Rayat Shikshan Sanstha's

SADGURU GADGE MAHARAJ COLLEGE, KARAD.

(An Empowered Autonomous College)

Accredited By NAAC with 'A^{+} (3.63 CGPA)' Grade ISO- 9001-2015

Certified

Affiliated to Shivaji University, Kolhapur

Faculty of Commerce and Management

Syllabus for
Bachelor of Computer Applications (BCA)
Part I (SEM-I & II)

CBCS Course Structure to be implemented from Academic Year 2024-25
(Under NEP 2.0)
as per AICTE Model Curriculum

(Subject to the modifications that will be made from time to time)

Bachelor of Computer Applications (BCA)

CBCS Course Structure to be implemented from June 2024
Syllabus as per AICTE Model Curriculum

1. Introduction:

Bachelor of Computer Application (4years) program / degree is a specialized program in Computer Applications. It builds the student on studies in applied use of computers and to become competent in the current race and development of new computational era.

The duration of the study is of eight semesters, which is completed in four years. The program is based on Choice-Based Credit System (CBCS) comprising 176 credit points and intake for one batch is as per AICTE Norms.(i.e.60)

2. Objective:

BCA offers the prequalification for professionals heading for smart career in the IT field, which measures up to international standards. On completing this course one can do higher studies such as MCA, MBA etc., in any UGC recognized universities or in any other reputed institution in India or abroad.

3. Eligibility:

The eligibility of students taking admission at B.C.A. Part-I [Level 4.5] (initial entry) and the eligibility of students making lateral entry (Multiple Entry- ME) admission at Level 5.0/ Level 5.5/ Level 6.0 are required to be scrutinized (with stipulated procedure) on the basis of following criteria:

a. Eligibility requirements for admission to B.C.A. Part-I (Level 4.5):

Candidate should have passed standard XII (10+2) in any stream or government approved equivalent diploma in Engineering/ Technology from any recognized Board or Vocational stream.

A candidate who has completed qualifying qualification from any Foreign Board /University must obtain an equivalence certificate from Association of Indian Universities (AIU) or competent body in India.

Students should appear CET of CET Cell Govt . of Maharashtra and admission will be done as per CET Process conducted by CET Cell Govt of Maharsahta

b. Eligibility requirements for admission to B.C.A. Part-II (Level 5.0):

i. The students passing the B.C.A. Part-I (or Undergraduate Certificate in Computer Application) shall be allowed to enter upon the B.C.A. Part-II (or Undergraduate Diploma in Computer Application).

OR

ii. An Examination of any other Statutory University or an examining Body recognized as equivalent thereto.

iii. No candidate shall be allowed to appear the B.C.A. Part-II (or Undergraduate Diploma in Computer Application) Examination unless the candidate has satisfactorily kept two terms for the programme at a college affiliated to/ university department of this University or any other recognized university.

Rules of ATKT made in University time to time will be applicable.

c. Eligibility requirements for admission to B.C.A. Part-III (Level 5.5):

i. The students passing the B.C.A. Part-II (or Undergraduate Diploma in Computer Application) shall be allowed to enter upon the B.C.A. Part-III (or Three Year Undergraduate Degree in Computer Application).

OR

ii. An Examination of any other Statutory University or an examining Body recognized as equivalent thereto.

iv) No candidate shall be allowed to appear the B.C.A. Part-III (or Three- Year Undergraduate Degree in Computer Application) Examination unless the candidate has satisfactorily kept two terms for the programme at a college affiliated to/ university department of this University or any other recognized university.

Rules of ATKT made in University time to time will be applicable.

d. Eligibility requirements for admission to B.C.A. Part-IV (Level 6.0):

i. The students passing the B.C.A. Part-III (or Three-Year Undergraduate Degree in Computer Application) with 7.5 CGPA or 75% marks in Three-Year Undergraduate Degree in Computer Application shall be allowed to enter upon the B.C.A. Part-IV (or Four-Year Undergraduate Degree in Computer Application with Honors/ Honors with Research).

OR

ii. An Examination of any other Statutory University or an examiningBody recognized as equivalent there to.

No candidate shall be allowed to appear the B.C.A. Part-IV (or Four-Year Undergraduate Degree in Computer Application with Honors/ Honors with Research) Examination unless the candidate has satisfactorily kept two terms for the programme at a college affiliated to/ university department of this University or any other recognized university.

Rules of ATKT made in University time to time will be applicable.

Eligibility Application requirement:

(a) Students who are seeking admission for Level 4.5 need to apply for eligibility.

(b) Students who are not taking any exit from the programme at any level and students re-entering after taking exit, need not require to make application for eligibility at Level 5.0, 5.5 and 6.0.

(c) However, students from other university who wish to seek admission for any level of undergraduate degree need to apply for eligibility.

Rules for Multiple Exit:

a) If a student wishes to exit after completion of Level 4.5, he/she has to complete additional four credit skill course/ internship.

b) If a student wishes to exit after completion of Level 5.0, he/she has to complete additional four credit skill course/ internship.

c) If a student wishes to exit after completion of Level 5.5, he/she need not require to complete any additional skill course/ internship.

4. PEO, PO and CO Mappings:

Program Educational Outcomes: After completion of this program, the graduates /students would:

PEO I	Technical Expertise	Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning.
PEO II	Successful Career	Deliver professional services with updated technologies in Computer application based career.
PEO III	Interdisciplinary and Life Long Learning	Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession. Undergo higher studies, certifications and technology research as per market needs.

Program Outcomes (PO's):- After completion of program Students /graduates will be able to:

PO1: Apply knowledge of ICT in solving business problems.
PO2: Learn various programming languages and custom software. **PO3:** Design component, or processes to meet the needs withinrealistic constraints.
PO4: Identify, formulate, and solve problems using computationaltemperaments.
PO5: Comprehend professional and ethical responsibility incomputing profession.
PO6: Express effective communication skills.
PO7: Recognize the need for interdisciplinary, and an ability to engage in life-long learning.
PO8: Knowledge of contemporary issues and emerging developments incomputing profession.
PO9: Utilize the techniques, skills and modern tools, for actual developmentprocess.

Course Outcome(s): Every individual course under this program has course outcomes (CO). The course outcomes rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustrated below:

Program Educational Objectives	Thrust Area	Program Outcome	Course Outcome
PEO I	Technical Expertise	PO1,PO2,PO3,PO9	All Core and Lab courses
PEO II	Successful Career	PO4,PO5,PO6	All AEC courses
PEO III	Interdisciplinary and Life Long Learning	PO7,PO8	All Electives

5. **Workload (Period/Lectures for each Course):** For every semester 60 periods (60 minutes per period) are allotted to complete the syllabus of each Course of four credit.(Subject).

6. **Standard of Passing:** Rules extended by University regarding ATKT will be applicable.

Gradation Chart:

Marks obtained	Numerical Grade (Grade Point)	CGPA	Letter Grade
Absent	0(Zero)		
<40	0 to 4	0.0 to 3.99	Fail
40-50	5	4.00 to 4.99	C
5 -60	6	5.00 to 5.99	B
6 -70	7	6.00 to 6.99	B+
7 -80	8	7.00 to 7.99	A
8 -90	9	8.00 to 8.99	A+
91-100	10	9.00 to 10.00	O(outstanding)

Note: i) Marks obtained > = 0.5 shall be rounded off to next higher digit.
ii) The SGPA & CGPA shall be rounded off to 2 decimal points.

Calculation of SGPA & CGPA

1. Semester Grade Point Average (SGPA) SGPA = Course credits x Grade Points obtained of a semester Course credits of respective semester

2. Cumulative Grade Point Average (CGPA) CGPA = Total credits of a semester x SGPA of respective semester of all semesters Total course creditsof all semesters

7. **Re-entry or Lateral Entry:** Students, opting for exits at any level, will have the option to re-enter the programme as per AICTE New Delhi Guidelines and Shivaji University, Kolhapur based on intake capacity.

Semester, NSQF Level and Exit Points

Sr. No.	Semester	Year	Year	Credits	Level	Exit Points& Award
1	Sem. I & II	2024-25	1 Year	44	4.5	UG Certificate (One Year or Two Semester)
2	Sem. III & IV	2025-26	2 Year	88	5.0	UG Diploma (Two Year or Four Semester)
3	Sem. V & VI	2026-27	3 Year	132	5.5	Bachelor of Computer Applications (Three Year or Six Semester)
4	Sem. VII & VIII	2027-28	4 Year	176	6.0	Bachelor of Computer Applications with Honours (Four Year or Eight Semester)
5	Sem. VII & VIII	2027-28	4 Year	176	6.0	Bachelor of Computer Applications with Research (Four Year or Eight Semester)

8. Nature of Theory Question paper:

a) Nature of question paper is as follows for 80 Marks University end semester examination

QUESTION PAPER PATTERN 80 MARKS

Duration: 3 Hours Total Marks – 80

Instructions: 1) Que.1 and Que. 8 are compulsory.
2) Attempt any FOUR questions from Que. No.2 to Que. No. 7.
3) Figures to the right indicate marks.

Qu.1)

A. Multiple Choice Questions (10 questions for 1 mark each) 10 MARKS

B. Give Reasons or Short answer question (Any two out of three) 10 MARKS

Qu.2) Broad answer question	10 MARKS
Qu.3) Broad answer question	10 MARKS
Qu.4) Broad answer question	10 MARKS
Qu.5) Broad answer question	10 MARKS
Qu.6) Broad answer question	10 MARKS
Qu.7) Broad answer question	10 MARKS
Qu.8) Write notes on (Any Four out of Six)	20 MARKS

b) Nature of question paper is as follows for 60 Marks University end semester Examination

QUESTION PAPER PATTERN 60 MARKS

Duration: 2 Hours Total Marks –60

Instructions: 1) Que.1 and Que. 7 are compulsory.
2) Attempt any THREE questions from Que. No.2 to Que. No. 6.
3) Figures to the right indicate marks.

Qu.1) Multiple Choice Questions (10 questions for 1 mark each)	10 MARKS
Qu.2) Broad answer question	10 MARKS
Qu.3) Broad answer question	10 MARKS
Qu.4) Broad answer question	10 MARKS
Qu.5) Broad answer question	10 MARKS
Qu.6) Broad answer question	10 MARKS
Qu.7) Write notes on (Any Four out of Six)	20 MARKS

c) Nature of question paper is as follows for 40 Marks University end semester Examination

QUESTION PAPER PATTERN 40 MARKS

Duration: 1.5 Hours Total Marks –40

Instructions: 1) Que.1 and Que. 6 are compulsory.
2) Attempt any TWO questions from Que. No.2 to Que. No. 5.
3) Figures to the right indicate marks.

Qu.1) Multiple Choice Questions (10 questions for 1 mark each)	10 MARKS
Qu.2) Broad answer question	10 MARKS
Qu.3) Broad answer question	10 MARKS
Qu.4) Broad answer question	10 MARKS
Qu.5) Broad answer question	10 MARKS
Qu.6) Write notes on (Any TWO out of FOUR)	10 MARKS

d) Nature of question paper is as follows for 30 Marks University end semester Examination

QUESTION PAPER PATTERN 30 MARKS

Duration: 1.5 Hour Total Marks–30

Instructions: 1) All questions are compulsory
2) Figures to the right indicate marks.

