

SCHEME & SYLLABUS

BCA Course - 04 Years

(3/4 years Honours or Honours with Research)

Four Year Under-Graduate (FYUG) Programme as per NEP Choice Based Credit System Semester Scheme with Multiple Entry and Exit Options



Programme Code: UG002 (Academic Session 2025-26 onwards)
National Higher Education Qualifications Framework (NHEQF)
Level (3 Years- 5.5, 4 Years- 6)

Department of Computer Science and Applications
UICAIS

Sant Baba Bhag Singh University
Batch: 2025-2026 onwards (As Per NEP 2020)

SCHEME & SYLLABUS

(04 YEARS BCA PROGRAMME)

Session: 2025-29

ABOUT THE BCA

Computer Application has been evolving as an important branch of science and technology in the last few years and it has carved out a space for itself like computer science and engineering. Computer application spans theory and more application and it requires thinking both in abstract terms and in concrete terms. Computer science has a wide range of specialities. These include computer architecture, software systems, Graphics, Artificial Intelligence, Mathematical and Statistical Analysis, Data science, Computational Science and Software Engineering.

SALIENT FEATURES OF THE DEPARTMENT

- Research oriented curriculum designed to enable students to acquire all the skills needed to collect and analyze the data.
- The Institute draws upon its strength of highly qualified well trained faculty, state of art infrastructure and innovative teaching methodology.
- Elective courses that bridge the gap between industry requirements and academia.
- Hands-on experience in most of the courses of computer applications so as to impart practical knowledge in the relevant field.
- To keep the students at par with the emerging technologies prevailing in the market, the institute is furnished with various specialized research Ps and software Ps.

BCA (BACHELOR IN COMPUTER APPLICATION)

- The Program outcomes in BCA are aimed at allowing flexibility and innovation in design and development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in BCA courses, in the outcome-based curriculum framework, help students learn solving problems, accomplishing IT tasks, and expressing creativity, both individually and cooperatively. The proposed framework will help Students learn programming techniques and the syntax of one or more programming languages. **After graduating with a 4 years**

degree, the students are eligible for 1 year MCA (Master in Computer Application) Programme.

VISION

- To prepare technically proficient and skillful computer professionals thereby contributing towards building a strong and developed nation.

MISSION

- To provide innovative and quality knowledge to students for global competence and excellence. Also, to prepare high quality Professionals for catering the needs of industry.

ELIGIBILITY CRITERIA

- 10+2 or its equivalent examination in any stream conducted by a recognized Board/ University/Council

DURATION

- 4 Years

The present Curriculum Framework for BCA degrees is intended to facilitate the students to achieve the following:

- To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation
- To develop the ability to use this knowledge to analyze new situations in the application domain.
- To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit the above-mentioned purpose.
- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems
- To learn skills and tools like mathematics, statistics and electronics to find the solution, interpret the results and make predictions for the future developments
- To formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate.

The objectives of the Programme are:

- The primary objective of this program is to provide a foundation of computing principles and business practices for effectively using/managing information systems and enterprise software.
- It helps students analyze the requirements for system development and exposes students to business software and information systems.
- This course provides students with options to specialize in legacy application software, system software or mobile applications.
- To produce outstanding IT professionals who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves.
- To provide opportunity for the study of modern methods of information processing and its applications.
- To develop among students the programming techniques and the problem- solving skills through programming.
- To prepare students who wish to go on to further studies in computer science and related subjects.
- To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications.

Program Outcomes:

PO1: Discipline knowledge: Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity.

PO2: Problem Solving: Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.

PO3: Design and Development of Solutions: Ability to design and develop algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.

PO4: Programming a computer: Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.

PO5: Application Systems Knowledge: Possessing a sound knowledge on computer application software and ability to design and develop apps for applicative problems.

PO6: Modern Tool Usage: Identify, select and use a modern scientific and IT tool or technique for modeling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.

PO7: Communication: Must have reasonably good communication knowledge both in oral and writing.

PO8: Project Management: Practicing existing projects and becoming independent to launch own projects by identifying a gap in solutions.

PO9: Ethics on Profession, Environment and Society: Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.

PO10: Lifelong Learning: Should become an independent learner. So, learn to learn ability.

