficiency Modules• Lectures by Eminent People• Visits to Local Areas• Familiarization to Department/Branch & Innovations

Mandatory Visits/ Workshop/Expert Lectures:

1. It is mandatory to arrange the industrial visits.
2. It is mandatory to conduct a workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.
3. It is mandatory to organize at least one expert lecture from domain specific industry.

For Summer Internship / Projects / Seminar etc.

1. Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc.



Semester wise Structure and Curriculum for UG Course in BCA

Teaching and Examination Scheme

BCA Semester-I

S N	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme								
				(TH)	TU	P		Theory				Practical				
								Exam Hrs.	SEE	CIE	Mi n.	SEE	CIE	Mi n.		
1	DSC	Mathematics Foundation to Computer Science	BCA1T01	3	-	-	3	3	80	20	40	-	-	-		
2	SEC	Problem Solving Techniques with C	BCA1T02	3	-	-	3	3	80	20	40	-	-	-		
3	SEC	Problem Solving Techniques with C- LAB/Practical 1	BCA1P01	-	-	4	2	-	-	-	-	25	25	25		
4	DSC	Basics of Computer Architecture	BCA1T03	3	-	-	3	3	80	20	40	-	-	-		
5	DSC	Basics of Computer Architecture LAB/Practical 2	BCA1P02	-	-	2	1	-	-	-	-	25	25	25		
6	AEC	English Compulsory	BAE1T01	2	-	-	2	3	50	50	40	-	-	-		
7	VEC	Environmental Science	BVE1T01	2	-	-	2	3	80	20	40	-	-	-		
8	IKS	Vedic Mathematics	BIK1T01	2	-	-	2	3	80	20	40	-	-	-		
9	CC	Refer Annexure – V CC Basket	BCC1P01	-	-	4	2	-	-	-	-	-	100	50		
10	AEC	Additional Course - Indian or Foreign Language Other than Mother Tongue and English (1-1- 0)) [optional course] *	BAE1T02	1	1	0	0*	-	-	-	-	-	50	20		
Total				16	1	10	20	-	450	150	-	50	200	-		

Note: Indian Languages: Sanskrit/Hindi/All Regional languages

Foreign Languages: (not limited to) Spanish/German/French/Korean/Mandarin etc.





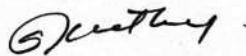


BCA Semester-II

S N	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(TH)	TU	P		Theory			Practical			
								Exam Hrs.	SEE	CIE	Mi n.	SEE	CIE	Mi n.
1	DSC	Programming in C++	BCA2T04	3	-	-	3	3	80	20	40	-	-	-
2	DSC	Programming in C++ - LAB/Practical 1	BCA2P03	-	-	4	2	-	-	-	-	25	25	25
3	DSC	Database Management System	BCA2T05	3	-	-	3	3	80	20	40	-	-	-
4	SEC	Data Structures	BCA2T06	3	-	-	3	3	80	20	40	-	-	-
5	SEC	Data Structures – LAB/ Practical 2	BCA2P04	-	-	4	2	-	-	-	-	25	25	25
6	DSC	Operating System and Linux	BCA2T07	2	-	-	2	3	80	20	40	-	-	-
7	SEC	Web Technologies	BCA2T08	2	-	-	2	3	80	20	40	-	-	-
8	SEC	Web Technologies – LAB/ Practical 3	BCA2P05	-	-	2	1	-	-	-	-	25	25	25
9	VEC	Constitution of India	BVE2T02	2	-	-	2	3	80	20	40	-	-	-
10	AEC	Additional Course - Indian or Foreign Language Other than Mother Tongue and English (1-1- 0) [optional course] *	BAE2T03	1	1	0	0*	-	-	-	-	-	50	20
Total				16	01	10	20	-	480	120	-	75	125	-

Note: Indian Languages: Sanskrit/Hindi/All Regional languages

Foreign Languages: (not limited to) Spanish/German/French/Korean/Mandarin etc



After Year 1, Students are advised to take Social Responsibility & Community Engagement - encompassing Community Engagement with an NGO in the vacation time.

An UNDER GRADUATE CERTIFICATE IN COMPUTER APPLICATION will be awarded If a student wishes to exit at the end of First year.

Exit Criteria after First Year of BCA Programme

Students will have the option to exit the Bachelor of Computer Applications (BCA) program after successfully completing the first year. Upon exit, they will be awarded a **UG Certificate in Computer Application**. To be eligible for this certificate, students must complete an additional 04 credits in one of the following areas:

1. **Skill-Based Subject:** A course designed to enhance practical and technical skills in the field of computer applications.
2. **Work-Based Vocational Course:** A vocational course offered during the summer term that emphasizes hands-on training and workplace readiness.
3. **Internship/Apprenticeship:** A professional internship or apprenticeship program in a relevant field, with a minimum duration of 08 weeks, which will take place after the second semester.
4. **Social Responsibility & Community Engagement:** Active engagement with an NGO or community organization for a minimum duration of 08 weeks, focusing on real-world problem-solving, social responsibility, and community service.

The respective University/Admitting Body will determine the mode and specifics of these additional credits, and students will be required to complete the 08-week program during the summer term following their second semester.

The exiting students will clear the subject / submit the Internship Report as per the University schedule.

Re-entry Criteria in to Second Year (Third Semester)

The student who takes an exit after one year with an award of certificate may be allowed to re-enter in to Third Semester for completion of the BCA Program as per the respective University /Admitting Body schedule after earning requisite credits in the First year.



BCA Semester-III

S N	Course Categor y	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Cred it	Examination Scheme						
				(TH)	TU	P		Theory				Practical		
								Exa m Hrs.	SE E	CI E	M in.	SEE	CIE	Mi n.
1	DSC	Object Oriented Programming using JAVA	BCA3T09	3	-	-	3	3	80	20	40	-	-	-
2	DSC	Object Oriented Programming using JAVA-LAB/Practical 1	BCA3P06	-	-	4	2	-	-	-	-	25	25	25
3	DSC	Probability and Statistics	BCA3T10	2	-	-	2	3	80	20	40	-	-	-
4	SEC	Python Programming	BCA3T11	3	-	-	3	3	80	20	40	-	-	-
5	SEC	Python Programming-LAB/Practical 2	BCA3P07	-	-	4	2	-	-	-	-	25	25	25
6	DSC	Software Engineering	BCA3T12	2	-	-	2	3	80	20	40	-	-	-
7	DSC	Basics of Data Analytics using Spreadsheet	BCA3T13	2	-	-	2	3	80	20	40	-	-	-
8	DSC	Basics of Data Analytics using Spreadsheet- LAB/Practical 3	BCA3P08	-	-	4	2	-	-	-	-	25	25	25
9	VAC	SQL and PL/SQL	BCA3T14	-	-	4	2	3	-	-	-	-	50	25
Total				12	-	16	20		400	100		75	125	

BCA Semester-IV

S N	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Cred it	Examination Scheme						
				(TH)	TU	P		Theory				Practical		
								Exa m Hrs.	SE E	CI E	M in.	SEE	CIE	Mi n.
1	DSC	Artificial Intelligence	BCA4T15	3	-	-	3	3	80	20	40	-	-	-
2	DSC	Artificial Intelligence LAB/Practical 1	BCA4P09	-	-	4	2	-	-	-	-	25	25	25
3	DSC	Computer Networks	BCA4T16	2	-	-	2	3	80	20	40	-	-	-
4	DSC	PHP	BCA4T17	3	-	-	3	3	80	20	40	-	-	-
5	DSC	PHP LAB/Practical 2	BCA4P10	-	-	4	2	-	-	-	-	25	25	25
6	DSC	Design and Analysis of Algorithm	BCA4T18	3	-	-	3	3	80	20	40	-	-	-
7	SEC	Data Visualization	BCA4T19	2	-	-	2	3	80	20	40	-	-	-
8	SEC	Data Visualization-LAB/ Practical 3	BCA4P11			4	2					25	25	25
9	VAC	Design Thinking and Innovation	BCA4T20	-	-	2	1	-					50	25
Total				13	1	14	20		400	100		75	125	

Students can choose their specialization i.e. Stream with Discipline Specific Elective [DSE] from Third year onwards as indicated in Appendix –I.