Qu.1) Broad question/case study/Exercise Example/Quantitative problems 10 MARKS
OR
Qu. 1) Broad question/case study/Exercise Example/Quantitative problems 10 MARKS

Qu.2) Write Short answer question/Exercise/Problem (Any TWO out of FOUR) 10 MARKS
i)
ii)
iii)
iv)

Qu.3) Write short notes (Any TWO out of FOUR) 10 MARKSi)
ii)
iii)
iv)

9. Nature of Practical Question Paper:

a) Nature of Practical question paper for 50 Marks University end semester Examination- There will be three questions of 15 Marks each, out of which student have to attempt any two Questions and 10 marks for journal and 10 marks for oral and time duration is two hours.

b) Nature of Practical question paper for 25 Marks University end semester Examination- There will be two questions of 15 Marks each, out of which student have to attempt any one Question and 5 marks for journal and 5 marks for oral and time duration is 1.5 hours.

Practical Examination conducted by the University appointed examiner panel. The panel members have more than five years' experience as full time teacher.

10. Medium of Instruction: The medium of instructions shall be in English.

11. Teachers Qualification: As per AICTE Norms.

12. Internal Marks Distribution

For 20 Marks

1 Ten Marks for Mid Tests.
2 Five Marks for presentation or activity based learning or Group exercise (Number of students in Group are not more than six).
3 Five Marks for Assignments.
(The record of internal submission by the students should be maintain by higher educational institute for the examination of university authority if required)

For 15 Marks

1 Five Marks for Mid Tests.
2 Five Marks for presentation or activity based learning or Groupexercise (Number of students in Group are not more than six).
3 Five Marks for Assignments.

The record of internal submission by the students should be maintain by higher educational institute for the examination of university authority if required)

For 10 Marks

1 Five Marks for Mid Tests.
2 Five Marks for Assignments / presentation or activity based learning/ Group exercise (Number of students in Group are not more than six)/ Laboratory work/ Library work
(The record of internal submission by the students should be maintain by higher educational institute for the examination of university authority if required)

13. Major Software Development Project/ Internship Project:

The Objective of major project is to design and develop the live application with current technology to be used in various industries. The Group size of maximum three students can undertake major project. Project Viva-Voce Examination will be conducted by the University appointed examiner panel. The panel members have more than fiveyears' experience as full time teacher. The chairman for viva voce committee will be faculty having more than ten years experience as full time faculty.

14. Fee Structure: As per Govt. of Maharashtra norms.

15. Requirements:

i) Core Faculty: As per AICTE Norms
ii) Computer Lab and Internet: As per AICTE Norms*
iii) Library (Books and Journals) : As per AICTE Norms*
iv) Class Room and Physical Infrastructure: As per AICTE Norms*
v) Nonteaching: One clerk, two peons and two lab assistants for one division and will be increased in proportion to number of divisions.

*Refer AICTE Process Manual 2024-27

Pattern of B.C.A. Programme

Combination of internal assessment and Semester- End Examination for B.C.A will be 40:10 pattern which shall be applicable for each course of 2 credits and 80:20 pattern shall be applicable for each course of 4 credits. Here, each course in each semester wherein 8 0% marks shall be for University Semester-End-Examination and 2 0% marks for internal assessment.

Credits	External	Internal	Total
For 4 Credit	80	20	100
For 3 redit	60	15	75
For 2 Credit	40/30	10/20	50
For 2 Credit Practicals	50	-	50

1. Standard of Passing

There would be separate head of passing. For university written examination and institution internal evaluation 40% of total marks separately have to be secured by student per course i.e. Passing Standard = Total Passing 40 % out of 100 (40% Theory and 40 % Internal Examination Separately)

2. Weightage

Category wise Distribution

Semester	Core Courses	Ability Enhancement Courses	Multi-Disciplinary Elective course	Value added Courses	Skill Enhancement courses	Discipline Specific Elective	Total
I	9	4	2	2	5	-	22
II	12	0	0	2	8	-	22
III	11	0	0	1	4	6	22
IV	14	0	0	0	2	6	22
V	0	0	0	0	7	15	22
VI	6	2	0	0	4	10	22
BCA (Honours)							
VII	5	0	3	0	4	10	22
VIII					8	14	22
BCA (Honours with Research)							
VII	12					10	22
VIII	22						22

There shall be Three Year B. C.A. Programme with 132 credits. The candidate who wishes to attempt for Four-Year B.C.A. (Honours/ Research) may opt for 4th year which will have 44 credits. Hence, Four Year B.C.A. Programme will require 176 credits.

Credit Distribution Chart for B.C.A. Programme

SEMESTER-WISE CREDIT DISTRIBUTION

Category-wise distribution*

Description	Core Courses	Ability Enhancement Courses	Multi Disciplinary Elective course	Value added Courses	Skill Enhancement courses	Discipline Specific Elective	Total
BCA	52	6	2	5	30	37	132
BCA (Hon ours)	57	6	5	5	42	61	176
BCA (Hon ours with Research)	86	6	2	5	30	47	176

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

INDUCTION PROGRAM

The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program', as available on AICTE Portal, (Link:https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf). For more, Refer

Induction program (mandatory)	**Three-week duration**
Induction program for students to be offered right at the start of the first year.	• Physical activity • Creative Arts • Universal Human Values • Literary • 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 one industrial visit every semester for the studentsof each branch.
2. It is mandatory to conduct a One-week workshop during the winter break afterfifth semester on professional/ industry/ entrepreneurial orientation.
3. It is mandatory to organize at least one expert lecture per semester for eachbranch by inviting resource persons 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-1: *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.*

Note-2: College/Institute should conduct bridge courses on proficiency modules on Mathematics, Computer Architecture and Computer fundamentals.

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Course in BCA SEMESTER I

S. No.	Course Code	Course Title	L	T	P	Credits	Theory			Pratical
							Internal	External	Total	
1	CC101	Mathematics Foundations to Computer Science - I	4	0	0	4	20	80	100	
2	SEC101	Problem Solving Techniques	3	0	4	5	15	60	75	50
3	CC102	Computer Architecture	3	0	4	5	15	60	75	50
4	AEC101	General English - I	1	1	0	2	10	40	50	
5	MDE101	Indian Vision for Human Society	2	0	0	2	20	30	50	
6	VAC101	Environmental Science and sustainability	2	0	0	2	20	30	50	
7	AEC102	Marathi/Hindi/Sanskrit/ German/Japanese/Russia n-Paper-I	1	1	0	2	10	40	50	
TOTAL						**22**			**450**	**100**
Total Marks										**550**

SEMESTER II

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Interl	External	Total	
1	CC103	Mathematics Foundations to Computer Science-II	4	0	0	4	20	80	100	
2	CC104	Data Structures	4	0	4	6	20	80	100	50
3	CC105	Operating Systems	2	0	0	2	10	40	50	
4	SEC102	Object Oriented Programming using Java	4	0	4	6	20	80	100	50
5	SEC103	Web Technologies	1	0	2	2	-	-	-	50
6	VAC102	Indian Constitution	2	0	0	2	20	30	50	
TOTAL						**22**			**400**	**150**
										550

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 Application (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. (Tally, NPTEL- Certificate)

Following courses should completed

2. **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. (as per Shivaji University On Job Training (OJT) Policy).
3. **Social Responsibility & Community Engagement**: Active engagement with an NGO or community organization for a minimum duration of 08 weeks, focusing onreal-world problem-solving, social responsibility, and community service.

The mode and specifics of these additional credits will be determined by the Shivaji **University** 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 Shivaji University NEP Regulations after earning requisite credits in the First year.

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

SEMESTER III

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	Theory		
1	CC201	Probability and Statistics	4	0	0	4	20	80	100	
2	CC202	Data Base Management System	3	0	2	4	10	40	50	50
3	SEC201	Python Programming	3	0	2	4	10	40	50	50
4	CC203	Software Engineering	3	0	0	3	15	60	75	
5	DSE201*	Professional Elective-I	4	0	4	6	20	80	100	50
6	VAC201	Yoga/Sports/NCC/NSS/Disaster Management/ VivekVahini	0	0	2	1	20	30	50	
TOTAL						**22**			**425**	**150**
Total Marks										**575**

* To be selected from the Proposed Streams with Discipline-Specific Electives - Data Science / Artificial Intelligence and Machine Learning / Full Stack Development proposed by Universities as indicated at the appendix - I

SEMESTER IV

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	External	Total	
1	CC204	Relational Database Management System(RDBMS)	1		2	2				50
2	CC205	Computer Networks	3	0	0	3	15	60	75	
3	CC206	Design and Analysis of Algorithm	3	0	0	3	15	60	75	
4	CC207	Artificial Intelligence	4	0	4	6	20	80	100	50
5	DSE202*	Professional Elective-II	4	0	4	6	20	80	100	50
6	SEC202	Design Thinking and Innovation	1	1	0	2	20	30	50	
TOTAL						**22**		**150**	**400**	**150**
										550

Note:

1. At the end of the Fourth Semester every student shall undergo Summer Training / Internship / Capstone for Eight Weeks in the industry/Research or Academic Institute. This component will be evaluated during the fifth semester.
2. An **UNDER GRADUATE DIPLOMA IN COMPUTER APPLICATION** will be awarded, if a student wishes to exit at the end of Second year.

Exit Criteria after Second Year of BCA Programme

Students will have the option to exit the Bachelor of Computer Application (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 specific mode of completing the additional credits will be decided by the respective **University/Admitting Body**, 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.

SEMESTER V

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	External	Total	
1	DSE301*	Professional Elective-III	3	0	4	5	15	60	75	50
2	DSE302*	Professional Elective-IV	3	0	4	5	15	60	75	50
3	DSE303*	Professional Elective-V	3	0	4	5	15	60	75	50
4	SEC301	Quantitative Techniques	1	2	0	3	15	60	75	
5	SEC302	Internship/capstone Project	0	0	8	4	20	80		100
6	SEC303	Major Project [evaluation in sixth semester]	-	- -		0				
TOTAL						**22**			**300**	**250**
Total Marks										**550**

SEMESTER VI

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	External	Total	
1	CC301	Generative AI	2	0	4	4	10	40	50	50
2	CC302	Entrepreneurship and Startup Ecosystem	1	1	0	2	10	40	50	
3	DSE304*	Professional Elective-VI	3	0	4	5	15	60	75	50
4	DSE305*	Professional Elective-VII	3	0	4	5	15	60	75	50
5	AEC301 S	t Skills	2	0	0	2	10	40	50	
6	SEC304	Major Project [Initiated in 5th Semester]	0	0	8	4	20	80		100
TOTAL						**22**			**300**	**250**
Total Marks										**550**

1. 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.