PO11: Motivation to take up Higher Studies: Inspiration to continue education towards advanced studies on Computer Science.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Apply standard Software Engineering practices and strategies in real -time software project development

PSO2: Design and develop computer programs/computer -based systems in the areas related to AI, algorithms, networking, web design, cloud computing, IoT and data analytics

PSO3: Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

PSO4: The ability to apply the knowledge and understanding noted above to the analysis of a given information handling problem.

PSO5: The ability to work independently on a substantial software project and as an effective team member

CHOICE BASED CREDIT SYSTEM (CBCS)

The choice based credit system provides flexibility in designing curriculum and assigning credits based on the course content and hour of teaching. The choice based credit system provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective and open elective courses. The CBCS provides a cafeteria type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. The courses shall be evaluated on the grading system, which is considered to be better than the conventional marks system. It is necessary to introduce the grading system to make uniformity among all technical institutions of India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in the evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the AICTE has formulated the guidelines to be followed.

Curriculum Structure: BCA degree programme will have a curriculum with SylPi consisting of following type of courses:-

- A. **Core Courses:** A course, which should be studied compulsorily by a candidate as a necessary requirement is termed as a core course.
- **Major: Compulsory Course**
 - **Minor: Use their minor course to focus or specialized certain area**
 - **Skill/ Vocational: Skill Enhancement**
 - **Multidisciplinary Course : Introduce for other course**
- B. **Elective Course:** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
- **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

- **Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

C. Major Specific Elective courses (MSE): Elective courses offered under the major: Management/ Economics/History/Sociology/Political science/Philosophy/Public administration shall be referred to as major specific electives.

D. Open Elective Courses (OE): Open electives courses offered under the related stream/disciplines (Languages/Performing and visual arts) and those under the unrelated streams/disciplines (Physical and chemical sciences/Mathematical, Management and computational sciences) to seek exposure beyond main discipline of choice shall be referred to as open elective courses.

As per UGC Guidelines:

Outline of Choice Based Credit System:

1. Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
2. Elective Course: Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
 - 2.1 Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
 - 2.2 Dissertation/Project: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a a teacher/faculty member is called a dissertation/project.
 - 2.3 Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

P.S.: A core course offered in a discipline /subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. Ability Enhancement Courses (AEC): The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). “AECC” courses are the courses based upon the content that leads to Knowledge enhancement;

i) Environmental Science and

ii) English/MIL Communication

These are mandatory for all disciplines.

SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

3.1 Ability Enhancement Compulsory Courses (AECC): Environmental Science, English Communication/ MIL Communication.

3.2 Skill Enhancement Courses (SEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

* Introducing Research Component in Under-Graduate Courses

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

Points to be considered

- The NEP 2020 offers the students the option of choosing a 01 year Diploma, a 03 years bachelor degree or a 04 years bachelor degree with research across disciplines.

GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

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

B. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
CC	Core Courses
AEC	Ability Enhancement Courses
MDE	Multi-Disciplinary Elective course
VAC	Value added Courses
SEC	Skill Enhancement courses
DSE	Discipline Specific Elective
OE	Open Elective

Course Name: Bachelor in Computer Application, Bachelor in Computer Application (Honours) and Bachelor in Computer Application (Honours with Research)

Course Level/Duration/System:

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

- One year:** Under Graduate Certificate in Computer Application (**Total Credits:50**)
- Two years:** Under Graduate Diploma in Computer Application (**Total Credits:97**)
- Three years:** Bachelor in Computer Application (BCA) (**Total Credits:147**)
- Four years:** Bachelor in Computer Application with Honours: BCA (Honours) or Bachelor in Computer Application Honours with Research: BCA (Honours with Research) (**Total Credits:195**)

Minimum Eligibility Criteria:

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

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

SEMESTER WISE CREDIT DISTRIBUTION:

SEMESTER WISE CREDIT DISTRIBUTION OF PROPOSED BCA [BCA (HONOURS) AND BCA (HONOURS WITH RESEARCH)] PROGRAM:

Semester	Core Courses	Ability Enhancement Courses	Multi-Disciplinary Elective Courses	Value Added Courses	Skill Enhancement Courses	Discipline Specific Elective	Practical Subjects	Total
I	20	-	-	2	-	-	6	28
II	17	2	-	3	3	-	4	29
III	11	-	1	6	3	-	5	26
IV	15	3	-	2	-	-	2	22
V	18	-	-	2	-	-	4	24
VI	-	-	-	-	-	-	-	20
BCA (Research)								
VII	19	-	-	2	-	-	6	27
BCA (Research With Honours)								
VII	19	-	-	-	2	-	6	27
VIII	-	-	-	-	-	-	-	20