Exit Criteria after Second Year of BCA Programme

Students will have the option to exit the Bachelor of Computer Applications (BCA) program after successfully completing the second year. Upon exit, they will be awarded a **UG Diploma in Computer Application**. To be eligible for this diploma, students must complete an additional 04 credits in one of the following areas:

1. **Skill-Based Subject:** A specialized course aimed at enhancing technical and practical expertise in computer applications.
2. **Work-Based Vocational Course:** A vocational course offered during the summer term, focused on building practical, industry-relevant skills.
3. **Internship/Apprenticeship:** A professional internship or apprenticeship with a minimum duration of 08 weeks, conducted after the fourth semester, offering hands- on experience in a relevant field.







4. **Social Responsibility & Community Engagement:** Involvement with an NGO or community-based organization for a minimum of 08 weeks, contributing to social initiatives and applying computer application knowledge to solve real-world challenges.
5. **Capstone Project:** Completion of a capstone project integrating the skills and knowledge gained during the first two years of the program, which can be an independent or group project.

The respective University/Admitting Body will decide the specific mode of completing the additional credits, and students will be required to complete the 08-week program or project during the summer term following their fourth semester.

Students opting for this exit will also be required to **submit an Internship/Apprenticeship Report** or complete the Capstone Project as per the schedule outlined by the University/Admitting Body before they are awarded the UG Diploma.

Re-entry Criteria in to Third Year (Fifth Semester)

The student who takes an exit after second year with an award of Diploma may be allowed to re-enter into fifth Semester for completion of the BCA Program as per the respective University / Admitting Body schedule after earning requisite credits in the Second year.



BCA Semester-V

S N	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credi t	Examination Scheme						
				(TH)	TU	P		Theory				Practical		
								Exam Hrs.	SE E	CIE	Min	SEE	CIE	Min
1	DSE	Professional Elective – I	BCA5T21	3	-	-	3	3	80	20	40	-	-	-
2	DSE	Professional Elective – I Lab/Practical-1	BCA5P12	-	-	4	2					25	25	25
3	DSE	Professional Elective – II	BCA5T22	3	0	0	3	3	80	20	40	-	-	-
4	DSE	Professional Elective – II Lab/Practical-2	BCA5P13			4	2					25	25	25
5	DSE	Professional Elective – III	BCA5T23	3	0	0	3	3	80	20	40	-	-	-
6	DSE	Professional Elective – III Lab/Practical-3	BCA5P14			4	2					25	25	25
7	DSC	Quantitative Techniques	BCA5T24	0	2	0	2	-	-	-	-	-	50	25
8	OJT	Internship/Capstone Project	BOJ5P01	0	0	8	4	-	-	-	-	100	100	100
9	RP	Major Project [Evaluation in sixth Semester]	BRP5P01	-	-	-	-	-	-	-	-	-	-	-
Total				09	2	20	21	-	240	60	-	175	225	-

BCA Semester-VI

S N	Course Categor y	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Cred it	Examination Scheme						
				(TH)	TU	P		Theory			Practical			
								Exa m Hrs.	SE E	CI E	Mi n.	SE E	CIE	Min .
1	DSC	Generative AI	BCA6T25	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Generative AI Lab/Practical-1	BCA6P15	-	-	4	2					25	25	25
3	DSE	Professional Elective – IV	BCA6T26	3	-	-	3	3	80	20	40	-	-	-
4	DSE	Professional Elective – IV Lab/Practical-2	BCA6P16	-	-	4	2					25	25	25
5	DSE	Professional Elective – V	BCA6T27	3	-	-	3	3	80	20	40	-	-	-
6	DSE	Professional Elective – V Lab/Practical-3	BCA6P17	-	-	4	2					25	25	25
7	AEC	Soft Skills	BAE6P04	-	1	-	1	-	-	-	-		50	25
8	RP	Major Project [Initiated in 5th Semester]	BRP6P02	-	-	8	4					100	100	100
Total				8	1	20	19		240	60		175	225	

1. BACHELOR OF COMPUTER APPLICATIONS 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 of Computer Applications (BCA).

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 (Honors) or BCA (Honors with Research) Program as per the respective University / Admitting Body schedule after earning requisite credits in the Third year.






Minimum Eligibility Criteria: Minimum eligibility criteria for opting the course in the fourth year will be as follows:

- 1. BCA (Honors with Research):** Minimum 75% marks or equivalent CGPA in BCA Degree upto 6th Semester.
- 2. For BCA (Honors):** BCA Degree

SEMESTER VII - (BCA (Honors))

Specialization - AI & ML

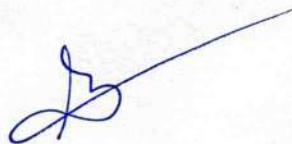
S N	Course Categor y	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Cred it	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exa m Hrs.	SE E	CI E	Mi n.	SE E	CIE	Min .
1	MDE	Social Network Analysis	BMD7T01	3	-	-	3	3	80	20	40	-	-	-
2	DSC	Optimization of ML	BCA7T28	3	-	-	3	3	80	20	40			
3	DSC	Optimization of ML Lab/Practical-1	BCA6P18	-	-	4	2					25	25	25
4	DSE	Professional Elective – VI	BCA7T29	3	-	-	3	3	80	20	40	-	-	-
5	DSE	Professional Elective – VI Lab/Practical-2	BCA7P19	-	-	4	2					25	25	25
6	DSE	Professional Elective– VII	BCA7T30	3	-	-	3	3	80	20	40	-	-	-
7	RP	Dissertation work [Evaluation in Eight Semester]	BRP7P03	-	-	-	-					-	-	-
8	OJT	Summer Internship II	BOJ7P02	0	0	8	4					100	100	100
Total				12	-	16	20		320	80		150	150	











SEMESTER VII - (BCA (Honors))
Specialization - Data Science

S N	Course Categor y	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Cred it	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exa m Hrs.	SE E	CI E	Mi n.	SE E	CIE	Min .
1	MDE	Advanced Statistical methods for Data Science	BMD7T02	3	-	-	3	3	80	20	40	-	-	-
2	DSC	Python for Data Science	BCA7T28	3	-	-	3	3	80	20	40			
3	DSC	Python for Data Science Lab/Practical-1	BCA7P18			4	2					25	25	25
4	DSE	Professional Elective – VI	BCA7T29	3	-	-	3	-3	80	20	40	-	-	-
5	DSE	Professional Elective – VI Lab/Practical-2	BCA7P19			4	2					25	25	25
6	DSE	Professional Elective – VII	BCA7T30	3	-	-	3	3	80	20	40			
7	RP	Dissertation work [Evaluation in Eight Semester]	BRP7P03	-	-	-	-	-	-	-	-	-	-	-
8	OJT	Summer Internship II	BOJ7P02	0	0	8	4					100	100	100
Total				12	-	16	20		320	80		150	150	

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BCA SEMESTER VIII - (Honors)
(For Specialization AI-ML & Data Science)

S N	Course Categor y	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Cred it	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exa m Hrs.	SE E	CI E	Mi n.	SE E	CIE	Min .
1	DSE	Professional Elective – VIII	BCA8T31	3	-		3	3	80	20	40	-	-	-
2	DSE	Professional Elective – VIII Lab/Practical 1	BCA8P20			4	2					25	25	25
3	DSE	Professional Elective – IX	BCA8T32	3	-	4	3	3	80	20	40			
4	DSE	Professional Elective – IX Lab/Practical 2	BCA8P21			4	2					25	25	25
5	DSE	Professional Elective – X	BCA8T33	2	-	-	2	3	80	20	40			
6	RP	Dissertation work [Started in Seventh Semester]	BRP8P04	-	-	16	8					100	100	100
Total				8	-	28	20		320	80		150	150	



BCA SEMESTER VII - (Honors with Research)