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

1. **BCA (Honours with Research):** BCA Degree
2. **For BCA (Honours)**: BCA Degree

SEMESTER VII - (BCA (Honours))
Specialization-AI & ML

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	External	Total	
1	MDE401	Social Network Analysis	3	-	-	3	15	60	75	-
2	CC401	Optimization of ML	3	-	4	5	15	60	75	50
3	DSE401*	Professional Elective-VIII	3	-	4	5	15	60	75	50
4	DSE402*	Professional Elective-IX	3	-	4	5	15	60	75	50
5	SEC401	Dissertation work [evaluation in Eight semester]	-	-	-	-				
6	SEC402	Summer Internship II	0	0	8	4	25	75		100
TOTAL						**22**			**300**	**250**
Total Marks										**550**

SEMESTER VIII - (BCA (Honours))

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	External	Total	
1	DSE403*	Professional Elective-X	3	-	4	5	15	60	75	50
2	DSE404*	Professional Elective-XI	3	-	4	5	15	60	75	50
3	DSE405*	Professional Elective-XII	3	-	2	4	15	60	75	25
4	SEC403	Dissertation work [Started in Seventh semester]	0	0	16	8	50	150		200
TOTAL						**22**			**225**	**325**
Total Marks										**550**

SEMESTER VII - (BCA-(Honours with Research))

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	External	Total	
1	CC401	Advanced Data Analysis Tools	3	-	2	4	15	60	75	25
2	CC402	Research Methodology	4	-	0	4	20	80	100	
3	CC403	Research Internship Report and Viva-Voce	0	0	8	4	20	80		100
4	DSEXX	Professional Elective-IX	4	-	2	5	15	60	75	50
5	DSEXX	Professional Elective-X	4	-	2	5	15	60	75	50
		Total				**22**			**325**	**225**
										550

SEMESTER VIII- (BCA-(Honours with Research))

S. No.	Course Code	Course Title	L	T	P	Credit	Int	Ext.	Total
1	SEC401	Dissertation (For Research Track)*	-	-	-	22	150	400	550
TOTAL						**22**			**550**

*****The Dissertation work will start from the beginning of fourth year of BCA (Honours 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

Note: The following is indicative. Universities/Institutes may add streams / electives asper their specific requirements.

1. Data Science

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE*201	Basics of Data Analytics using Spreadsheet
2	IV	DSE*202	Data Visualization
3	V	DSE301	Introduction to Data Science
4	V	DSE302	Time Series Analysis
5	V	DSE303	Machine Learning
6	VI	DSE304	Big Data Analytics
7	VI	DSE305	Exploratory Data Analysis
8	VII	DSE401	Business Intelligence & Analytics
9	VII	DSE402	Data Mining & Warehousing
10	VIII	DSE403	Advanced Data Visualization
11	VIII	DSE404	Cloud Computing for Data Analytics
12	VIII	DSE405	Data Security & Privacy

2. Artificial Intelligence & Machine Learning

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE*201	Feature Engineering
2	IV	DSE*202	Introduction to ML
3	V	DSE301	Neural Network
4	V	DSE302	Digital Image Processing
5	V	DSE303	Natural Language Processing
6	VI	DSE304	Deep Learning for Computer Vision
7	VI	DSE305	Predictive Analysis
8	VII	DSE401	Explainable AI
9	VII	DSE402	Evolutionary Algorithm
10	VIII	DSE403	Speech Recognition
11	VIII	DSE404	Augmented Reality & Virtual Reality
12	VIII	DSE405	Security aspects of ML

3. Full Stack Development

Sl.No	Semester	Course Code	Professional Elective
1	III	DSE*201	Web Programming –I
2	IV	DSE*202	Web Programming –II
3	V	DSE301	Web Programming –III
4	V	DSE302	Web Programming –IV
5	V	DSE303	Web Programming –V
6	VI	DSE304	Web Programming –VI
7	VI	DSE305	Web Programming -VII
8	VII	DSE401	Web Programming -VIII
9	VII	DSE402	Web Programming –IX
10	VIII	DSE403	Web Programming –X
11	VIII	DSE404	Web Programming –XI
12	VIII	DSE405	Web Programming –XII

(Note: Subject titles of Full Stack Development will be declared at the beginning of Semester-III)

SEMESTER –I

BCA-I-Sem-I(NEP 2.0)

MATHEMATICS FOUNDATION TO COMPUTER SCIENCE - Is

BCA24-CC101

Course Outcomes	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 analyzeand understand problems in computer science. CO3: This course demonstrates how the mathematical principles give succinct abstraction ofcomputer science problems and help them to efficiently analyze.

Total Hours of Teaching : 60	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 4**
	4	**0**	**0**	**4**	
Total Marks :100	**External Exam Theory : 80**				**Internal : 20**

Syllabus Contents:

Unit: I	**Set, Relation and Function:** Set, Set Operations, Properties of Set operations, Subset, Venn Diagrams, Cartesian Products. Relations on a Set, Properties of Relations, Representing Relations using matrices and digraphs, Types of Relations, Equivalence Relation, Equivalence relation and partition on set, Closures ofRelations. Functions, properties of functions (domain, range), composition of functions, surjective (onto), injective (one-to-one) and bijective functions, inverse of functions. Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor functions.	15 Hours
Unit: II	**Counting and Recurrence Relation:** Basics of counting, Pigeonhole principle, permutation, combination, Binomial coefficients, Binomial theorem. Recurrence relations, modelling recurrence relations with examples like Fibonacci numbers the tower of Hanoi problem	15 Hours
Unit: III	**Elementary Graph Theory:** Basic terminologies of graphs, connected and disconnected graphs, subgraph, paths and cycles,complete graphs, digraphs, weighted graphs, Euler and Hamiltonian graphs	15 Hours
Unit-IV	**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, inverse of a matrix	15 Hours
Text Books:	1. Garg, Reena, Engineering Mathematics, Khanna Book Publishing Company, 2024.(AICTE Recommended Textbook) 2. Garg, Reena, Advanced Engineering Mathematics, Khanna Book Publishing Company,2023. 3. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition,Pearson Education, 2015. 4. Deo Narsingh, Graph Theory with Application to Engineering and Computer Science,Prentice Hall, India, 1979.	

	5. Vasishtha A. R. and Vasishtha A. K., Matrices, Krishna Prakashan, 2022.
Reference Books:	1. Grimaldi Ralph P. and Ramana B. V., Discrete and Combinatorial Mathematics: AnApplied Introduction, Fifth Edition, Pearson Education, 2007. 2. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications,McGraw Hill, India, 2019. 3. West Douglas B., Introduction to Graph Theory, Second Edition, Pearson Education,2015
Web Resources	1. https://nptel.ac.in/courses/106103205 2. https://nptel.ac.in/courses/111101115

BCA-I-Sem-I(NEP 2.0)

PROBLEM SOLVING TECHNIQUES

BCA24-SEC101

Course Objectives	CO1: Understand basic terminology of computers, problem solving, programming Languages and their evolution (Understand) CO2: Create specification from problem requirements by asking questions to disambiguate the requirement statement. (Create) CO3: Design the solution from specification of a problem and write pseudo code of the algorithm using basic building blocks or structured programming constructs (Sequence, Selection and Repetition statement). (Create) CO4: Translate an algorithm into a C computer program (Create) CO5: Testing and analyzing programs using debugging tools. (Analyze)

Total Hours of Teaching : 45	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 5**
	3	**0**	**4**	**5**	
Total Marks :75	**External Exam Theory : 60**				**Internal : 15**
Practical 50	**External Exam. Practical:50**				

Syllabus Contents:

Unit: I	**(CO-1,CO-2)** Problems And Problem Instances, Generalization and Special Cases, Types of Computational Problems, Classification of Problems, Analysis of Problems, Solution Approaches, Algorithm Development, Analysis of Algorithm, Efficiency, Correctness, Role of Data Structures in Problem Solving, Problem-Solving Steps (Understand the Problem, Plan, Execute, And Review),Breaking the Problem into Sub problems Input / Output Specification, Input Validation, Pre and Post Conditions.	12 Hours
Unit: II	*(CO-2,CO-3, CO-4)* Structured Programming Concepts: Sequence (Input/Output/Assignment), Selection (If, If-Else) And Repetition (For, While, Do-While) Statements, Control Structure Stacking and Nesting. Different Kinds of Repetitions :	11 Hours

	Entry Controlled, Exit Controlled, Counter Controlled, Definite, Indefinite and Sentinel-Controlled Repetitions. Pseudocode and Flowcharts. Definition And Characteristics of Algorithms, Standard Algorithm Format. Problems Involving Iteration and Nesting: Displaying Different Patterns and Shapes Using Symbols and Numbers, Generating Arithmetic and Geometric Progression, Fibonacci and Other Sequences,. Different Kinds of Data in The Real World and How They are Represented in The Computer Memory. Representation of Integers: Signed Magnitude Form, 1's Complement And 2's Complement. Representation of Real Numbers: IEEE 754 Floating Point Representation. Representation of Characters: ASCII, UNICODE. C Language : Introduction To Programming Languages, Different Generations of Programming Languages. Typed Vs Typeless Programming Languages, History of C Language ,An Empty C Program. C Language Counterparts For Input (scanf()), Output (printf()) Statements, Assignment, Arithmetic, Relational and Logical Operators. If, If-Else Statements, For, While, Do-While Statements. Data Types. Translating Pseudocode/Algorithm to C Program. Incremental Compilation and Testing of The C Program. Simple Problems Involving Input, Output, Assignment Statement, Selection and Repetition. Good Coding Practices.	
Unit: III	(CO-2,CO-3,CO-4) Problems on Numbers: Extracting Digits of a Number (Left to Right and Right to Left), Palindrome, Prime Number, Prime Factors, Amicable Number, Perfect Number, Armstrong Number, Factorial, Converting Number from One Base to Another. Statistics (Maximum, Minimum, Sum and Average) on a Sequence of Numbers which are Read using Sentinel- Controlled Repetition using only a few Variables. C Language: else-if Ladder, switch Case, Increment/Decrement Operators, break and continue Statements	11 Hours
Unit-IV	*(CO-2,CO-3, CO-4,CO-5)* Modular Programming, Top- Down and Bottom-Up Approaches to Problem Solving. Recursion. Problems on Arrays: Reading and Writing of Array Elements, Maximum, Minimum, Sum, Average, Median and Mode. Sequential And Binary Search. Anyone Sorting Algorithm. Matrix Operations. C Language: Function Definition and Declaration (Prototype), Role of Return Statement, One Dimensional and Two-Dimensional Arrays. String Functions Other Operators, Operator Precedence and Associativity. Debugging	11 Hours
Text Books:	1. Venkatesh, Nagaraju Y, Practical C Programming for Problem Solving, Khanna Book Publishing Company, 2024. 2. AICTE's Programming for Problem Solving (with Lab Manual),Khanna Book Publishing Company, 2024. 3. Harvey Deiteland Paul Deitel, C How to Program,9 th edition,Pearson India,2015. 4. R G Dromey, How to Solve It by Computer.	
Reference Books:	1. Brian W. Kernighanand Dennis Ritchie,The C Programming Language,2 nd edition,Pearson,2015. 2. Jeri Hanly and Elliot Koffman, Problem Solving and Program Design in C, 8 th edition, Pearson, 2015.	