*Category-wise distribution**

Description	Core Courses	Ability Enhancement Courses	Multi-Disciplinary Elective Courses	Value Added Courses	Skill Enhancement Courses	Discipline Specific Elective	Practical Subjects	Total
BCA	81	05	01	15	06	-	27	135
BCA (Research)	19	00	00	02	00	-	6	47
BCA (Research With Honours)	19	00	00	00	02	-	6	47

3 Years BCA Program	Total Credits = 135
4 Years BCA (Research) and BCA (Research With Honours)	Total Credits = 182

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

Course Scheme (BCA Program)
Semester 1

I. Theory Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA151	Fundamentals of IT	4:1:0	4:1:0	5	5
2	Major Course	CSA153	Introduction to Data Communication and Networks	4:1:0	4:1:0	5	5
3	Major Course	CSA155	C Programming	4:1:0	4:1:0	5	5
4	Major Course	CSA163	Indian Knowledge System (Ancient Indian Innovations in Computer Technology)	4:1:0	4:1:0	5	5
5	AEC	AEC/JK (LS)-I	Jeevan Kaushal Life Skills 2.0 (Communication Skills in English-I)	2:0:0	2:0:0	2	2
6	PT	PT102/PT104/PT106	Physical Training (NSO/NCC/NSS)	0:0:2	NC	2	NC

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA157	Fundamentals of IT (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA159	C Programming (P)	0:0:4	0:0:2	4	2
3	Major Course	CSA161	Data Communication and Networks (P)	0:0:4	0:0:2	4	2

Total Credits: 28
Total Contact Hours: 36

Semester 2**I. Theory Subjects**

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA152	Object Oriented Programming with C++	4:0:0	4:0:0	4	4
2	Major Course	CSA154	Introduction to Web Technology	4:0:0	4:1:0	5	5
3	Major Course	CSA156	Operating System Principles	4:0:0	4:0:0	4	4
4	Major Course	MAT174	Fundamentals of Elementary Mathematics	4:0:0	4:0:0	4	4
5	AEC	AEC-II	Jeevan Kaushal 2.0 (Communication Skills in English -II)	2:0:0	2:0:0	2	2
6	VAC	VAC016	Value Added Course(Fitness & Wellness)	3:0:0	3:0:0	3	3
7	SEC	SEC008	Skill Enhancement Course (E-Filing of Tax Returns - Theory)	3:0:0	3:0:0	3	3
8	PT	PT201/PT203/PT205	Physical Training (NSO/NCC/NSS)	0:0:2	NC	2	NC

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA158	Object Oriented Programming with C++ (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA160	Introduction to Web Technology (P)	0:0:4	0:0:2	4	2

Total Credits: 29
Total Contact Hours: 35

***Students exiting after one year have to do Vocational Course**

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

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

The mode and specifics of these additional credits will be determined by the respective **University/Admitting Body**, 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 into Third Semester for completion of the BCA Program as per the respective University /Admitting Body schedule after earning requisite credits in the First year.

Semester 3**I. Theory Subjects**

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA251	Simplified Approach to Data Structure	3:1:0	3:1:0	4	4
2	Major Course	CSA253	Introduction to Database Management System	4:0:0	4:0:0	4	4
3	Minor Course	CSA255	Essentials of Software Engineering	3:0:0	3:0:0	3	3
4	VAC	VAC022/ EVS200	Value Added Course (Environmental Education)	4:0:0	4:0:0	4	4
5	SEC	SEC006	Skill Enhancement Course (Tally Computer Based Accounting Practical)	3:0:0	3:0:0	3	3
6	VAC	VAC-II (JKM001)	Mulya Pravah 2.0 (Human Values and Professional Ethics)	2:0:0	2:0:0	2	2
7	MDC	CSR001	Community Engagement and Social Responsibilities	1:0:0	1:0:0	1	1

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA257	Simplified Approach to Data Structure (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA259	Introduction to Database Management System (P)	0:0:4	0:0:2	4	2
3	MDC	CSR002	Community Engagement and Social Responsibilities (P)	0:0:1	0:0:1	1	1