S N	Course Categor y	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Cred it	Examination Scheme						
				(TH)	TU	P		Theory				Practical		
								Exa m Hrs.	SE E	CI E	Mi n.	SE E	CIE	Min .
1	DSC	Advanced Data Analysis Tools	BCA8T34	-	2	-	2	3	80	20	40	-	-	-
2	DSE	Advanced Data Analysis Tools Lab/Practical 1	BCA8P20	-	-	4	2	-				25	25	25
3	DSC	Research Methodology	BCA8T35	2	2	-	4	3	80	20	40			
4	DSE	Professional Elective – VII	BCA8T36	2	2	-	4	3	80	20	40			
5	DSE	Professional Elective – VIII	BCA8T37	2	-	-	4	3	80	20	40			
6	DSE	Professional Elective – VIII Lab/Practical 2	BCA8P21	-	-	4						25	25	25
7	OJT	Research Internship Report and Viva –Voce	BOJ8P03	-	-	8	4					100	100	100
Total				6	6	16	20		320	80		150	150	

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SEMESTER VIII- (BCA – (Honors with Research))

S N	Course Categor y	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Cred it	Examination Scheme						
				(Th)	TU	P		Theory			Practical			
								Exa m Hrs.	SE E	CI E	Mi n.	SE E	CIE	Min .
1	RP	Project Work Full Time	BRP8P04	-	-	-	16	-				200	200	200
2	RP	Seminar	BRP8P05	-	-	-	4	-				100	100	100
Total							20					300	300	

*The Dissertation work will start from the beginning of fourth year of BCA (Honors with Research) Program.

Students of Fourth Year shall be assessed for Project Work and Research Internship Report and Viva
-Voce and Dissertation (For Research Track)

Proposed Streams with Discipline-Specific Electives (DSE)

Appendix-I

1. Data Science

Sr. No	Course Category	Semester	Course Code	Name of the Professional Elective
1	Elective-I	V	BCA5T21	Introduction to Data Science
2	Elective-II	V	BCA5T22	Time Series Analysis
3	Elective-III	V	BCA5T23	Machine Learning
4	Elective-IV	VI	BCA6T26	Big Data Analytics
5	Elective-V	VI	BCA6T27	Exploratory Data Analysis
6	Elective-VI	VII	BCA7T29	Business Intelligence & Analytics
7	Elective-VII	VII	BCA7T30	Data Mining & Warehousing
8	Elective-VIII	VIII	BCA8T31	Advanced Data Visualization
9	Elective-IX	VIII	BCA8T32	Cloud Computing for Data Analytics
10	Elective-X	VIII	BCA8T33	Data Security & Privacy

2. Artificial Intelligence & Machine Learning

Sr. No	Course Category	Semester	Course Code	Name of the Professional Elective
1	Elective-I	V	BCA5T21	Neural Network
2	Elective-II	V	BCA5T22	Digital Image Processing
3	Elective-III	V	BCA5T23	Natural Language Processing
4	Elective-IV	VI	BCA6T26	Deep Learning for Computer Vision
5	Elective-V	VI	BCA6T27	Predictive Analysis
6	Elective-VI	VII	BCA7T29	Explainable AI
7	Elective-VII	VII	BCA7T30	Evolutionary Algorithm
8	Elective-VIII	VIII	BCA8T31	Speech Recognition
9	Elective-IX	VIII	BCA8T32	Augmented Reality & Virtual Reality
10	Elective-X	VIII	BCA8T33	Security aspects of ML



SEMESTER – I

BCA Semester-I
DSC (Paper I)
BCA1T01
MATHEMATICS FOUNDATION TO COMPUTER SCIENCE

Credits : 3

Duration :30 Hours

Course Objectives:

- 1 To cover certain sets, functions, relations and groups concepts for analyzing problems that arise in engineering and physical sciences.
- 2 To imparting to analyze the problems connected with combinatorics and Boolean algebra.
- 3 To solve calculus and integral calculus problems.

Course Outcomes:

1. Observe the various types of sets, functions and relations.
2. Understand the concepts of group theory.
3. Understand the concepts of combinatorics.
4. Understand the concepts of graph theory and its applications.
5. Learning logic and Boolean algebra. Using these concepts to solve the problems

UNIT I

Mathematical Logic: Propositional Calculus: Connectives, statement formulas and truth tables, well-formed formulas, Tautologies, Equivalence of formulas, duality law, Tautological Implications, functionally complete set of connectives, other connectives. **Normal Forms:** CNF, DNF, PCNF, PDNF.

UNIT II

Fundamentals: Sets and Subsets, operations on sets, sequences, Division of the integer, Matrices, Methods of Proof, Mathematical Induction. **Counting:** Permutations, Combinations, The pigeonhole Principle, Recurrence Relations.

UNIT III

Relations and Digraphs: Product sets and Partitions, Relations and Digraphs, Paths in Relations and Digraphs, Properties of Relations, Equivalence Relations, Operations of Relations, Transitive Closure and Warshall's Algorithms. **Functions:** Definition and Introduction, Permutation Functions, Growth of Functions.

UNIT IV

Order Relations and Structures: Partially Ordered Sets, Lattices. **Graph Theory:** Basic Concept of Graph Theory, Euler Paths and Circuits, Hamiltonian Paths and Circuits. **Tree:** Introduction, Undirected Tree, Minimal Spanning Trees. **Semigroups and Groups:** Binary Operations Revisited, Semigroups, Products and Quotients of Groups.

Books

1. Discrete Mathematical Structures By Bernard Kolman, Busby & Sharon Ross [PHI].
2. Discrete Mathematical Structures with Application to computer science By J. P. Tremblay & R. Manohar [Tata McGraw -Hill]
3. Discrete Mathematics with Graph Theory by Goodaire[PHI]
4. Discrete Mathematics by J.K.Sharma(McMillan)
5. Discrete Mathematics and its Applications by Kenneth Rosen (TMH)

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BCA Semester-I
SEC (Paper II)
BCA1T02

PROBLEM SOLVING TECHNIQUES WITH C

Credits : 3

Duration : 30 Hours

Course Objectives:

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To implement operations on arrays, strings , structures, unions , functions and file handling.

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

1. Write simple algorithms for arithmetic and logical problems.
2. Write the C code for a given problem
3. Perform input and output operations using programs in C
4. Write programs that perform operations on arrays, strings , structures, unions , functions and file handling.

UNIT I

Programming Structure: Sequence, Selection, Iteration and Modular. Problem Solving techniques: Development Tools: Algorithm, Flowcharts and Pseudo code (Definition and its characteristics) Developing Algorithm and Drawing flowcharts

UNIT II

C Character set, Tokens, Data types, **Operators and Expressions:** Arithmetic, Relational, Logical, Bit-Wise, Increment, Decrement, Conditional and Special operators. typedef, Type Conversion, Constants, Declaring Symbolic Constants, Character Strings, Enumerated Data Types, Operator Precedence and Associativity. Library functions: Maths, string handling Functions. Control Structure: Compound Statement, Selection Statement: if, if-else, Nested if, switch. Iteration statement: for, while, do...while, Nested loops, Jump statements: break, continue, goto (Special emphasis on problem solving)

UNIT III

Arrays: Need, Types: Single and Two Dimensional Array. Strings: Strings Manipulation, Arrays of Strings, Evaluation order

Function: Function Components, Return Data type, Parameter Passing, Return by Reference, Default Arguments, Recursive Functions, Arrays with Functions, Storage Classes. (Special emphasis on problem Solving)

UNIT IV

Structure: Declaration, Definition, Accessing structure members, Initialization, Nesting of Structures.

Union: Unions, Differences between Structure and Union

Pointer: Introduction, Address Operator (&), Pointer variables, void pointers, Pointer Arithmetic, Pointers to Pointers.

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File handling: Hierarchy of File Stream Classes, Opening & closing a file, Testing for errors, File Modes, File pointers and their manipulations, Sequential Access, Random Access, Command Line arguments.