BCA24-SECP101-Problem Solving Techniques: Lab Problems

UNIT-II

1. Converting degrees Celsius to Fahrenheit and vice versa?
2. Display three input numbers in sorted (non-decreasing) order?
3. Given a positive integer value n (>= 0) display number, square and cube ofnumbers from 1 to n in a tabular format?
4. Given an input positive integer number, display odd numbers from in therange[1,n]?
5. Display first mathematical tables, each table up to 10 rows? Generalise this todisplayfirst n (> 0) mathematical tables up to m (m > 0) rows?
6. Display following patterns of n rows (n > 0), For the below examples n = 5?Foreach pattern write a separate algorithm/program?

$ $$ $$$ $$$$ $$$$$	$ $$ $$$ $$$$ $$$$$	12345 1234 123 12 1	12345 1234 123 12 1

7. Display the following patterns of n rows (n > 0), for the below examples n = 5?

Hollow square pattern:	Triangle Patterns with numbers:	Square with diagonals:	Diamond Pattern
##### # # # # # # #####	1 121 12321 1234321 123454321	* * * * * * * * * * * * * * * * * * * * *	* *** ***** *** *

8. Given the first term (a), difference/multiplier (d) and number of terms (n > 0),display the first n terms of the arithmetic/geometric progression?
9. Display the first n (n > 0) terms of the fibonacci sequence?
10. Display the first n (n > 0) terms of the Tribonacci sequence?
11. Given two positive integer numbers n1 and n2 check if the numbers areconsecutive numbers of the fibonacci sequence?
12. Compute approximate value of π considering first n (n > 0) terms of theTaylor series for π?
13. Compute approximate value of e^x considering first n (n > 0) terms of theTaylor series for e^x?
14. Compute approximate value of sin(x)/cos(x) considering first n (n > 0) terms of theTaylor series for sin(x)/cos(x)?

UNIT-III

1. Extract digits of an integer number (left to right and right to left)?
2. Given a sequence of digits form the number composed of the digits. Use sentinel controlled repetition to read the digits followed by -1. For example, forthe input 2 7 32 9 -1 the output number is 27329?
3. Check if a given positive integer number is a palindrome or not?
4. Compute character grade from the marks (0≤marks≤100) of a subject. Grading Scheme: 80-100 : A, 60 - 79: B, 50 - 59: C, 40-49: D, 0-39: F? Solve this using both else-if ladder and switch case?
5. Compute the sum of a sequence of numbers entered using sentinel controlled repetition?
6. Check if a given positive integer number is a prime number or not?
7. Compute prime factors of a positive integer number?
8. Check if two positive integer numbers are amicable numbers or not?
9. Check if a given positive integer number is a perfect number or not?
10. Check if a given positive integer number Armstrong number or not?
11. Converting a positive integer number (n > 0) from one base (inputBase) to another base (outputBase) (2 <= input Base, outputBase <= 10). Input number should be validated before converting to make sure the number uses only digits allowed in the input base?
12. Write a program to display a number in text form. For example If the number is 5432the output should be “FIVE FOUR THREE TWO”?
13. Using the grading scheme described in the question 4 (UNIT III), Compute how many students awarded each grade and display the frequency as a bar chart (horizontal) using single “*” for each student. Use sentinel controlled repetition (-1 as sentinel value) in reading the students marks. Use else-if ladder/switch case to compute the grade and the corresponding frequency.

    Sample bar chart when the class has 7-A, 10-B, 3-C, 7-D and 1-F grades.

    A:
    ****
    B:
    ****
    C: ***
    D:
    ****
    F: *
14. Compute maximum, minimum, sum and average of a sequence of numbers which areread using sentinel controlled repetition using only few variables?
15. Compute body mass index, BMI = weightinKGs / (HeightinMeters *HeightinMeters), Both weight and height values are positive real numbers. Your program should display BMI value followed by whether the person is Underweight, Normal, Overweight or Obese using the below ranges:

    BMI Values
    Underweight: less than
    18.5Normal: >=18.5 and

<25
Overweight: >=25 and < 30
Obese: >= 30

UNIT IV

1. Design a modularized algorithm/program to check if a given positive integer numberis a circular prime or not?
2. Design a modularized algorithm/program to compute a maximum of 8 numbers?
3. Design a modular algorithm/program which reads an array of n integer elements andoutputs mean (average), range (max-min) and mode (most frequent elements)?
4. Design a modular algorithm/program which reads an array of n integer elements andoutputs median?
5. Implement your own string length and string reversal functions?
6. Design algorithm/program to perform matrix operations addition, subtractionand transpose?
7. Write a recursive program to count the number of digits of a positive integernumber?
8. Recursive solutions for the following problems:
   a. Factorial of a number?
   b. Display digits of a number from left to right (and right to left)?
   c. Compute x^y using only multiplication?
   d. To print a sequence of numbers entered using sentinel controlledrepetition inreverse order?

BCA-I-Sem-I(NEP 2.0)
COMPUTER ARCHITECTURE
BCA24-CC102

Course Outcomes	After Completion of course student will be able to :- CO1: To Understand the basics of Digital Electronics and Binary Number System CO2: To Learn the implementation of Combinational Circuit. CO3: To Learn the implementation of Sequential Circuit. CO4: To Understand the Organization of basic computers and concept of memory organization

Total Hours of Teaching : 45	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 05**
	3	**0**	**4**	**5**	
Total Marks :75	**External Exam Theory : 60**				**Internal : 15**
Practical 50	**External Exam. Practical:50**				

Syllabus Contents:

Unit: I	Digital Principles: Definition for Digital signals, Digital logic, Boolean Laws and Theorems, K-Map: Truth Tables to K-Map, 2, 3 and 4 variable K Map, K-Map Simplifications, Don't Care Conditions, SOP and POS	12 Hours
Unit: II	**Number Systems:** Decimal, Binary, Octal, Hexadecimal, Number System Conversions Binary Arithmetic, Addition and subtraction of BCD, Octal Arithmetic, Hexadecimal Arithmetic, Binary Codes, Decimal Codes, Error detecting and correcting codes, Excess-3 Code, The Gray Code	11 Hours

Unit: III	**Combinational Circuits:**Half Adder and Full Adder, Subtractor, Decoders, Encoder,Multiplexer, Demultiplexer. Sequential Circuits: Flip-Flops- SR Flip- Flop, D Flip-Flop, J-K Flip-Flop, T Flip Flop. Register: 4 bit register with parallel load, Shift Registers- Bidirectional shift register with parallel load. Binary Counters-4 bit synchronous and Asynchronous binary counter	11 Hours
Unit-IV	Basic computer functions and interconnections- Computer components, compute function, instruction fetch and execute, interrupts, I/O functions. Interconnection structures – Bus interconnections, point to point interconnect. , Compute r Registers- Types of registers: Program Counter (PC), Accumulator (AC) Instruction Register (IR). Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory, Virtual Memory, Memory Management Hardware.	11 Hours
Text Books:	1. Donald P Leach, Albert Paul Malvino, Goutam Saha- "Digital Principles &Applications" , Tata McGraw Hill Education Private Limited,2011Edition. 2. M. Morris Mano- "Computer System Architecture", Pearson/Phi, Third Edition. 3. R.P.Jain "Modern Digital Electronics" 4 th Edition Mc Graw Hill.	
Reference Books:	1 William Stallings- "Computer Organization and Architecture", Pearson/PHI, SixthEdition, 2 Andrew S. Tanenbaum- "Structured Computer Organization", PHI /Pearson 4th Edition, 3 M.V .Subramanyam, "Switching Theory and Logic Design", Laxmi Publications (P)Ltd. 4 Ikvinderpal Singh, Computer Organization Architecture, Khanna Book Publishing.	

Suggestive Laboratory Experiments:

1. Verify logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffergates.
2. To study and verify NAND as a Universal Gate
3. To Convert Binary to Grey Code
4. Design and verify operation of half adder and full adder.
5. Design and verify operation of 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. Configure BIOS settings- disable and enable USB and LAN
4. Adding additional RAM to the system.(expanding RAM size).
5. Install and configure windows OS
6. To study the installation of Printer and trouble shooting.

BCA-I-Sem-I(NEP2.0)
GENERAL ENGLISH
BCA24-AEC101

Course Description	General English subject aims to improve basics of English language. It illustrates the minutiae of the English language and its various applications in our daily lives. It covers study about Vocabulary Building, Basic Writing Skills, Identifying Common Errors in Writing, Nature and Style of sensible Writing, Oral Communication. Students gain a solid understanding of English grammar concepts and related aspects by studying the English language.
Course Objectives	1. To provide learning environment to practice listening, speaking, reading and writing skills. 2. To assist the students to carry on the tasks and activities through guided instructions and materials. 3. To effectively integrate English language learning with employability skills and training. 4. To provide hands-on experience through case-studies, mini-projects, group and individual presentations.
Course Outcomes	After completion of course, students will be able to : 1. Explain concept of Word Formation in English Language. 2. Illustrate use of phrases and clauses in sentences in English Language. 3. Identify common errors in English Writing. 4. Develop reading and listening, writing and speaking skills.

Total Hours of Teaching: 30	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 02**
	1	**1**	**0**	**2**	
Total Marks:50	**Theory : 30**				**Internal : 20**

Syllabus Contents:

Unit: I	**A)Vocabulary Building** The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.	8 Hours

	B)Basic Writing Skills Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely.	
Unit: II	**A) Identifying Common Errors in Writing** Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies **B) Nature and Style of sensible Writing** Describing, Defining, Classifying, providing examples or evidence, writing introduction and conclusion, Module V: Writing Practices, Comprehension, Precise Writing, Essay Writing	8 Hours
Unit: III	**Oral Communication-I** Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations	7 Hours
Unit: IV	**Oral Communication -II** Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations.	7 Hours

Note: Unit-III and IV should be interactive practice sessions preferably in Language Lab.

Suggested Field Work or Practical Work

1. Exercises on Word Formation by the Addition of Prefixes and suffixes.
2. Word formation by conversion, compounding. Exercises on synonyms, antonyms.
3. Exercises on sentence structure; Phases and clauses.
4. Exercises on identifying common errors : Choosing the correct verb; Exercises on noun –pronoun exercise.
5. Exercises on modifiers ; articles , prepositions ,redundancies ; word stress , intonation
6. Exercises on writing short paragraph on given topic ; Exercise on comprehension writing.
7. Exercises on short precise writing on given topic ; short essay writing on given topic or topic of student's choice.
8. Exercise on listening and rewriting short comprehension; Exercises- group communication on given topics.

BCA-I-Sem-I(NEP 2.0)

INDIAN VISION FOR HUMAN SOCIETY

BCA24-MDE101

Course Description	This course will provide an overview of concept of 'Vasundhaiva Kutumbam'. It is a fundamental to know its realization process as a base for the development of vision for a human society. It helps to understand universality in human and its coexistence in existence. It helps to understand ancient knowledge system for holistic development.
Course Description	1. Understand the concept of Vasudhaiv Kutumbakam and about its realization for the development of vision for a human society. 2. Discuss the universality in humans and its co-existence in existence. 3. Classify different stages of life and its development 4. Illustrate a sense of responsibly, duties and participation of individual for establishment of fearless society. 5. Investigate programs for ensuring human purpose at individual and societal level.
Course Outcomes	After completion of course, students will be able to: 1. Explain the concept of "Vasudhaiva Kutumbkam" and its realization process as an base for the development of vision for a human society. 2. Identify the universality in humans and its coexistence in existence. 3. Demonstrate the sense of responsibility, duties, and participation of individual for establishment of fearless society. 4. Explain the apparently rational, verifiable and universal solution from ancient Indian knowledge system for the holistic development of physical, mental and spiritual wellbeing of one and all, at the level of individual, society, nation and ultimately the whole world.