Total Credits: 26
Total Contact Hours: 30

Semester 4**I. Theory Subjects**

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA252	Concepts of Computer Architecture	3:1:0	3:1:0	4	4
2	Major Course	CSA254	Basics of Java Programming	4:0:0	4:0:0	4	4
3	Major Course	MAT274	Title Computer Oriented Statistical Methods	4:0:0	4:0:0	4	4
4	Major Course	CSAIKS02	Indian Knowledge System (Artificial Intelligence)	3:0:0	3:0:0	3	3
5	VAC	VAC	Jeevan Kaushal Life Skills 2.0 (Universal Human Values)	2:0:0	2:0:0	2	2
6	AEC	AEC001	Ability Enhancement Course(Functional English-I)	3:0:0	3:0:0	3	3

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA256	Basics of Java Programming (P)	0:0:4	0:0:2	4	2

Total Credits: 22
Total Contact Hours: 24

National Higher Education Qualifications Framework (NHEQF 5)

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 Applications**. 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 5**I. Theory Subjects**

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA351	Development of Applications using Android programming	4:0:0	4:0:0	4	4
2	Major Course	CSA353	Basics of Computer Graphics	3:1:0	3:1:0	4	4
3	Major Course	CSA355	Introduction to Internet Applications	4:0:0	4:0:0	4	4
4	Minor Course	CSA357	IT Management	3:0:0	3:0:0	3	3
5	Minor Course	CSA359	Basics of Electronics	3:0:0	3:0:0	3	3
6	VAC	VAC	Jeevan Kaushal Life Skills 2.0 (Leadership and Management Skills)	2:0:0	2:0:0	2	2

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA361	Development of Applications using Android programming (P)	0:0:4	0:0:2	4	2
2	Major	CSA363	Basics of Computer Graphics (P)	0:0:4	0:0:2	4	2

Total Credits: 24
Total Contact Hours: 28

Semester 6

Apprenticeship/Internship Training (ATS001)

Guidelines for the Apprenticeship in the Sixth Semester of the BCA Programme can vary slightly depending on the university or institution, but here's a general structure that many BCA programmes follow:

1. Objective: To provide students with hands-on experience in a real work environment and apply the theoretical knowledge gained in the previous semesters.

2. Duration: Typically 4 to 6 months. Covers the entire 6th semester of the BCA programme.

3. Eligibility: Students must have successfully completed the first five semesters of BCA.

4. Work Scope: Students may work on:

- Software/application development
- Web development
- Database management
- Networking
- IT support and services
- Testing and QA
- Cyber Security
- Data analytics

5. Documentation and Reporting: **Daily/Weekly Log Book:** Students must maintain records of their daily tasks. **Mid-Term Review:** Some colleges may conduct an internal review midway. **Final Report:** A detailed project/apprenticeship report must be submitted at the end of the term.

6. Evaluation:

Generally includes:

- Supervisor's evaluation from the organization
- Internal faculty evaluation (viva + report)
- Weightage in final semester results (often 100-200 marks)

7. Code of Conduct: Students must follow the organization's rules and professional ethics. Regular attendance and performance are mandatory.

8. Certification: A certificate of completion must be obtained from the organization, detailing the nature of work and duration.

Total Credits: 20

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

National Higher Education Qualifications Framework (NHEQF 5.5)

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.



Semester 7 (For Research Opting Student)**I. Theory Subjects**

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA451	Advanced Data Structures	4:0:0	4:0:0	4	4
2	Major Course	CSA453	Database Administration	4:0:0	4:0:0	4	4
3	Major	CSA455	Recent Trends in the field of IT	3:0:0	3:0:0	3	3
4	Major Course	CSA457	Linux Administration	3:1:0	3:1:0	4	4
5	Minor Course	CSA459	Introduction to Research Methodology	3:1:0	3:1:0	4	4
6	VAC	VAC	Jeevan Kaushal Life Skills 2.0 (Professional Skills)	2:0:0	2:0:0	2	2

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA461	Research Synopsis	0:0:8	0:0:4	8	4
2	Major Course	CSA463	Advanced Data Structures (P)	0:0:4	0:0:2	4	2

Total Credits: 27
Total Contact Hours: 33

Semester 7 (For Honours Students)**I. Theory Subjects**

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA451	Advanced Data Structures	4:0:0	4:0:0	4	4
2	Major Course	CSA453	Database Administration	4:0:0	4:0:0	4	4
3	Major	CSA455	Recent Trends in the field of IT	3:0:0	3:0:0	3	3
4	Major Course	CSA457	Linux Administration	3:1:0	3:1:0	4	4
5	Minor Course	CSA459	Introduction to Research Methodology	3:1:0	3:1:0	4	4
6	SEC	SEC039	Professional Skills	2:0:0	2:0:0	2	2