Books :

1. The Art of programming through flowcharts & algorithm by Anil B. Chaudhari Firewall Media, Laxmi publication, New Publication.
2. Programming in C by E. Balagurusamy TMH Publications.
3. C Programming – Kernighen Ritche
4. Programming with C – Y. Kanetkar.
5. C Programming – Holzner, PHI Publication.
6. Programming in C – Ravichandran.

PRACTICAL LIST (BCA1P01)

1. Write a Program in c to find largest of three numbers.
2. Write a Program in c to print Fibonacci Series up to n terms.
3. Write a Program in c to find if a number is prime or not.
4. Write a Program in c to find sum of digits of any entered number.
5. Write a Program in c to reverse the digit.
6. Write a Program in c to find frequency of occurrence of a given number from array of N elements.
7. Write a Program in c to insert an element in one dimensional Array at a given position.
8. Write a Program in c to delete an element from one dimensional array.
9. Write a Program in c to sort array elements using Bubble Sort.
10. Write a Program in c to search the element in an array of N elements using Linear Search method.
11. Write a Program in c to multiply Two Dimensional Array's (3*3matrix).
12. Write a Program in c to find largest element in Two Dimensional Array's (3*3matrix).
13. Write a Program in c to check if given String is Palindrome or not.
14. Write a Program in c to find Factorial of a number using Recursive function.
15. Write a Program in c using function to find sum of two numbers with no argument and no return values.
16. Write a Program in c using function to find sum of two numbers with argument and no return values.
17. Write a Program in c to swap values of two variables by passing pointers.
18. Write a program in c to demonstrate structure.
19. Program to calculate number of blanks ,vowel, and words from entered phrase
20. Program to create a sequential file and perform following operation fields are Roll, Name, M1, M2, M3
 - i) Add records
 - ii) Process & Display output

BCA Semester-I
DSC (Paper III)
BCA1T03
BASICS OF COMPUTER ARCHITECTURE

Credits : 3

Duration : 30 Hours

Course Objectives:

1. To provide the fundamental concepts associated with the digital logic and circuit design.
2. To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits.
3. To familiarize with the different number systems, logic gates, and combinational and sequential circuits utilized in the different digital circuits and systems.

Course Outcomes:

After completing this course satisfactorily, a student will be able to:

1. To Understand the basics of Digital Electronics and Binary Number System
2. To Learn the implementation of Combinational Circuit.
3. To Learn the implementation of Sequential Circuit.
4. Realize and simplify Boolean Algebraic assignments for designing digital circuits using K-Maps and Design and implement Sequential and Combinational digital circuits as per the specifications.

UNIT-I: Number System and Data Representation

Number System: Binary, Octal, Decimal, and Hexadecimal Number System and their Inter Conversion. Binary Codes: BCD, Excess3, Parity, Gray, ASCII, EBCDIC Codes and their advantages and disadvantages. Data Representation: Positive, Negative, Maximum and Minimum Number Representation (Related to 8-bit Number), Real Number Representation, Underflow, Overflow, Range, and Accuracy.

UNIT-II: Binary Arithmetic & Logic Gates

Binary Arithmetic: Binary Addition, Decimal Subtraction Using 9's and 10's Complement, Binary Subtraction Using 1's and 2's **Logic Gates:** Truth Table, Properties and Symbolic Representation of NOT, AND, OR, NOR, NAND, EX-OR, EX-NOR Gates. NOR and NAND Gates as Universal Gates.

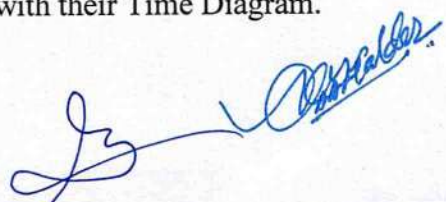
UNIT-III: Combinational Circuits and Boolean algebra

Combinational Circuits: Half Adder, Full Adder, Parallel Adder, Half Subtractor, Full Subtractor, 4-Bit Binary Adder Subtractor, Multiplexer, DE multiplexer, Decoder, Encoder.

Boolean Algebra: Laws and Identities of Boolean Algebra, Demorgan's Theorem, Use of Boolean Algebra for Simplification of Logic Expression, K-Map for 2, 3, 4 Variables, Simplification of SOP and POS Logic Expression Using K-Map.

UNIT-IV: Sequential Circuits and Counters

Sequential Circuits: Flip-Flops Construction and Working of RSFF, DFF, TFF, JKFF and JKMSFF. Counters: Construction and Working of Asynchronous, Synchronous, Up-Down Counter, Shift Registers and Their Types, Ring Counter, Johnson Counter with their Time Diagram.



Books:

1. Gothman, "Digital Electronics", PHI.
2. Navaneeth,, Kale and Gokhale, "Digital and Analog Technique", ISBN-81-225-0153-2

References:


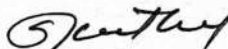
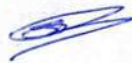
1. Soumitra Mandal, "Digital Electronics", TMH, ISBN0-07015382-5
2. Bram, "Fundamental of Microprocessor and Microcomputer", Dhanpat Rai Pub.
3. Liu.Gibson, "Microcomputer System: The8086/8088 Family", ISBN-1-55623-874-6

Practical List (Using Simulator) (BCAIP02)

1. To Study and Design the characteristics of basic gates (AND, OR, NOT).
2. To Study and Design the characteristics of Universal gates (NAND, NOR).
3. To Study and Design the Derived gates (EX-OR, EX-NOR)
4. To Study and Design the basic gates (AND, OR, NOT) using a Universal NAND gate.
5. To Study and Design, the basic gates (AND, OR, NOT) using a Universal NOR gate.
6. To Study and Design the basic gates (EX-OR, EX-NOR) using Universal NAND gate.
7. To Study and Design the derived gates (EX-OR, EX-NOR) using Universal NOR gate.
8. To Study and Design NOR gate using NAND gate.
9. To Study and Design NAND gate using NOR gate.
10. To Study and Design RSFLIP FLOP using NAND gate.
11. To Study and Design RSFLIP FLOP using NOR gate.
12. To Study and Design JKFLIPFLOP.
13. To Study and Design JKMS FLIPFLOP.
14. To Study and Design the Half-adder.
15. To Study and Design the Full-adder.
16. To Study and Design the half subtractor.

Hardware

1. Familiarize the computer system layout: marking positions of SMPS, motherboard, FDD, HDD, CD, DVD and add on cards.
2. Identify the Computer Name and Hardware Specification (RAM capacity, Processor type, HDD, 32 bit/ 64 bit)
3. Identify and Troubleshoot the problems of RAM, SMPS and motherboard
4. Configure BIOS settings- disable and enable USB and LAN
5. Adding additional RAM to the system. (expanding RAM size).
6. To Study mother board layout of a system.
7. Demonstrate the assembly of a PC
8. Demonstration of various ports: CPU, VGA port, PS/2 (keyboard, mouse), USB, LAN, Speaker, Audio.
9. Install and configure windows OS
10. To study the installation of Printer and trouble shooting.



BAE1T01

**B.Sc/B.Sc(IT)/BCA/B.Sc (Data Science)/B.Sc(AI)
SEMESTER-I**

**SYLLABUS FOR COMPULSORY ENGLISH
(ABILITY ENHANCEMENT COURSE)**

(As per NEP 2020)

(To be implemented from the Academic Session 2024-2025 and onwards)

COURSE OUTCOMES:

- Students will be able to enhance their awareness of correct usage of English language in writing and speaking.
- Students will improve their speaking ability in English both in terms of fluency and comprehensibility.
- Students will enlarge their vocabulary.
- Students will review the grammatical forms of English and the appropriate use of these forms in specific communicative contexts.
- Students will develop their ability as critical readers and connect issues discussed in the text with life.
- Students will attain and enhance competence in the four modes: writing, speaking, reading & listening
- Students will develop skills that enable them to present their ideas clearly and logically to achieve a specific purpose.