Total Hours of Teaching : 30	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 02**
	2	**0**	**0**	**2**	
Total Marks:50	**Theory: 30**				**Internal: 20**

Syllabus Contents:

9. Conduct Short presentation on any given topic.
10. Arrange mock job interview

Note: *Each student should solve any 5 exercises and conduct it .Prepare report including detailed information as per guidelines and format of report given by subject teacher.*

References

1. AICTE's Prescribed Textbook: Communication Skills in English (with Lab Manual), Anjana Tiwari, Khanna Book Publishing Co.
2. Effective Communication Skills. Kul Bhushan Kumar, Khanna Book Publishing
3. Practical English Usage. Michael Swan. Oxford University Press.
4. Remedial English Grammar. F.T. Wood. Macmillan.
5. On Writing Well. William Zinsser. Harper Resource Book.
6. Chauhan/Kashiramka,Technical Communication, Cengage Learning India Pvt.Ltd.
7. Smith-Worthington/Jefferson, Technical writing for success, Cengage Learning India Pvt.Ltd.
8. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.
9. Communication Skills. Sanjay Kumar and Pushplata. Oxford University Press.
10. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Suggested NPTEL Online Courses

- English language for competitive exams ,Prof. Aysha Iqbal ,IIT Madras
- Technical English for engineers, Prof. Aysha Iqbal ,IIT Madras

Unit: I	**The world view & Vision of Human Society** The concept of non-duality of Prakriti (Jad) and Purush (Chetana), human as coexistence of Jad & Chetan, Pancha-mahabhutas, the root of sorrow and suffering, freedom from sorrow, salvation, eternal peace truth (vyaharika satya), ultimate truth. The acceptance of various systems of philosophy for realization of truth and complementariness in society in ancient Indian system.	8 Hours
Unit: II	**Aspiration and Purpose of Individual and Human Society** Aims of Human life; at individual level and societal level. At societal level; Four purusarthas Dharma, Artha, Kama, Moksha. Individual level; Abhyudaya (progress),Nihsreyasa (perfection) Pravrtti , Nivrtti. Dharma; Dharma sutras (Gautama, Apastamba, Baudhayana, Vasistha). Dharma-Shastra; (Manusmriti, Naradamrti,Visnusmrti, Yajnavalkya Smriti) sociology, different stages of life like studenthood, householdership, retirement and renunciation, rites and duties,judicial matters, and personal laws (Aachara, Vyavahara, Prayaschitta). Artha;Kautliya Arthashastra, Kamandakiya Nitisara, Brihaspati Sutra, Sukra Niti,Moksha: Human liberation (Ignorance to Knowledge)	8 Hours

Unit: III	**Program for Ensuring Human Purpose: at Individual and Societal Level –I** Fundamental concept of Nitishastra: Satyanishtha Aur Abhiruchi (Ethics, Integrity & aptitude). The true nature of self; Shiksha Valli, Bhrigu Valli (concept of Atman-Brahman (self, soul). The true constitution of Human: Ananda Valli (Annamaya Kosha, Pranamaya Kosha, Manomaya Kosha, Vijnanamaya Kosha, Anandamaya Kosha)**.** The four states of consciousness (Waking state, Dreaming state, Deep Sleep State, Turiya the fourth state), Consciousness (seven limbs and nineteen mouths), Prajna, Awarness**.** The Life Force *Prana (*Praana-Apaana-Vyaana-Udaana- Samaana)	7 Hours
Unit: IV	**Program for Ensuring Human Purpose: at Individual and Societal Level - II** Differentiating *Vidya* and *Avidya*, human bondages, Higher and Lower Knowledge (Para Vidhya & Apara Vidhya). Concept of Sattva, Rajas, Tamas and need of balancing the same, Patanjali yog sutra; Yama, Niyama, Asanas, pranayams, pratyahara, dharna, dhyana, Samadhi, Sixteen category of padartha, pramans (pratyaksh, anuman, upaman, shabda). Saadhana chatushtayam (viveka, vairagya, mumukshatavam, shadsampathi (sama, dama, uparama, titiksha, shradha, samadhana), Understanding Nitya karma, Naimittika Karma, Kamya karma, prayaschitta karma, Nishidha Karma. Meditation and Progressive meditation (Narada's education), Ativadin to self knowledge,Jyan yog, Karma yog, sanyas yog in aspect to harmonious practice in society.	7 Hours

Note: Relevant case studies based on the above units should be discussed in the class.

Suggested Field Work or Practical Work :

1. Explain practical application of 'Vasudhaiv Kutumbkam'theme in Indian culture.
2. Write detailed Essay on Vasudhaiiv Kutumbkam theme
3. Write note on composition of Panch Mahabhuta in human body and its importance.
4. Study role of 4 Purushartha in human life and prepare report on it.
5. Read the Book-Kautiya's Arthashatra and write Book Review
6. Conduct group activity on states of consciousness
7. Invite Experts in Yoga and Meditation techniques to know its importance in human life and prepare report on it
8. Arrange group presentation/activity on stages of human life
9. Write a note on 3 Gunas-Nature of Aattva,Rajas and Tamas with some examples
10. Write a note on Importance on Patanjali Yog Sutra-Yama,Niyama,Asanas

Note:

Each student should prepare report for any 5 practicals /Field work including detailed information as per guidelines and format of report given by subject teacher. Take photographs in your cell phone with prior permission during the visit to business units and discussion with people. Produce the black and white print of photographs in your report wherever possible.

References

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2.S. C. Manerjee, Society in Ancient India: Evolution Since the Vedic Times Based on Sanskrit, Pali, Pakritand Other Classical Sources: No. 1 (Reconstructing Indian History and Culture), DK Printing, India

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7.Shendge, M. (1977). The civilized demons. The Harappans in Ṛgveda. Abhinav Publications

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11. VIII, in The Strange World of Human Sacrifice, ed., J. Bremmer. Leuven,Belgium: Peeters.

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Institute of Advanced Study, Shimla. Tatvabodh of Sankaracharya, Central Chinmay Mission Trust, Bombay, 1995.

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15. Keith, A. (1925). The religion and philosophy of the Veda and Upanishads.Delhi: Motilal Banarsidass Publishers.

16. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: HindologyBooks, 2008.

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18. R C Dutt, A history of civilization in ancient India, vol 2, Taylor & Francis, US

19. SK Das , The education system of Ancient hindus, Gyan publication house,India

20. BL Gupta,Value and disatribution system in india, Gyan publication house,India20. Reshmi ramdhoni, Ancient Indian Culture and Civilisation, star publication,2018

21. Supriya Lakshmi Mishra, Culture and History of Ancient India (With Special Reference Of Sudras), 2020.

21. Om Prakash, Religion and Society in Ancient India , Bhariya Vidhya Prakashan,1985
22. J Auboyer, Daily Life in Ancient India from Approximately 200 BC to AD 700,Munshi ram Manoharlal publication, 1994.
23. DK Chakkrabarty, Makkhan Lal, History of Ancient India (Set of 5 Volumes),Aryan book Internation publication, 2014
24. Dr. Girish Nath Jha, Dr. Umesh Kumar Singh and Diwakar Mishra, Science and Technology in Ancient Indian Texts, DK Print World limited,
25. Swami BB Vishnu, Vedic Science and History - Ancient Indian's Contribution to the Modern World, Gosai Publication, 2015
26. Chatterjee, S.C. The Nyaya Theory of Knowledge. Calcutta: University of Calcutta Press, 1950.
27. Vidyabhusana, S.C. A History of Indian Logic. Delhi: Motilal Banarsidass Publication, 1971.
28. Dasgupta, Surendra. A History of Indian Philosophy. Delhi: Motilal Banarsidass, 1991.Vols. III & IV.
29. Mercier, Jean L. From the Upanishads to Aurobindo. Bangalore: Asian Trading Corporation, 2001.
30. Shukla/Yadav/Chauhan,Human Values and Professional Ethics, Cengage Learning India Pvt.Ltd.

BCA-I-Sem-I(NEP 2.0) ENVIRONMENTAL SCIENCE AND SUSTAINABILITY BCA24-VAC101	
Course Description	This course aims to familiarize students with fundamental environmental concepts and their relevance to business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers. The course content is divided into four comprehensive units. Unit 1 introduces basic environmental principles, the man-environment relationship, and sustainability issues. Unit 2 focuses on ecosystems, biodiversity, and sustainable practices. Unit 3 addresses environmental pollution, waste management, and sustainable development strategies. Finally, Unit 4 explores social issues, environmental legislation, and practical applications through hands-on fieldwork. Through this holistic approach, students will gain a deep understanding of environmental processes, the importance of sustainable practices, and their role in promoting sustainability within business contexts.
Course Objectives	1. To familiarize students with basic environmental concepts, their relevance to business operations, and forthcoming sustainability challenges. 2. To equip students to make decisions that consider environmental consequences. 3. To become environmentally sensitive and responsible managers.
Course Outcomes	After completion of course, students will be able to : 1. Explore the basic environmental concepts and issues relevant to the business and management field. 2. Recognize the interdependence between environmental processes and socioeconomic dynamics. 3. Determine the role of business decisions, policies, and actions in minimizing environmental degradation. 4. Identify possible solutions to curb environmental problems caused by managerial actions. 5. Develop skills to address immediate environmental concerns through changes in business operations, policies, and decisions.

Total Hours of Teaching : 30	Lecture	Tutorial	Practical	Total Per Week	Credit Points : 02
	2	0	0	2	
Total Marks:50	**Theory : 30**				**Internal : 20**

Syllabus Contents:

Unit: I	**Understanding Environment, Natural Resources, and Sustainability** Fundamental environmental concepts and their relevance to business operations; Components and segments of the environment, the man-environment relationship, and historical environmental movements. Concept of sustainability; Classification of natural resources, issues related to their overutilization, and strategies for their conservation. Sustainable practices in managing resources, including deforestation, water conservation, energy security, and food security issues. The conservation and equitable use of resources, considering both intergenerational and intergenerational equity, and the importance of public awareness and education.	8 Hours
Unit: II	**Ecosystems, Biodiversity, and Sustainable Practices** Various natural ecosystems, learning about their structure, functions, and ecological characteristics. The importance of biodiversity, the threats it faces, and the methods used for its conservation. Ecosystem resilience, homeostasis, and carrying capacity, emphasizing the need for sustainable ecosystem management. Strategies for in situ and ex situ conservation, nature reserves, and the significance of India as a mega diverse nation.	8 Hours
Unit: III	**Environmental Pollution, Waste Management, and Sustainable Development** Various types of environmental pollution, including air, water, noise, soil, and marine pollution, and their impacts on businesses and communities. Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; Solid waste management; Natural and man-made disasters, their management, and the role of businesses in mitigating disaster impacts.	7 Hours

Unit: IV	**Social Issues, Legislation, and Practical Applications** Dynamic interactions between society and the environment, with a focus on sustainable development and environmental ethics. Role of businesses in achieving sustainable development goals and promoting responsible consumption. Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Environmental justice, environmental refugees, and the resettlement and rehabilitation of affected populations; Ecological economics, human population growth, and demographic changes in India.	7 Hours
Note: Relevant case studies based on the above units should be discussed in the class.		