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA461	Project	0:0:4	0:0:2	4	2
2	Major Course	CSA463	Advanced Data Structures (P)	0:0:4	0:0:2	4	2
3	Major Course	CSA465	Database Administration (P)	0:0:4	0:0:2	4	2

Total Credits: 27
Total Contact Hours: 33

Semester 8 (For Honours/Research Opting Students)

Apprenticeship/Internship Training (ATS002)

Guidelines for the Apprenticeship in the Sixth Semester of the BCA Programme can vary slightly depending on the university or institution, but here's a general structure that many BCA programmes follow:

1. Objective: To provide students with hands-on experience in a real work environment and apply the theoretical knowledge gained in the previous semesters.

2. Duration: Typically 4 to 6 months. Covers the entire 6th semester of the BCA programme.

3. Eligibility: Students must have successfully completed the first five semesters of BCA.

4. Work Scope: Students may work on:

- Software/application development
- Web development
- Database management
- Networking
- IT support and services
- Testing and QA
- Cyber Security
- Data analytics

5. Documentation and Reporting: **Daily/Weekly Log Book:** Students must maintain records of their daily tasks. **Mid-Term Review:** Some colleges may conduct an internal review midway. **Final Report:** A detailed project/apprenticeship report must be submitted at the end of the term.

6. Evaluation:

Generally includes:

- Supervisor's evaluation from the organization
- Internal faculty evaluation (viva + report)
- Weightage in final semester results (often 100-200 marks)

7. Code of Conduct: Students must follow the organization's rules and professional ethics. Regular attendance and performance are mandatory.

8. Certification: A certificate of completion must be obtained from the organization, detailing the nature of work and duration.

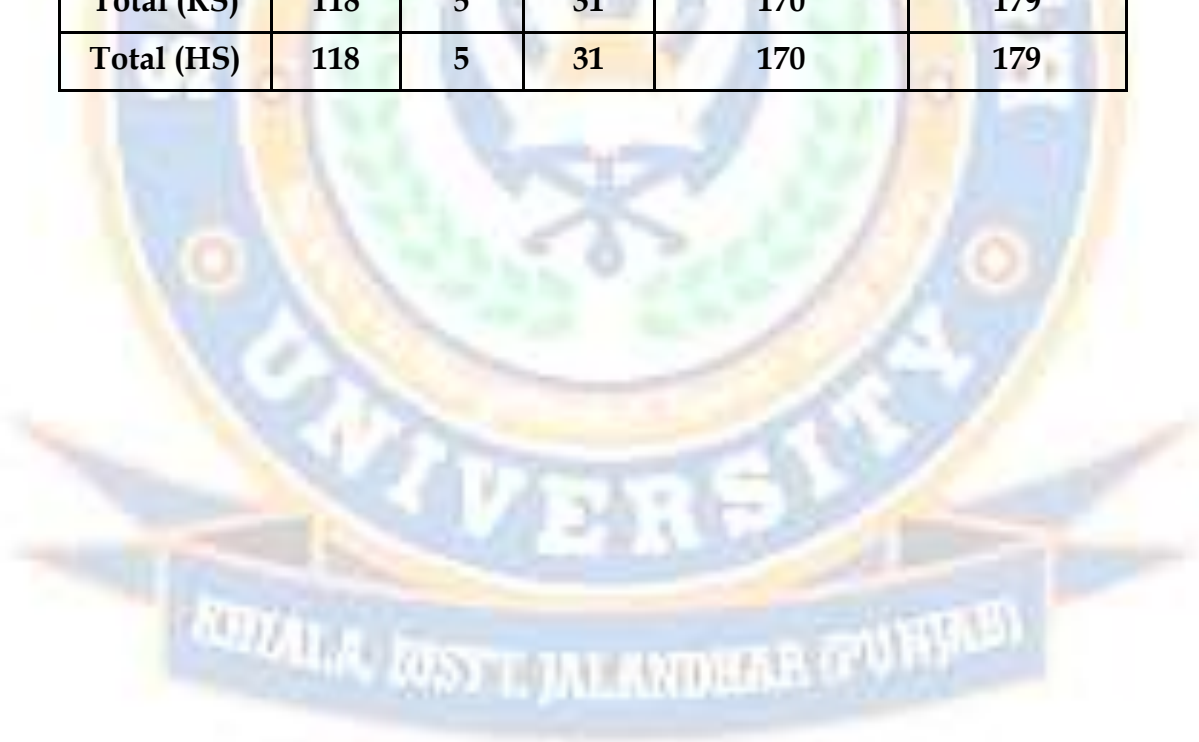
A Bachelor's degree 'Honours with research' after a 4-year (eight semesters) programme of study if the student completes a rigorous research project in her/his major area(s) of study as specified by the HEI.