Theory Exam: 50 Marks

Continuous Internal Evaluation (CIE): 50 Marks

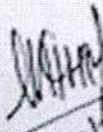
Total : 100 Marks


**Prescribed Text : *Stepping Stone* - Board of Editors
(Published by Macmillan Education India Pvt. Ltd.)**

SEMESTER - I

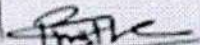
UNIT-I

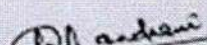
1. Grassroots Innovation and Social Enterprise - Saji Varghese
2. Two Gentlemen of Verona - A. J. Cronin
3. Go, Kiss the World - Subroto Bagchi

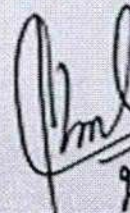

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UNIT-2

4. Little Girls Wiser than Men - Leo Tolstoy
5. The Narmada
6. Old Man at the Bridge - Ernest Hemingway

UNIT-3 (LANGUAGE SKILLS-1)

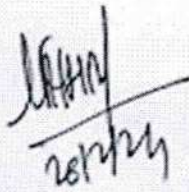
- Greetings and Introduction
- Countries and Nationalities
- Interesting Products
- Activities and Interest
- Food
- My Family

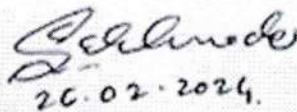
UNIT-4 (LANGUAGE SKILLS-2)

- Preparing a Flyer for an Event, Preparing Advertisement for a Product, Preparing a Handout for a Social Cause/Issue
- Resume Writing

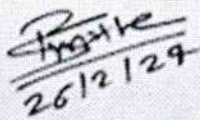
Continuous Internal Evaluation (CIE): 50 Marks

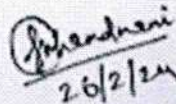
A Continuous Internal Assessment of 50 marks shall be based on the different oral communication skills activities regularly conducted by the Teacher and the worksheets/written assignments/creative projects to be submitted by the students. The students are required to actively participate in these activities and mandatorily submit the worksheets/written assignments/creative projects. The guidelines and some suggested items for the activities/assignments are given in the prescribed Text Book, 'Stepping Stone'.

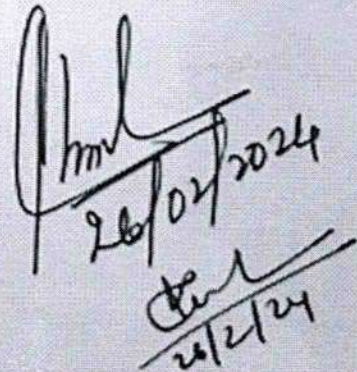
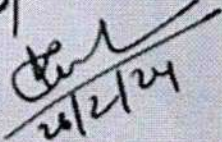

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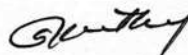

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**QUESTION PAPER PATTERN
THEORY EXAM
(50 MARKS)**

Q.1 Answer any Two (Out of Three) of the given questions in about 50 words each. (UNIT-1) (2 X 5 Marks = 10)

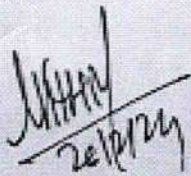
Q.2 Answer any Two (Out of Three) of the given questions in about 50 words each. (UNIT-2) (2 X 5 Marks = 10)

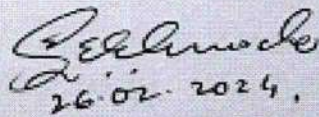
Q.3 (A) Five Very Short Answer Questions to be answered in one or two sentences each (UNIT-1) (5 X 1 Mark = 5)

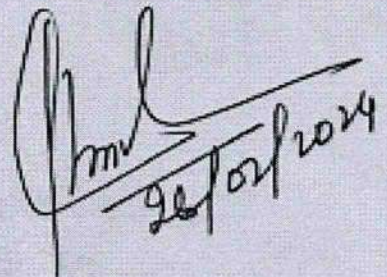
(B) Five Very Short Answer Questions to be answered in one or two sentences each (UNIT-2) (5 X 1 Mark = 5)

Q.4 Writing a script of the dialogue of any ONE (Out of Two) of the conversational situations. (UNIT-3) (1 X 10 Marks = 10)

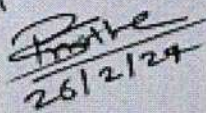
Q.5 Attempt any ONE (Out of Two) of the Questions based on the items prescribed in UNIT-4 (1 X 10 Marks = 10)

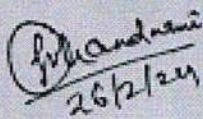

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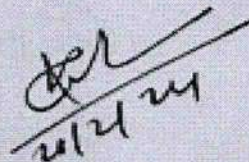

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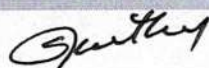
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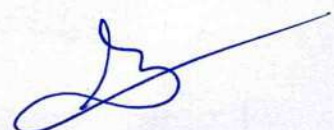

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Indian Knowledge System (IKS)

Semester 1: VEDIC MATHEMATICS

(BIK1T01)

Course Outcomes: This course will enable the students to

1. Improve speed and accuracy in numerical calculations
2. Acquire IQ skills and high-end technical knowledge
3. gain test taking skills & creativity of calculations

UNITS	TOPICS	HOURS
Unit 1	(i) Addition - Subtraction - Combined operations - Beejank (ii) Multiplication methods: Urdhwatiryagbhayam, Nikhilam, Ekanyunen, Ekadhiken, Antyayordashakepi. (iii) Vinculum - Operations. (iv) Awareness of 1 to 5 Vedic sutras as per Shankaracharya Bharthikrishan Teerthji Swamiji's book.	8
Unit 2	(i) Division methods : Nikhilam, Paravartya Yojayet, Dhvajank(ii) GCD and LCM (iii) Expression of GCD in terms of two numbers.	8
Unit 3	(i) Divisibility tests, Osculation & Reverse osculation. (ii) Division Algorithm, Quotient & Remainder. (iii) Duplex method.	7
Unit 4	i) Squares & Square-roots for 6 digit number. (ii) Cubes & Cube-roots for 6 digit number, Contribution of Indian Mathematicians in Arithmetic.	7
	TOTAL	30 HRS

Reference Books:

1. Tirthaji B.K. (1965) Vedic Mathematics, MotilalBanarsidass
2. Bidder G.P. (1856) On Mental Calculation. Minutes of Proceedings, Institution of Civil Engineers (1855-56), 15, 251-280
3. Scripture E.W. (1891) American Journal of Psychology. Vol. IV 1-59
4. Mitchell F.D. (1907) American Journal of Psychology. Vol. XVIII 61-143
5. Aitken A.C. (1954) The Art of Mental Calculation: With Demonstrations. Transactions of the Society of Engineers. 45, 295-309
6. Dow A. (1991) A Unified Approach to Developing Intuition in Mathematics, Scientific Research on the Transcendental Meditation and TM-Sidhi Program Vol 5,3386-3398
7. Williams K.R. (1984) Discover Vedic Mathematics. Vedic Mathematics Research Group
8. Nicholas, Williams, Pickles (1984) Vertically and Crosswise. Inspiration Books

BCA SEMESTER – I

BVE1T01: ENVIRONMENTAL SCIENCE

COURSE OUTCOMES:

At the end of the course, students shall be able to:

- Explain the basics of Environmental Science and Atmospheric Science along-with the components of Environment
- Explicate the importance of Environmental Education.
- Elucidate the fundamentals of atmospheric science including formation, depletion and effects of ozone layer and acid rain on environment.
- Describe the various physical and chemical characteristics and properties of Water and Soil
- Understand the Ecology and its allied branches
- Comprehend about Population and Community Ecology
- Study the changes in Population by understanding the concept of Population ecology

Unit-I: Basics of Environmental Science (7.5 Hrs)

- A. Introduction of Environmental Science: Definition, Types, Classification, Characteristics, Components and principles of environment. Scope and need for environmental science, Multidisciplinary nature of environmental science, Environmental ethics.
- B. Environmental Education: Goals, Objectives and principles of environmental education, formal and non-formal environmental education, environmental programme, importance of environmental education, environmental awareness.
- C. Components of Environment: Atmosphere (Structure and composition), hydrosphere – distribution of water, hydrological cycle, global water balance, lithosphere – Internal structure of Earth, types of rocks, Biosphere- Boundaries of biosphere.