Suggested Field Work or Practical Work

1. A study of relationship between environment and human health.
2. A study of major environmental issues and their impacts.
3. A study of major environmental components of sustainable development.
4. A study of importance of biodiversity and threatens to the biodiversity.
5. A study of man-made activities responsible to the degradation of environment.
6. A study of environmental pollution and its impact on human being.
7. A study of plastic waste generation and its impact.
8. A study of impact of population growth, industrialization and urbanization.
9. A study of mis-use and over exploitation of natural resources.
10. A study of environmental legislations and the judiciary’s role in environmental protection.

Note:

Each students should prepare report of any 5 field work topics including detailed information after visiting to the location generating various environmental issues as per the guidelines of subject teacher.

References:

Text Books (Latest Editions)

- Poonia, M.P. *Environmental Studies* , Khanna Book Publishing Co.
- Bharucha, E. *Textbook of Environmental Studies*, Orient Blackswan Private Ltd.
- Dave, D., & Katewa, S. S. *Text Book of Environmental Studies.* Cengage Learning India Pvt Ltd.
- Rajagopalan, R. *Environmental Studies: from crisis to cure* , Oxford University Press.
- Miller, G.T. & Spoolman S. *Living in the Environment*. Cengage.
- Basu, M., & Xavier Savarimuthu, S. J. *Fundamentals of environmental studies*.Cambridge University Press.
- Roy, M. G. *Sustainable Development: Environment, Energy and Water Resources*. Ane Books.
- Pritwani, K *Sustainability of business in the context of environmental management.* CRC Press.
- Wright, R.T. & Boorse, D.F. *Environmental Science: Toward A Sustainable Future* (13th ed,). Pearson
- Odum,Fundamentals of Ecology, Cengage Learning India Pvt.Ltd.

Web links

- https://www.ourplanet.com
- https://www.undp.org/content/undp/en/home/sustainable-developmentgoals. html
- www.myfootprint.org
- https://www.globalchange.umich.edu/globalchange1/current/lectures/kling/ecosystem/ecosystem.html

BCA-I-Sem-I (NEP 2.0)

GERMAN-I

BCA24-AEC102

Course Description	German language is a structured curriculum created to instruct students in speaking, reading, writing, and gaining an understanding of the language. These classes include vocabulary, grammar, pronunciation, and cultural quirks, and they are designed for students at all skill levels, from absolute beginners to fluent speakers.
Course Objectives	1. To give brief introduction about German Language. 2. To study about speaking about Hobbies. Conjugation of strong verbs and revision of regular verbs. 3. To assess development in German language vocabulary by interacting with others.
Course Outcomes	After successful completion of the course, students will be able to, 1. Recognize basic grammar used in German Language 2. Demonstrate familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. 3. Execute himself /herself and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. 4. Debate and interact in a simple way provided the other person talks slowly and clearly and is prepared to help. 5. Assess development in German language vocabulary by interacting with others 6. Construct presentation of how to use and scope of German Language.

Total Hours of Teaching : 30	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 02**
	1	**1**	**0**	**2**	
Total Marks:50	**Theory : 30**				**Internal : 20**

Syllabus Contents:

Unit-I	**A.Introduction to German Language-Level-I** Introduction of the language, Greetings, to Introduce oneself, speaking about yourself and others, Alphabets and numbers, Listening of Alphabets and numbers, Reading Information about other people and understanding simple information	15 Hours

	about them, country names and languages ,Numbers 1 to 100 and listening of numbers Personal pronouns and verb conjugation of regular verbs.	
	B.Introduction to German Language-Level-II Speaking about Hobbies. Conjugation of strong verbs and revision of regular verbs. Learning articles and genders of nouns, Singular / Plural noun forms, Learning weekdays, months and Seasons. Speaking about informal appointments Grammar: yes/no questions, Verb position in normal statements and in questions Learning Professions, reading small texts and understanding information about working days, hours, and profession	
Unit-II	**A.Demonstrative German Language-Level-I** Learning to name the famous places, buildings in a city, name the modes of transportation. Learning definite/ indefinite and negative articles in German to learn to describe the way, Imperative for Pronoun "Sie"	15Hours
	B.Demonstrative German Language-Level-II Words to speak about food, understanding food items, where one can buy what, Quantities and packing of the grocery items. Subject and object of the sentence and introduction of akkusativ case in German Conversation between shopkeeper and customer, Understanding of Grammar.	

Suggested Field Work or Practical Work :

Subject Teacher should assign any 5 practical work based on syllabus and evaluate student performance. (e.g. Assignment, Presentation, Group activity, Role Play, Group Discussion, etc.)

Reference Books

1) Netzwerk neu A1 (Deutsch als Fremdsprach) Kursbuch : Goyal Publishers and Distributors Private Ltd.
2) Netzwerk neu A1 (Deutsch als Fremdsprach) Arbeitsbuch : Goyal Publishers and Distributors Private Ltd.
3) Netzwerkneu A1 (Deutsch als Fremdsprach) Testheft : Goyal Publishers and Distributors Private Ltd.

SEMESTER–II

BCA-I-Sem-II(NEP 2.0) MATHEMATICS FOUNDATIONS TO COMPUTER SCIENCE-II BCA24-CC203					
Course Objectives	CO1: This course helps the students to understand correct lines of arguments and proofs. CO2: This course introduces mathematical techniques that are foundations for understandingadvanced computational methods, including numerical methods and optimization. CO3: This course helps the students to understand various problem-solving strategies andmethods to tackle both theoretical and practical challenges in computer science.				
Total Hours of Teaching : 60	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 4**
	4	**0**	**4**	**4**	
Total Marks :100	**External Exam Theory : 80**				**Internal : 20**

Syllabus Contents:

Unit: I	*Logic and Methods of Proofs:* Propositions, logical operations (basic connectives), compound statements construction of truth table, quantifiers, conditional statements, tautology contradiction, contingency, logical equivalence. Conjunctive Normal Forms (CNF) and Disjunctive Normal Forms (DNF). Methods of proofs: Rules of inference for propositional logic, modus ponens modus tollens, syllogism, proof by contradiction, Mathematical Induction	15 Hours
Unit: II	*Algebraic Structures:* Semi-group, Monoid, Group, Subgroup, Cyclic group	15 Hours
Unit: III	*Numerical Methods:* Concept and importance of errors in numerical methods. Solution of algebraic and transcendental equations: Bisection method and Newton-Raphsonmethods. Numerical Interpolation: Newton's Forward and Newton's Backward interpolation formula and Lagrange's formula. Numerical Integration: Trapezoidal rule and Simpson's 1/3 rule Only formula and problem solving for all the topics mentioned above	15 Hours
Unit-IV	*Optimization Techniques:* Linear programming: Introduction, LP formulation, Graphical method for solving LPs with twovariables, , Simplex method, Duality. Transportation problem: Definition, Linear form, North-west corner method, Least cost method, Vogel's approximation method for finding feasible solution, MODI method for finding optimum solution, MODI method for finding optimum solution	15 Hours
Text Books:	. Structures, 6th Edition, Pearson Education, 2015. 2. Sastry S. S., Introductory Methods of Numerical Analysis, Fifth Edition, PHL, 2022. 3. Taha Hamdy A., Operations Research: An Introduction, Eighth Edition, Pearson Prentice Hall, 2003. 4. S.B. Singh, Discrete Structures, Khanna Book Publishing, 2023 (AICTE Recommended Textbook)	

Reference Books:	. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and itsApplications, McGraw Hill, India, 2019. 2. Chakravorty J. G. and Ghosh P. R., Linear Programming and Game Theory, MoulikLibrary, 2017. 3. Sharma J. K., Operations Research: Theory and Applications, Fourth Edition,Macmilllan Publishers, 2007.
Web Resources	. https://nptel.ac.in/courses/111107127 2. https://www.math.iitb.ac.in/~siva/si50716/SI507lecturenotes.pdf

BCA-I-Sem-II(NEP 2.0)

DATA STRUCTURES

BCA24-CC204

Course Outcomes	CO1: Understand the fundamental concepts of Data Structures and their applications. CO2: Develop problem-solving skills using Data Structures. CO3: Implement Data Structures using C programming language
Prerequisite	1. **Programming Fundamentals:** Understanding the basic syntax and semantics of C programming language. 2. **Problem-Solving Skills:** Ability to break down a problem into smaller steps and devise a step-by-step solution and familiarity with simple algorithms.

Total Hours of Teaching : 60	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 6**
	4	**0**	**4**	**6**	
Total Marks :100	**External Exam Theory : 80**				**Internal : 20**
Practical 50	**External Exam. Practical:50**				

Syllabus Contents:

Unit: I	**Introduction and Overview:** Definition, Classification and Operations of Dat a Structures. Algorithms: Complexity, Time-Space Trade-off. **Arrays:** Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Operations on Linear Arrays: Traversing, Inserting, Deleting, Searching, Sorting and Merging. Searching: Linear Search and Binary Search, Comparison of Methods. Sorting: Bubble Sort, Selection Sort, and Insertion Sort. Two-Dimensional Arrays Representation of Two- Dimensional Arrays in Memory, Matrices and Sparse Matrices, Multi-Dimensional Arrays.	15 Hours
Unit: II	**Linked Lists:** Definition, Comparison with Arrays, Representation, Types o f Linked lists, Traversing, Inserting, Deleting and Searching in Singly Linked List Doubly Linked List and Circular Linked List. Applications of Linked Lists: Addition of Polynomials. **Hashing and Collision:** Hashing, Hash Tables, Types of Hash Functions Collision, Collision Resolution with Open Addressing and Chaining.	15 Hours

Unit: III	**Stacks:** Definition, Representation of Stacks using Arrays and Linked List Operations on Stacks using Arrays and Linked List, Application of Stacks: Arithmetic Expressions, Polish Notation, Conversion of Infix Expression to Postfix Expression, Evaluation of Postfix Expression. **Recursion:** Definition, Recursive Notation, Runtime Stack, Applications o f Recursion: Factorial of Number, GCD, Fibonacci Series and Towers of Hanoi. **Queues:** Definition, Representation of Queues using Array and Linked List, Types of Queue: Simple Queue, Circular Queue, Double-Ended queue, Priority Queue Operations on Simple Queues and Circular Queues using Array and Linked List, Applications of Queues.	15 Hours
Unit-IV	**Graphs:** Definition, Terminology, Representation, Traversal. **Trees:** Definition, Terminology, Binary Trees, Traversal of Binary Tree, Binar y Search Tree, Inserting, Deleting and Searching in Binary Search Tree, Height Balanced Trees: AVL Trees, Insertion and Deletion in AVL Tree.	15 Hours
Text Books:	1. R.B. Patel, "Expert Data Structures with C", Khanna Book Publishing Company, 2023(AICTE Recommended Textbook) 2. Seymour Lipschutz, "Data Structures with C", Schaum's Outlines, Tata McGraw-Hill,2011. 3. Yashavant Kanetkar, "Data Structures Through C", 4th Edition, BPB Publications,2022.	
Reference Books:	1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2014. 2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, Universities Press, 2007.	
Web Resources	1. **GeeksforGeeks** - Data Structures Tutorial 2. **Khan Academy** - Algorithms Course	