Total Credits: 20

National Higher Education Qualifications Framework (NHEQF 6)

Summary of Scheme

Semester	L	T	P	Contact Hours Per Week	Credits
1	17	0	4	27	21
2	24	0	4	34	28
3	20	1	5	30	26
4	19	1	2	24	21
5	19	1	10	28	30
6	--	--	--	--	20
7 (RS)	19	2	6	27	33
7 (HS)	19	2	6	27	33
8	--	--	--	--	20
Total (RS)	118	5	31	170	179
Total (HS)	118	5	31	170	179



The logo of Sant Baba Bhag Singh University is a circular emblem. The outer ring contains the text "SANT BABA BHAG SINGH UNIVERSITY" in blue capital letters. Inside this ring is a smaller circle with a green border and a white center. The center features a stylized figure of a person with arms raised, possibly a deity or a saint, set against a background of green leaves. Above the figure, the letters "BBSU" are visible. Below the main circular emblem is a blue banner with white text that reads "KOTLA, DISTT. JALANDHAR (PUNJAB)".

First Semester

Course Code	CSA151
Course Title	Fundamentals of IT
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic Knowledge About Computers
Course Objective(s)	To gain experience about MS-Office. To help students to understand the basic concepts of computer.
Course Outcome (CO)	The students will be able to: <ol style="list-style-type: none"> 1. Understand the basic concepts of computer 2. Understand the various storage devices 3. Learn basics of Word Processing, Spread Sheets and Presentation. 4. Learn new concepts used in IT world.

SYLLABUS

UNIT-I:

Fundamentals of computer: Introduction to Computers, Generation of Computers, classification of Computer, block diagram of Computer and applications of computer.

Introduction to peripheral devices: Introduction to various Input and Output devices with its types.

Operating system and its functions: types of operating system (Single user, multi-user, multitasking, time sharing, distributed). Fundamentals of DOS, internal and external commands.

UNIT-II:

Storage Devices: Introduction to storage devices, types of storage devices: primary memory with its types, secondary memory with its types, cache memory. Primary storage devices (RAM, ROM, PROM, EPROM, EEPROM), secondary storage devices (Floppy disk, Hard disk, optical disk, magnetic tapes). Input and output devices (keyboard, mouse, light pen, joystick, scanner, monitor, printers.)

Introduction to Internet: WWW, Internet, how to compose Email, Email components.

UNIT-III:

Software: Introduction to Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Introduction and working with Word Processing, Spread Sheets and Presentation.

UNIT-IV:

Recent Trends in IT: Introduction to Data Science, Basic concepts of IoT, Introduction to AI, use of AI in IT world, introduction to Robotics. **Emerging Technologies:** Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Fundamentals of Information Technology	Alexis Leon and Mathews Leon	Vikas Publishing House
2.	Computer Fundamentals	P.K. Sinha	BPB Publications
3.	Fundamentals of Computer	E. Balagurusamy	TATA McGraw Hill

Course Code	CSA153
Course Title	Introduction to Data Communication and Networks
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	+2 in any stream
Course Objective(s)	The objective of this course includes learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.
Course Outcome (CO)	The students will be able to: <ol style="list-style-type: none"> 1. Familiar with the different Network Models. 2. Understand different protocols working at Medium Access Sub layer. 3. Learn the concept of network routing through algorithms. 4. Learn and understand Internet protocols and network security.

SYLLABUS

UNIT-I: Computer Networks: Uses of computer Networks, Goals and applications of networks, Computer Network Structure and Architecture, Reference models: OSI model, TCP/IP model, and Comparison of TCP/IP and OSI models. **Medium Access Sub layer:** Static and dynamic channel allocation for LAN and MAN, ALOHA Protocols, LAN Protocols: CSMA, CSMA/CD, Collision Free protocol.