Unit-II: Basics of Atmospheric Science (7.5 Hrs)

- A. Atmospheric Chemistry: Structure of atmosphere based on temperature, photochemical reaction in the atmosphere, temperature inversion and lapse rate, smog formation, types of smog (sulphur and photochemical smog), adverse effect of smog on human being, aerosol.
- B. Green House Effect: Greenhouse gases, relative contribution and effects of greenhouse effect, control of greenhouse gases. Ozone depletion: chemistry of ozone depletion, Dobson Unit, ozone depleting substances (ODS), ozone hole, consequences of ozone depletion, mitigation measures and international protocols.
- C. Acid Rain: Chemistry of Acid Rain, effect of acid rain on ecosystem, control measures. Precipitation – Forms of precipitation (rain, drizzle, snow, sleet, and hail), types of precipitation (conventional, orographic, and cyclonic).

Unit-III: Basics of Ecology (7.5 Hrs)

- A. Ecology: Definition, subdivision and modern branches of ecology, ecology spectrum, scope of ecology. Application and significance of ecology to human beings.
- B. Abiotic Factors: Temperature: effect of temperature on plants and animals, Adaptation to meet extreme temperature. Light: Zonation in marine habitat, effects of light on plants and animals, Microclimate and fire, Shelford law of tolerance, Leibigs law of minimum.
- C. Biotic Factor: Inter specific relationship Positive: Mutualism (symbiosis), commensalism, proto-cooperation Negative: Parasitism, predation, competition, Antibiosis, Neutralism.

Unit-IV: Ecosystems and food chain (7.5 Hrs)

- B. Ecosystem: Definition, structure and function of ecosystem, types of ecosystem: Terrestrial (forest, grassland, desert, cropland), Aquatic (Marine and freshwater)
- C. Food chain: Definition & types: Grazing food chain, detritus food chain, and parasitic food chain, food web in forest and grassland ecosystem. Ecological pyramids (number biomass and energy), energy flow in ecosystem (Y- shaped). Energy flow and the law of thermodynamics.
- D. Biogeochemical Cycles: Definition, classification, gaseous cycle (oxygen, carbon and nitrogen) Sedimentary cycle (phosphorus and sulphur).

Reference Books:

1. Text Book of Environment: K M Agrawal, P.K. Sikdar, and S.C. Deb, Mc'Millan Publication, Mumbai.
2. Man and Environment: M.C. Dash and P.C. Mishra, Mc'Millan Publication, Mumbai.
3. Environmental Science: S.C. Santra, New Central Book Pvt.Ltd, Kolkatta.
4. Environmental Problems and Solution: D.K. Asthana, S.Chand Publication, New Delhi.
5. Environmental Chemistry: S.S. Dara, S.Chand Publication, New Delhi.
6. Environmental Chemistry: A.K. Dey, New Age International Publishers, 2001.
7. A Textbook of Environmental Studies: Dr S.Satyanarayan, Dr S.Zade, Dr S Sitre and Dr

P.U. Meshram, Allied Publishers, New Delhi.

8. Environmental Biology: Biswarup Mukherjee, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1996.
9. Animal Ecology and Distribution of Animals: Veer Bala Rastogi, Rastogi Publication, Meerut (U.P).
10. Ecology and Environment: P.D.Sharma, Rastogi Publication, Meerut (U.P).
11. Fundamentals of Environmental Biology: S. Arora, Kalyani Publishers.
12. Environmental Biology: P.K.G. Nair, Himalaya Publication.
13. Environmental Biology: K.C. Agrawal, Agro Botanical Publisher, Bikaner, 1994

SEMESTER – II


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BCA Semester-II

DSC (Paper I)

BCA2T04

PROGRAMMING IN C++

Credits : 3

Duration : 30 Hours

Course Objectives:

1. To provide basic characteristics of OOP through C++.
2. To impart skills on various kinds of overloading and inheritance.
3. To introduce pointers and file handling in C++ together with exception handling mechanism.

Course Outcomes:

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

1. Realize the need and features of OOP and idealize how C++ differs from C.
2. Infer knowledge on various types of overloading.
3. Choose suitable inheritance while proposing solution for the given problem.
4. Handle pointers and effective memory management.
5. Illustrate application of pointers in virtual functions.

UNIT I

Object Oriented Methodology: Elements of Object Oriented programming, Objects, Classes, OOPs features. **Classes & Objects:** Specifying a Class, Creating Objects, Accessing Class members, Defining member function, Outside Member Functions as inline, Accessing Member Functions within the class, Static data member, Access specifiers: private, protected and public Members.

UNIT II

Constructors & Destructors: Introduction, Parameterized Constructors, Constructor Overloading, Constructors with Default Arguments, Copy Constructor, Destructor, Order of Construction and Destruction, Static data members with Constructor and Destructors.

Operator Overloading: Definition, Overloadable Operators, Unary Operator Overloading, Unary & Binary overloading, Rules for Operators Overloading.

UNIT III

Dynamic Objects: Pointers to Objects, Creating and Deleting Dynamic Objects: New and Delete operators, Array of Objects, Array of Pointers to Objects, Pointers to Object Members, this Pointer.

Inheritance: Defining, Abstract classes, Single, Multilevel, Multiple, Hierarchical, Hybrid Inheritance, Constructor and Destructor in Derived Classes.

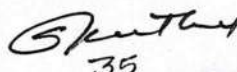
UNIT IV

Virtual Functions: Need for Virtual Functions, definition, Pure Virtual Functions, Abstract Classes, Rules for Virtual Functions.

Exception Handling: Exception Handling Model, List of Exceptions, Handling Uncaught Exceptions, Fault Tolerant Design Techniques, Memory Allocation Failure Exception, Rules for Handling Exception Successfully.

Books

1. Mastering C++ by K R Venugopal Tata McGraw-Hill, New Delhi.



2. The C++ Programming Language –Bjarne Stroustrup
3. Programming with C++ - Ravichandran
4. Programming with C++ - Robert Lafore
5. Object Oriented Programming with C++ by E. Balagurusamy, McGraw Hill

PRACTICAL LIST (BCA2P03)

- 1) Program to demonstrate, defining member functions inside outside the class.
- 2) Program to demonstrate, static data members and member functions.
- 3) Demonstrate the usage of Constructor and Destructor.
Define a class **data** with data member **acct_no, balance** containing constructor **data** to initialize data member and a member function **display** for output.
- 4) Program to demonstrate usage of a constructor and Destructor function. Declare a class with public data member **count**. The class containing one constructor and destructor to maintain updated information about active objects i.e. i) No of objects created. ii) No of objects Destroyed.
- 5) Program to accept the distance between city 1st & 2nd, city 2nd & 3rd. calculate the distance between city 1st & 3rd. Define a class **road** with private data member **km, m, d1, d2, d3** containing member function **getdata** to accept values of **d1, d2** and **calculate** for calculating distance.
- 6) Demonstrate the use of operators overloading (string manipulation: + for concatenation and relational operators for alphabetical comparison).
- 7) In a bank N depositor deposit the amount, write a program to find total amount deposited in the bank. Declare a class **deposit** with private data member **Rupee** and **Paisa** containing member function **getdata, putdata**.
 - i. Use array of objects
 - ii. Use Operator '+' overloading.
- 8) Declare class **event** and accept time of first event and second event and find the difference between 1st and 2nd event. Containing public member function **getdata** and **display** with private data member **hour, minute, second and total**.
 - i. Use Operator '-'overloading.
- 9) Program to demonstrate **Single Inheritance**. Declare a class **B** and derive publically class **D** from **B**.
 - i. The class **B** contains private data member **a**, public data member **b** with member function **get_ab, get_a, show_a**.
 - ii. The derived class **D** contains data member **c** with member function **mul** and **display**.
- 10) Program to demonstrate **Multiple Inheritances**. Declare class **M** and **N** and derive publically class **P** from **M** and **N**.
 - i. Declare a class **M** with protected data member **m** and public member function **get_m**.
 - ii. Declare a class **N** with protected data member **n** containing member function **get_n**.
 - iii. Declare class **P** containing member function **display**.
- 11) Program to demonstrate **Multilevel Inheritance**. Declare a class **student** and derive publically a class **test** and derive publically class **result** from class **test**.
 - i. The class **student** contains protected data member **roll_number** with public member functions **get_number** and **put_number**.
 - ii. The class **test** containing protected data member **sub1, sub2** with public member function **get_marks** and **put_marks**.
 - iii. The class **result** contains data member **total** and public member function **display**.
- 12) Program to demonstrate **Hierarchical Inheritance**. Declare a class **Side** and derive publically class