BCA24-CCP204-Practical

Mandatory Lab Programs:

1. Write a program for insertion and deletion operations in an array.
2. Write a program to search for an element in an array using Linear Search and Binary Search.
3. Write a program to sort an array using Bubble Sort, Selection Sort and Insertion Sort.
4. Write a program to merge two arrays.
5. Write a program to add and subtract two matrices.
6. Write a program to multiply two matrices.
7. Write a program to insert an element into a Singly Linked List:
(a) At the beginning
(b) At the end
(c) At a specified position
8. Write a program to delete an element from a Singly Linked List:
(a) At the beginning
(b) At the end
(c) A specified element
9. Write a program to perform the following operations in a Doubly Linked List:
(a) Create
(b) Search for an element
10. Write a program to perform the following operations in a Circular Linked List:
(a) Create
(b) Delete an element from the end
11. Write a program to implement stack operations using an array.
12. Write a program to implement stack operations using a linked list.

13. Write a program to add two polynomials using a linked lists.
14. Write a program to evaluate a postfix expression using a stack.
15. Write a program to perform the following using recursion:
(a) Find the factorial of a number
(b) Find the GCD of two numbers
(c) Solve Towers of Hanoi problem
16. Write a program to implement simple queue operations using an array.
17. Write a program to implement circular queue operations using an array.
18. Write a program to implement circular queue operations using a linked list.
19. Write a program to perform the following operations on a binary search tree.
(a) Preorder Traversal
(b) Inorder Traversal
(c) Postorder Traversal
20. Write a program to perform insertion operation in a binary search tree.

Operating Systems LAB

Operating System Practical

Course Outcomes (COs):

CO1: To implement scheduling of algorithms.
CO2: Understanding the concept of critical section problems.CO3: Concepts of file allocation of frames.
CO4: Concept of Page replacement algorithms.

List of experiments

1. Write C program to simulate the FCFS CPU Scheduling algorithm.
2. Write C program to simulate the SJF CPU Scheduling algorithm.
3. Write C program to simulate the Round Robin CPU Scheduling algorithm.
4. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
5. Write a C program to implement the Producer – Consumer problem using semaphores.
6. Write a C program to illustrate the IPC mechanism using Pipes.
7. Write a C program to illustrate the IPC mechanism using FIFOs.
8. Write a C program to simulate Paging memory management technique.
9. Write a C program to simulate Segmentation memory management technique.
10. Write a C program to simulate the Best Fit contiguous memory allocation technique.
11. Write a C program to simulate the First Fit contiguous memory allocation technique.
12. Write a C program to simulate the concept of Dining-Philosophers problem.
13. Write a C program to simulate the MVT algorithm.
14. Write a C program to implement FIFO page replacement technique.
15. Write a C program to write a C program for implementing sequential file allocation method.

BCA-I-Sem-II(NEP 2.0)

OPERATING SYSTEMS

BCA24-CC205

Course Outcomes	At the end of the course, students will be able to: CO1: Explain the fundamentals of the operating system. CO2: Comprehend multithreaded programming, CPU scheduling, process management,process synchronization, memory, deadlocks, and storage management. CO3: Compare the performance of CPU scheduling algorithms CO4: Identify the features of I/O and File handling methods.

Total Hours of Teaching : 30	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 2**
	2	**0**	**0**	**2**	
Total Marks :50	**External Exam Theory : 40**				**Internal : 10**

Syllabus Contents:

Unit: I	**Operating Systems Overview:** Definition, Evaluation of O.S, Components & Services of OS, Structure, Architecture, types of Operating Systems, Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems. **Operating Systems Structures:** Operating system services and systems calls, system programs, operating system structure, operating systems generations	8 Hours
Unit: II	**Process Management:** Process Definition, Process states, Process Stat e transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads. **Process Scheduling:** Definition, Scheduling objectives, Scheduling algorithms, CPU scheduling Preemptive and Non-preemptive Scheduling algorithms (FCFS, SJF and RR),Performance evaluation of the scheduling Algorithms	7 Hours
Unit: III	**Process Synchronization:** Introduction, Inter-process Communication, Race Conditions, Critical Section Problem, Mutual Exclusion, Semaphores, Monitors. **Deadlocks:** System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks	8 Hours
Unit-IV	**Memory Management:** Logical and Physical address map, Swapping, Memory allocation,MFT, MVT, Internal and External fragmentation and Compaction, Paging, Segmentation. **Virtual Memory:** Demand paging, Page Replacement algorithms, Allocation of frames,thrashing. **I/O Management:** Principles of I/O Hardware: Disk structure, Disk scheduling algorithms.	7 Hours

Text Books:	1. Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022 (AICTE Recommended Textbook) 2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating SystemPrinciples, 7th edition OR Later edition, Wiley India Private Limited, New Delhi. 3. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition,Pearson Education, India.
Reference Books:	1. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India. 2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata McGraw-Hill

BCA-I-Sem-II(NEP 2.0)

OBJECT ORIENTED PROGRAMMING USING JAVA

BCA24-SEC202

Course Outcomes	CO1: To introduce the object oriented programming system concepts CO2: To introduce syntax and semantics of Java programming language CO3: To develop modular programs using Java CO4: To setup JDK environment to create, debug and run Java programs
Prerequisite	Knowledge of Problem Solving Techniques using C programming language

Total Hours of Teaching : 60	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 6**
	4	**0**	**4**	**6**	
Total Marks :100	**External Exam Theory : 80**				**Internal : 20**
Practical 50	**External Exam. Practical:50**				

Syllabus Contents:

Unit: I	**Fundamentals of Object Oriented Programming:** Basic Concepts of Object OrientedProgramming (OOP), Benefits and Applications of OOP. **Java Evolution:** Java Features, Difference between Java, C and C++, Javaand Internet,Java Environment. **Overview of Java Language:** Introduction to Simple Java Program, Use ofComments and Math function, Application of two classes, Java Program Structure, Java Tokens and statements, Implementing Java programAnd JVM, Command Line Arguments. (Text Book 1: Chapters 1, 2 and 3)	15 Hours
Unit: II	**Constants, Variables and Data Types:** Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Typecasting. **Operators & Expressions:** Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment & Decrement operators, conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Type Conversions in Expressions, Operator Precedence & Associativity. **Decision Making, Branching & Looping:** Decision Making with Contro l Statements, Loopingstatements, Jump in loops, Labelled loops. (Text Book 1: Chapters 4, 5, 6, and 7.)	15 Hours
Unit: III	**Classes, Objects and Methods:** Defining Class, Methods Declaration, Constructors, MethodsOverloading, Overriding Methods, Inheritance **Arrays, Strings and Vectors:** 1D arrays, Creating an Array, 2D arrays, Strings, Vectors,Wrapper Classes, Enumerated Types **Inheritance:** Defining, extending classes, and Implementing Interfaces. Multiple inheritanceand polymorphism, overriding methods, concept of Multithreading in Java (Text Book 1: Chapters 8 9 and 10)	15 Hours
Unit-IV	**Packages:** Basics of packages, System packages, Creating and accessing packages, Creating user defined packages, Adding class to a package. **Exception Handling:** Using the main keywords of exception handling: try, catch,throw, throwsand finally; Nested try, Multiple catch statements, Creating user defined exceptions (Text Book 1: Chapters 11 & 13)	15 Hours

Text Books:	1. Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India:McGraw Hill Education 2. Schildt, H. (2022). Java: The Complete Reference. 12th edition.McGraw-Hill Education	
Reference Books:	1. Arunesh Goyal, The Essentials of JAVA, Khanna Book Publishing Company PrivateLimited, 2012. 2. Tanweer Alam, Core JAVA, Khanna Book Publishing Company Private Limited, 2015. 3. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson,2008. 4. S. Malhotra and S. Choudhary, Programming in Java, 2nd Edition, OxfordUniversityPress, 2014.	
Web Resources	1. https://www.w3schools.com/java/. 2. http://www.java2s.com/. 3. https://onlinecourses.nptel.ac.in/noc22_cs47/preview	

List of Practical:

1. Write a program to read two numbers from user and print their product.
2. Write a program to print the square of a number passed through commandline arguments.
3. Write a program to send the name and surname of a student through command line arguments andprint a welcome message for the student.
4. Write a java program to find the largest number out of n natural numbers.
5. Write a java program to find the Fibonacci series & Factorial of a numberusing recursive and nonrecursive functions.
6. Write a java program to multiply two given matrices.
7. Write a Java program for sorting a given list of names in ascending order.
8. Write a Java program that checks whether a given string is a palindrome ornot . Ex:MADAM is apalindrome.
9. Write a java program to read n number of values in an array and display it inreverse order.
10. Write a Java program to perform mathematical operations. Create a class called AddSub with methods to add and subtract. Create another class calledMulDiv that extends from AddSub class to use the member data of the superclass. MulDiv should have methods to multiply and divide A main function should access the methods and perform the mathematical operations.
11. Create a JAVA class called Student with the following details as variableswithin it.
    a. USN, NAME, BRANCH, PHONE, PERCENTAGE
    b. Write a JAVA program to create n Student objects and print the USN,Name, Branch, Phone,and percentage of these objects with suitable headings.
12. Write a Java program that displays the number of characters, lines and wordsin a text.
13. Write a Java program to create a class called Shape with methods called getPerimeter() and getArea(). Create a subclass called Circle that overrides the getPerimeter() and getArea() methods to calculate the area and perimeterof a circle.
14. Write a Java program to create a class Employee with a method called calculateSalary(). Create two subclasses Manager and Programmer. In eachsubclass, override the calculateSalary() method to calculate and return the salary based on their specific roles.
15. Write a Java program using an interface called 'Bank' having function 'rate_of_interest()'. Implement this interface to create two separate bank classes'SBI'and'PNB'to print different rates of interest. Include additionalmember variables, constructors also in classes 'SBI' and 'PNB'.

16. Write a Java package program for the class book and then import the datafrom the package anddisplay the result.
17. Write a Java program for finding the cube of a number using a package for various data typesand then import it in another class and display the results.
18. Write a Java program for demonstrating the divide by zero exceptionhandling.
19. Write a Java program that reads a list of integers from the user and throws anexception if any numbers are duplicates.
20. Create an exception subclass UnderAge, which prints "Under Age" along with the age value when an object of UnderAge class is printed in the catch statement. Write a class exceptionDemo in which the method test() throws UnderAge exception if the variable age passed to it as argument is less than 18. Write main() method also to show working of the program.