UNIT-II: Networking and Internetworking devices: Repeater, bridges, routers, gateways, switches. **High speed LAN:** FDDI, Fast Ethernet, HIPPI, Fiber channel. LAN IEEE 802.x standards.

UNIT-III: Data Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs. Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC), Framing, Flow Control

UNIT-IV: Internet Protocols: Principles of Internetworking, connectionless internetworking, Internet protocols, IPv6. **Network Security:** Security requirements and attacks, Encryption: Public key encryption and digital Signatures. **Distributed Applications:** SNMP, SMTP, HTTP.

RECOMMENDED BOOKS			
Sr. No.	Name	Author(s)	Publisher
1.	Computer Networks, 3 rd Edition	Andrew S. Tanenbaum	Prentice Hall
2.	Data Communication & Networking	Behrouz A. Forouzan	Tata McGraw Hill
3.	Computer Networks and Internet	D.E. Corner	Addison Wesley

Course Code	CSA155
Course Title	C Programming
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	+2 in any stream
Course Objective(s)	The objective of this course is to provide the students an overview of computer programming.
Course Outcome (CO)	The students will be able to: <ol style="list-style-type: none"> 1. Understand how to create flowcharts. 2. Perform logical proofs. 3. Apply recursive functions. 4. Determine equivalent logic expressions

SYLLABUS

UNIT-I: Introduction: History of languages, high- level, Low level, Assembly languages, Introduction to Algorithm, how to write algorithm, flowchart, symbols used in flowcharts, flowcharts examples to solve complex problems. **Introduction to Programming Language:** character Set, Constants, Types of constants, Variables and Keywords, data types. Instructions: Type Declaration Instruction, Arithmetic Instructions.

UNIT-II: Control structures: Decision making structures: If, If-else, Nested If –else, Switch. Loop Control structures: While, Do-while, for, Nested for loop. Other statements: Break, Continue, goto, Exit. **Arrays and Pointers:** Arrays Initialization, Types of Array. Initializing Two Dimensional & Multidimensional Arrays, Introduction to Pointers. Pointers and Functions.

UNIT-III: Storage Classes and Character Strings: Automatic, Register, Static, External (Local and Global), Strings, Standard library String Functions: strlen (), strcpy (), strcat(), strcmp(). **Functions:** Definition, Passing values between functions, call by value, call by reference, Recursion

UNIT-IV: Structures And Unions: Declaring structure and its variables, Arrays of structures. Introduction to Unions. **Input/Output:** Getchar (), putchar (), printf (), scanf (), puts (), gets () Introduction to files and its operations.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Programming in C	Byron Gottfried, Jitender Chhabra	Schuam out line series
2.	Let us C	Yaswant Kanetkar	BPB Publication
3.	A structured Programming approach using C	Behrouz Forouzan	Thomas learning

Course Code	CSAICS01
Course Title	Indian Knowledge System (Ancient Indian Innovations in Computer Technology)
Type of Course	Major
L T P	3:0:0
Credits	3
Course Prerequisites	Basic historical, mathematical and computational concepts.
Course Objective(s)	To explore ancient Indian contributions to mathematics, logic, and computational concepts that influenced the development of modern computer technology, fostering an appreciation of India's intellectual heritage and its relevance to contemporary innovation.
Course Outcome (CO)	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the historical evolution of computational concepts in ancient India. 2. Analyze the contributions of Indian mathematicians and scholars to algorithms, number systems, and logic. 3. Relate ancient Indian knowledge to modern computer science principles. 4. Apply interdisciplinary approaches to connect IKS with contemporary technological challenges.

SYLLABUS

UNIT I: Introduction to Indian Knowledge System and Computational Thought: Introduction to Indian Knowledge Systems, their interdisciplinary nature and relevance to modern science and technology. Ancient Indian Scientific Traditions: Role of Vedas and Shulba Sutras in fostering systematic thinking. Computational Thinking in Ancient India.

UNIT II: The Concept of Zero and the Decimal System: Origin of Zero (Shunya): Contributions of Indian mathematicians (Brahmagupta, Aryabhata) to the concept of zero as a number and placeholder. Decimal Place-Value System: Development and significance in arithmetic operations, its impact on modern computing algorithms.

UNIT III: Algorithms and Mathematical Innovations: Aryabhata's Algorithms and their relevance to computational algorithms. Bhaskaracharya's Contributions: Vedic Mathematics.