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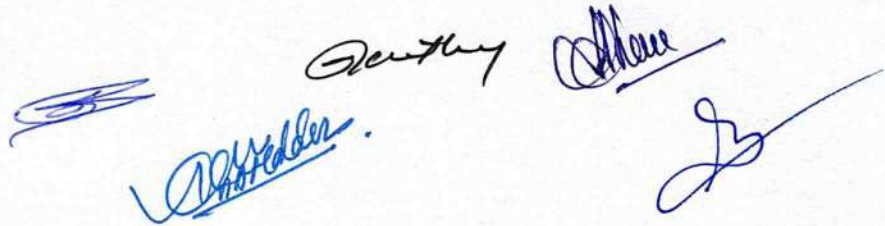




Square from base class **side** and also derive publically class **cube** from base class **side**.

- i. Class **Side** contains protected data member **L** with a member function **set_values**.
- ii. Class **Square** contains member function **sq**.
- iii. Class **Cube** contains member function **cub**.

- 13) Program to demonstrate usage of normal virtual function and pure virtual Function with abstract class.
- 14) Program to determine whether the input is +ve or -ve through exception.
- 15) Program to raise exception if an attempt is made to perform divide-by-zero.

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BCA Semester-II
DSC (Paper II)
BCA2T05

DATABASE MANAGEMENT SYSTEM

Credits: 3

Duration :30 Hours

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of database management systems (DBMS) and their role in modern information management. The course aims to develop students' skills in designing, querying, and managing relational databases.

Course Outcomes:

By the end of this course, students should be able to:

1. Understand the concepts and principles of database management systems.
2. Design and create ER diagrams and understand the concept of strong and weak entity sets.
3. Study about the relational data model.
4. Apply normalization techniques to ensure data integrity.

UNIT I:

DBMS : Definition: Databases, DBMS, Problems with traditional file processing system, Objectives of the database systems, Three level architectures of DBMS, Component of DBMS, Database Administrator, Database Users, Data model, Different types of data models, Concepts of Hierarchical, Network Models.

UNIT II:

E-R Models : Basic Concepts, Entity, Attributes, Relation Ship, Mapping, Keys, Weak and Strong Entity Set, Problems on E-R Diagrams, Extended E-R Features: Specialization, Generalization, Aggregation, Problems on Reduction of an E-R Schema to Tables, Tabular representation of Strong, Weak entity Sets and Relationship Sets.

UNIT III:

Relational Model: Structure, Relational Algebra, Fundamental Operations, Set – Intersection, Natural Join, Division and Assignment Operation. Extended Relational Algebra Operations, Aggregate Functions.

UNIT IV:

Functional Dependency: Functional Dependency, Fully Functional Dependency, Partial Dependency, Transitive Dependency, Multi Valued Dependency. Normalization, Normal Forms (1NF, 2NF, 3NF, BCNF, 4NF, 5NF). Problems on Normal forms.

Text Books:

1. Data Base System Concepts By A Silberschatz By Henry Korth And S.Sudarshan Mcgraw-Hill ltd. New Delhi 3rd Edition.
2. Introduction to Data Base Management by NAVEEN PRAKASH [Tata McGrawHill ltd.

Reference Books:

1. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications.
2. Raghu Ramakrishnan & Johannes Gerhrke, "Data Base Management Systems", Mc Graw Hill International Edition, 2000
3. Muzumdar, Introduction to Database Management Systems. TMH

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BCA Semester-II
DSC (Paper III)
BCA2T06

DATA STRUCTURES

Credits: 2

Duration :30 Hours

Course Objectives:

1. To understand basic data structures linked structures, stacks, queues, trees, and graphs
2. To understand algorithms for linked structures, stacks, queues, trees, and graphs
3. To understand the computational efficiency of the principal algorithms for sorting and searching

Course Outcomes: After completing this course satisfactorily, a student will be able to:

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
4. Demonstrate different methods for traversing trees
5. Compare alternative implementations of data structures with respect to performance
6. Describe the concept of recursion; give examples of its use
7. Discuss the computational efficiency of the principal algorithms for sorting and searching

UNIT I

Linked List: Linked List, Representation of Single, Double, Header, Circular Single and Double Linked list, All possible operations on Single and Double linked List using Dynamic representation, Polynomial Representation and its Manipulation.

UNIT II

Stacks: Stacks terminology, Representation of Stacks in Memory, Operation on Stacks, Polish Notations, Translation of infix to postfix & prefix expression, Infix to Postfix Conversion, Evaluation of Postfix Expression, Recursion, Problems on Recursion, Quick Sort and Tower of Hanoi Problem.

UNIT III

Queue: Representation of Queues in Memory, Circular Queue, Dequeue and Priority Queue. Operations of above Structure using Array and Linked Representation. **Sorting and Searching:** Selection Sort, Insertion Sort, Merge Sort, Efficiency of Sorting Methods, Big-O Notations. Hash Tables, Hashing Technique, Collision Resolution Technique.

UNIT IV

Trees: Basic Terminologies, Representation of Binary Trees in Memory, Traversing of Binary tree, Binary Search Tree, Operation on Binary Search Tree, Heap Tree, Operation on Heap Tree, Heap Sort Method
Graphs: Basic Terminologies, Definition and Representation of Graphs in Memory: Linked List and Matrix Representation. Traversing graphs: BSF, DFS Method.

Text Books

1. Classic Data Structures: D. Samanta, PHI, New Delhi.
2. Data Structure: Schaum Lipschutz, Outline Series

Reference Books

1. Data structure Using C++: Y. Kanetkar
2. Data Structures Using C++: Tanenbaum
3. Data structures by Tremblay Sorenson
4. Data structures by Bhagatsingh Naps

Practical List (BCA2P04)

- 1) Program to insert a node at the beginning of the given linked list.
- 2) Program to insert a node at the end of the given linked list.
- 3) Program to insert a node at the middle of the given linked list.
- 4) Program to delete a node at the beginning of the given linked list.
- 5) Program to delete a node at the end of the given linked list.
- 6) Program to delete a node in the middle of the given linked list.
- 7) Program to search a value in the given linked list.
- 8) Program to insert a node at the beginning, at the end and in the middle of a given double linked list.
- 9) Program to delete a node from the beginning, end and middle of a given double linked list.
- 10) Program to push and pop an element into / from a stack implemented using Array.
- 11) Program to evaluate postfix expression.
- 12) Program to sort an array using quick sort.
- 13) Program for calculating factorial of given no using Recursion
- 14) Write a Program to print n terms of Fibonacci sequence using Recursion.
- 15) Program to solve Towers of Hanoi problems using recursion.
- 16) Program to perform insertion and deletion operation in linear queues.
- 17) Program to sort an array using Selection sort.
- 18) Program to traverse inorder of a binary tree.
- 19) Program to traverse preorder of a binary tree.
- 20) Program to traverse postorder of a binary tree.

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BCA Semester-II
DSC (Paper IV)
BCA2T07
OPERATING SYSTEMS AND LINUX

Credits : 2

Duration :30 Hours

Course Objectives:

1. To introduce the Operating system concepts and designs to provide the skills required to implement the OS services.
2. To describe the trade-offs between contradictory objectives in large scale OS system design.
3. To develop the knowledge for application of the various OS design issues and services.
4. To understand structure of Linux OS and commands.