BCA-I-Sem-II(NEP 2.0)

WEB TECHNOLOGIES

BCA24-SECP203

Course Outcomes	CO1: To understand the concepts and architecture of the World Wide Web, Markup languages along with Cascading Style Sheets. CO2: To understand the concepts of event handling and data validation mechanisms. CO3: To understand the concepts of embedded dynamic scripting on client side programming. CO4: To develop modern interactive web applications
Prerequisite:	1) Proficiency in at least one programming language, such as Python, Java, or C. Understanding of programming concepts such as loops, conditionals, functions, and data structures like arrays, lists. 2) Familiarity with object-oriented programming (OOP) principles, including classes, objects, inheritance, and polymorphism.

Total Hours of Teaching : 15	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 2**
	1		**2**	**2**	
Practical 50	**External Exam. Practical:50**				

Syllabus Contents:

Unit: I	**Fundamentals of Web Architecture and Web designing** Introduction to World Wide Web, Protocols, Web development tools, Web browsers, DNS, Web servers and web hosting, Types of Web Hosting. Introduction to HTML, History of HTML, Objective, Basic Structures of HTML, Header Tags, body tags, Paragraph Tags. Tags for FORM Creation, TABLE FORM, TEXTAREA, SELECT, IMG, IFRAME FIELDSET, ANCHOR, Lists in HTML, Introduction to DIV tag, NAVBAR Design. Introduction to CSS: Types, Selectors and Responsiveness of a web page	8 Hours
Unit: II	**Web Programming using JavaScript, XML and AJAX** Introduction to JavaScript: Variables and Arrays in JavaScript, Output System in JavaScript (Alert, throughput, Input box, Console). Functions and Events in JavaScript, Introduction to Document Object Model (DOM) in JavaScript. Date and String handling in JavaScript. Manipulating CSS through JavaScript Validation mechanisms in JavaScript: Form Validation like required field validator, length validator, Pattern validator (Regular Expressions). Combining HTML, CSS and JavaScript Introduction to XML: uses, Key concepts, DTD	7 Hours

	schemas, XSLT and XSL Elements and transforming with XSLT. Introduction to AJAX, Purpose, advantages and disadvantages, AJAX based Web applications.	
Text Books:	1) Laura Lemay, Mastering HTML, CSS & Java Script Web Publishing, BPB Publications, 2016 2) Thomas A. Powell, The Complete Reference HTML & CSS, Fifth Edition, 2017	
Reference Books:	1) Tanweer Alam, Web Technologies, Khanna Book Publishing, 2011. 2) DT Editorial Services, HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, DreamTech, 2016	
Web Resources	1) www.javatpoint.com 2) www.w3schools.com 3) www.geeksforgeeks.org/web-technology/	

Practical list:

PART-A (Programs based on Unit-I)

1) Create Your Resume using different HTML tags (use text, color and lists.)
2) Create your class time table using table tag.
3) Design a Webpage for your college containing description of courses, department, faculties, library etc. using list tags, href tags, and anchor tags.
4) Create web page using Frame with header frame, left frame, right frame, and status bar frame. On clicking in the left frame, information should be displayed in right frame.
5) Create web page for student admission form using different form elements in HTML.
6) Create a Web Page of a super market using internal CSS.
7) Use Inline CSS to format your resume created through HTML tags.
8) Use External CSS to format your time table created.
9) Use all the CSS (inline, internal and external) to format college web page that you have created.
10) Write a HTML Program to create your college website for mobile device using CSS.

PART – B (Programs based on Unit-II)

1) Write a JavaScript program using Switch case.
2) Write a JavaScript program using any 5 events.
3) Write a JavaScript program using built in JavaScript objects.
4) Develop a Simple calculator for addiction, subtraction, multiplication and division operations using JavaScript.
5) Create HTML form for Student Information like Register Number, Name, Mobile Number, DOB and Email-Id with validations using JavaScript. (Use required field validator and length validator)
6) Write an HTML program to create login page with validations using JavaScript. (Use Regular Expressions for validations)
7) Create a DTD for Newspaper article.
8) Create XML schema for Student Information.
9) Create XSL file to convert XML file to XHTML file
10) Write a Program to retrieve date from a text file and displaying it using AJAX.

BCA-I-Sem-II (NEP 2.0) INDIAN CONSTITUTION BCA24-VAC202	
Course Description	This course offers a unique perspective on the Constitution of India, focusing on its economic dimensions and impact on business. It delves into the historical and ideological underpinnings of the Constitution as an economic document, tracing its evolution from post-colonial economic governance to contemporary debates. Students explore constitutional battles over land reforms, economic liberalization, and fiscal federalism, gaining insights into competing economic ideologies and interests. Through case studies and legal analysis, they examine fundamental rights related to business, fiscal federalism, and constitutional issues shaping India's economic landscape. By the end of the course, students will develop a nuanced understanding of the Constitution's role in shaping economic policies and its implications for business practices, equipping them with valuable insights for careers in business management and policy advocacy.
Course Objectives	1. Develop an understanding of the Indian Constitution beyond legal and political lenses, emphasizing its significance for business students. 2. Recognize the importance of comprehending constitutional basics and their impact on trade, economy, and business practices. 3. Analyze the inclusion of economic justice in the preamble and its implications for post-colonial economic policies. 4. Explore the legal history of competing claims between economic development and principles of equity and justice in India. 5. Examine the transition from state-led industrialization to liberalization, highlighting the constitutional underpinnings of these economic shifts. 6. Investigate the constitutional provisions relevant to business, such as the fundamental right to practice any profession, occupation, trade, or business as enshrined in Article 19.

Course Outcomes	After completion of course, students will be able to : 1. Explain concept of the Indian Constitution, particularly from the perspective of economic governance and business 2. Employ a nuanced analytical framework about ongoing constitutional debates and battles which affect the domain of business 3. Develop a sense of how questions of economic growth have to be balanced with other constitutional commitments, including social and economic justice.

Total Hours of Teaching : 30	**Lecture**	**Tutorial**	**Practical**	**Total Per Week**	**Credit Points : 02**
	2	**0**	**0**	**2**	
Total Marks:50	**Theory: 30**				**Internal: 20**

Syllabus Contents:

Unit: I	**An Economic History of the Constitution of India** Historical understanding of the constitution as an economic document. Understanding the Preamble, starting from the land reform cases in the 1950s to the validity of the bitcoin ban imposed by the RBI, this module signpost all of the important economic moments in the constitutional history of post-colonial India; Constitutional design, Legal Regulation and economic justice	8 Hours
Unit: II	**Fundamental Rights and Business in India** Article 19(1)(g) grants every citizen the right, to practise any profession, or to carry on any profession, occupation, trade, or business. Like other fundamental rights, this right is subject to reasonable restrictions impose by the state. This particular provision of the Constitution has been one of the most severely litigated freedoms. Fundamental Duties.	8 Hours
Unit: III	**Fiscal Federalism** Article articles 301 to 307 of the Constitution pertains to Trade, Commerce and Intercourse within the Territory of India; Challenges associated with fiscal federalism in India including the vertical fiscal imbalance; Article 280 of the Constitution.	7 Hours

Unit: IV	**Constitutional battles that shaped the economy** This module will be taught through key case studies that demonstrate the complex and fascinating overlap between the constitution and business and shall use Saurabh Kirpal's book Fifteen Judgments: Cases that Shaped India's Financial Landscape as our guide through this landscape. The case studies include the banning of diesel engine cars, Telecom regulation and ownership of broadcast media, Demonetisation, Aadhaar, the lifting of restrictions on dealing in cryptocurrencies.	7 Hours

Note: Relevant case studies based on the above units should be discussed in the class.

Suggested Field Work or Practical Work

1. Study and analyse case-Rustom Cavasjee Cooper v. Union of India, (1970) 1 SCC 248

2. Study and analyse case- State of Rajasthan v. Mohan Lal Vyas, AIR 1971 SC 2068 (confirmation of a private monopoly, not a violation of fundamental right)

3. Study and analyse case -Mithilesh Garg v. Union of India, (1992) 1 SCC 168 : AIR 1992 SC 221 (Right to carry on business, not breached when it is liberalised)

4. Study and analyse case -Chintamanrao v. The State of Madhya Pradesh, AIR 1951 SC 118 (scope of reasonable restrictions in relation to trade and occupation)

5. Study and analyse case -Cooverjee B. Bharucha v. Excise Commissioner, Ajmer, AIR 1954 SC 220 (the reasonableness of the restriction imposed may depend upon the nature of the business and prevailing conditions including public health and morality)

6. Study and analyse case- T. B. Ibrahim v. Regional Transport Authority. Tanjore, AIR 1953 SC 79

7. Study and analyse case- Harman Singh v. RTA, Calcutta, AIR 1954 SC 190

8.. Study and analyse case- Dwarka Prasad Laxmi Narain v. State of U.P., AIR 1954 SC 224

9. Study and analyse case- State of Bombay v. R.M.D. Chamarbaugwala, AIR 1957 SC 699

1. Study and Analyse case-Parbhani Transport Coop. Society Ltd. v. Regional Transport Authority, Aurangabad, AIR 1960 SC 801

Note:

Each student should prepare report any 5 practical or field work including detailed information as per guidelines and structure/format given by subject teacher. The report should be hand-written. Take photographs in your cell phone with prior permission during the visit to business units and discussion with people. Produce the black and white print of photographs in your report.

References

- The Oxford Handbook of the Indian Constitution, Oxford university press.

Cases

- Rustom Cavasjee Cooper v. Union of India, (1970) 1 SCC 248
- State of Rajasthan v. Mohan Lal Vyas, AIR 1971 SC 2068 (confirmation of a private
- monopoly, not a violation of fundamental right)
- Mithilesh Garg v. Union of India, (1992) 1 SCC 168 : AIR 1992 SC 221 (Right to
- carry on business, not breached when it is liberalised)
- Chintamanrao v. The State of Madhya Pradesh, AIR 1951 SC 118 (scope of
- reasonable restrictions in relation to trade and occupation)
- Cooverjee B. Bharucha v. Excise Commissioner, Ajmer, AIR 1954 SC 220 (the
- reasonableness of the restriction imposed may depend upon the nature of the
- business and prevailing conditions including public health and morality)
- T. B. Ibrahim v. Regional Transport Authority. Tanjore, AIR 1953 SC 79
- Harman Singh v. RTA, Calcutta, AIR 1954 SC 190
- Dwarka Prasad Laxmi Narain v. State of U.P., AIR 1954 SC 224
- State of Bombay v. R.M.D. Chamarbaugwala, AIR 1957 SC 699
- Parbhani Transport Coop. Society Ltd. v. Regional Transport Authority, Aurangabad, AIR 1960 SC 801
- State of Bombay v. R. M. D. Chamarbaugwala, (1957) S.C.R. 874,
- G.K.Krishnan vs State of Tamil Nadu, 1975 SCC (1) 375
- Automobile Transport (Rajasthan) Ltd. Vs State of Rajasthan, AIR 1962 SC 1406