Course Outcome:

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

1. Describe the various OS functionalities, structure and layers.
2. Usage of system calls related to OS management and interpreting different stages of various process States.
3. Design CPU scheduling algorithms to meet and validate the scheduling criteria.
4. Apply and explore the communication between inter process and synchronization techniques.
5. Implement memory placement strategies, replacement algorithms related to main memory and virtual memory techniques.
6. Differentiate the file systems; file allocation, access techniques.
7. Learn the concepts to identify create and maintain the basic command in operating systems

UNIT - I:

Structure of Operating System, Operating System functions, Characteristics of Modern OS. Process Management: Process states, Creation, Termination, Operations on Process, Concurrent process, Processes Threads, Multithreading, Micro Kernels CPU Scheduling: Schedulers, Scheduling Methodology, CPU Scheduling Algorithm: FCFS, SJF, RR, Priority Scheduling.

UNIT – II:

Performance comparison : Deterministic Modeling , Queuing analysis, Simulators. Deadlock and Starvation: Resource Allocation Graph, Conditions for Dead Lock, Dead Lock Prevention, Dead Lock Detection, Recovery from Deadlock.

UNIT - III:

Memory Management: Logical Vs. Physical Address Space, Swapping, Memory Management Requirement, Dynamic Loading and Dynamic Linking, Memory Allocation Method: Single Partition allocation, Multiple Partitions, Compaction, paging, segmentation, File Management: File Management system, File Accessing Methods, File Directories, File Allocation Methods

UNIT - IV:

Anatomy of Linux OS, Directory Structure, /usr Directory, File Types: User datafiles, System data files, Executable files. Naming files and directories. Shell: Creating User Account, Shell Program, bash shell, Changing shell prompt. Commands: Basic Syntax for a command, Exploring the Home Directory, ls, kdir, rmdir, stat, cat, rm, mv, cp, Managing users accounts, Changing Password,



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Creating group accounts.

Text Books:

1. Operating Systems by P. Balakrishna Prasad [Scitech Publication]
2. Operating System Concept : Silbershaz (Addision Education)
3. SAMS Teach Yourself Linux by Craig and Coletta Witherspoon [Techmedia]

Reference Books:

1. Operating Systems - H.M. Deitel - Addision Wesley.
2. Operating Systems- John J. Donoven.
3. Operating System : A. S. Godbole (TMH)
4. Modern Operating Systems : Tenenenbaum (Pearson Education)

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BCA Semester-II
DSC (Paper V)
BCA2T08

WEB TECHNOLOGIES

Course Objectives

1. To introduce the fundamentals of Internet, and the principles of web design
2. To understand the basics of Web Designing using HTML, DHTML, and CSS.
3. To introduce the fundamentals of Internet, and the principles of web design.
4. To understand the development of webpages using DHTML
5. To build dynamic web pages with validation using Java Script event handling mechanisms.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand web application architecture and can develop basic websites using HTML and Cascading Style Sheets.

CO2. Gain skills in different programming control structures and functions for development of dynamic client-side web applications.

CO3. To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms

UNIT - I :

Introduction to Internet, History of Internet, Internet users, Internet working, Information on Internet, Requirements for connecting to Internet, Basic Internet Terms, Introduction to world wide web, Evaluation of world wide web, basic features, web browsers, popular web browsers, web servers, HTTP, URL, Search Engines, Search Engines categories, how to use Search Engines, Searching criterion.

UNIT - II :

HTML: Introduction, Objective, HTML Browsers, Windows Switching, HTML Command Tags, URLs, links, new web page creation, main body of the text, putting headers, adding paragraph, formatting text in HTML and font mechanism: Color settings, superscripts and subscripts and other manipulations on text and paragraphs, using directory and menu lists, creation of links, inserting graphics, using images, all manipulations on tables and its display, Detailed working with forms, allowing visitors to upload files, active images, working with frames & framesets, Frames handling, scroll bars, alternatives to frames.

UNIT - III:

Introduction to browsers, Working with e-mail, Parts of e-mail text, working with messages. DHTML: using DHTML in internet explorer, heading and horizontal line, hidden message, the message at the center of the page, moving boxes, changeable box.

UNIT - IV:

Cascading Style Sheets Introduction to CSS, creating style sheets, common tasks with CSS, Colors, the font family, font metrics, length units, absolute units, relative units, the pixel unit ,percentages as values, keywords as values, various properties such as the font -size property, font size property etc, Assigning classes, tags and attributes for applying classes, applying classes to an HTML tag, applying classes to other document parts ,the layer tag, CSS Tags.

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Reference Books:

1. Internet and web design by R Bangia, Second edition , firewall media
2. Multimedia and Wed technology by R Bangia
3. Internet and web designing by ITELS (Macmillan)
4. Web Enabled Commercial Application Development Using HTML, DHTML, JS, Perl by Ivan Bayross
5. Deitel, Deitel & Nieto, Internet and Worldwide Web how to Program, Pearson Education, PHI.
6. Internmet Programming with VBScript and Java Script. Kathhleen Kalata, (Thomsaon Publication)
7. Programming the World Wide Web By. Robert W. Sebesta. (Pearson)
8. Web Technology Theory and Practice By: M Srinivasan (Pearson Publication)

PRACTICAL LIST (BCA2P05)

1. Write a program in html to create Resume
2. Write a program in html to illustrate use of hyperlinks.
(Direction: it should have two pages.page1 should contain image link to page 2.
Page 2 should contain image link to page 1.)
3. Create time table with row span and colspan using table tag
4. Write a html program to create table shown below

Metals and their reasonable cutting speeds		
Material	Sterstin speed (in feet/min)	
	Material	carbride
Brass	300	600
copper	300	1000

5. Write a program in html to create registration form
6. Write a program in html to illustrate frames
(Direction: frames should divide screen both horizontally and vertically.
One frame should divide horizontally and three frames should divide vertically)
7. write program in DHTML to change heading and horizontal line on click event
8. Write program in DHTML to illustrate changeable box
9. Write program in DHTML to illustrate moving boxes

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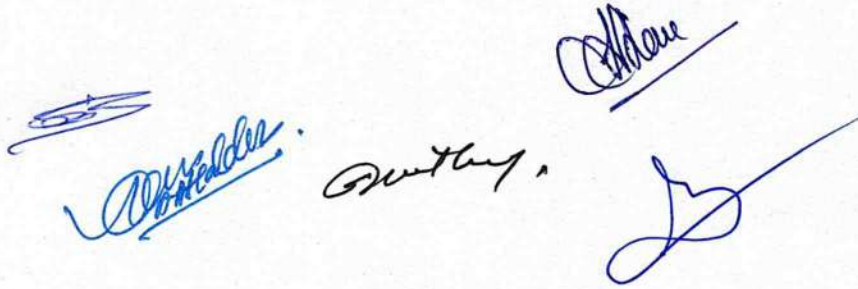
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10. Write a program in DHTML to display message exactly at the center of page
11. Write a program to explore font properties, background image and hover effect using external CSS
12. Write a program to illustrate CSS layer(z-index)
13. Write a program in CSS with multiple classes using external CSS
14. Write a program using inline CSS to display different text properties
15. Write a program to create resume using embedded CSS



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BCA Semester II
CONSTITUTION OF INDIA (BVE2T02)
Syllabus

UNIT – I:

- Historical Background to the Framing of the Indian Constitution: General Idea about the Constituent Assembly of India.

UNIT – II

- Preamble – Nature and key concepts/Constitutional values, Socialism, Secularism, Democracy, Justice, Liberty, Equality and Fraternity
- Salient Features of the Constitution of India

UNIT – III

- General study about the kinds, nature and importance of; Fundamental Rights, Directive Principles of State Policy and Fundamental Duties.

UNIT –IV

Introduction of the Constitutional Institutions and Authorities;

- Central Legislature and Executive (Parliament of India, President of India and Council of Ministers)
- State Legislature and Executive (State legislative Assemblies, Governors and Council of Ministers)
- Higher Judiciary (Supreme Court of India and High Courts)