UNIT IV: Interdisciplinary Applications and Modern Relevance: Ancient Indian Innovations in Technology: Metallurgy, architecture, and water management systems as examples of systematic engineering thought. Relevance to Modern Computer Science: How ancient concepts of zero, algorithms, and logic underpin binary systems, data structures, and AI.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Introduction to Indian Knowledge System: Concepts and Applications	Mahadevan, B., Bhat, V. R., & Nagendra, P. R. N.	PHI Learning. ISBN: 978-9391818203
2.	History of Technology in India, Vol. I	Bag, A. K.	Indian National Science Academy, New Delhi.
3.	Indian Knowledge Systems Vol. I & II	Kapoor, K., & Singh, A.	Indian Institute of Advanced Study, Shimla.

Course Code	AEC/JK(LS)-I
Course Title	Jeevan Kaushal Life Skills 2.0 (Communication Skills in English-I)
Type of Course	AEC
L T P	2:0:0
Credits	2
Course Prerequisites	+2 in any stream
Course Objective(s)	The course will introduce learners to the role and importance of effective communication at work. It presents theories and principles of communication responsible for good interpersonal interaction. Students will be prepared to communicate effectively in a variety of contexts and different mediums. The Units are structured around the communication tasks of managers.

SYLLABUS

UNIT-I:

Basics of Communication Skills: Communication, Process of Communication, Types of Communication Verbal and Non-verbal communication, Channels of Communication- Upward, Downward, Horizontal, Barriers to Communication, Role of Communication in society.

UNIT-II:

Listening Skills: Listening Process, Hearing and Listening, Types of Listening, Effective Listening, Barriers to Effective Listening, Note Taking. **Reading Skills:** Purpose of reading, Process of reading, Reading skills Models and strategies, scanning, skimming, SQ3R, Approaches of Reading, Comprehension passages for practice.

UNIT-III:

Purpose of writing, Effective writing, Types of writing, Business Correspondence, Precis writing, Memo writing, Minutes of meeting.

UNIT-IV:

Speaking Skills: Speech Mechanism, Sounds System, Articulation, Vowels & Consonants, Skills for effective speaking, Role of audience, Feedback Skill, Oral Presentation.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Bhupender Kour	Effectual Communication Skills	S.K. Kataria and Sons
2.	Communication Skills	D. Dutta Roy and K.K. Dheer	Vishal Publishing Company


Objective: The objective of this practical course is to introduce the fundamental concepts of computers, hardware and table to interact with Documentation, PowerPoint and Spreadsheet.

1. Familiar with various components of CPU.
2. Familiar with various Software and Hardware components.
3. Introduction of Office & Internet usage
4. Introduction to MS Word.
5. Prepare time-table in Word.
6. Create a Resume for the Jobs in different styles.
7. Introduction of PowerPoint.
8. Prepare Presentation in PowerPoint by applying Formatting Tools.
9. Introduction of Excel
10. Prepare Mark sheet in Excel.
11. Prepare the record of Employees of an organization.
12. Prepare the graphical representation of Sales of company for at least 5 years.



Objective: The objective of this practical course is to to understand the implementation of language. This Programming language helps in solving a problem.

1. Write and execute program to show the working of input/output statements.
2. Write and execute programs to show the use of different types of operators (arithmetic, relational, logical, and conditional).
3. Write and execute programs based on conditional control statements (if, if-else)
4. Write and execute programs based on switch-case statements.
5. Write and execute programs based on for loops
6. Write and execute programs based on while loop and do while loop.
7. Write and execute programs based on jumping control statements (break, continue).
8. Write and execute programs to implement one dimensional array.
9. Write and execute programs to implement two dimensional arrays.
10. Write and execute programs to show the use of pointers.
11. Write and execute programs to perform various functions on strings.
12. Write and execute programs based on use of functions (call by value)
13. Write and execute programs based on use of functions (call by reference)
14. Write and execute programs using recursive functions.
15. Write and execute programs to illustrate the concept of Structure and Union.

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Second Semester

Course Code	CSA152
Course Title	Object Oriented Programming With C++
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic Programming Skills/ Programming in C
Course Objective(s)	The objective of this course is to expose the student to procedural programming using C++ and to increase the depth of students' knowledge about several implementation issues.
Course Outcome (CO)	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Understand how C++ improves C with object-oriented features. 2. Learn how to write inline functions for efficiency and performance. 3. Learn the syntax and semantics of the C++ programming language. 4. Learn how to design C++ classes for code reuse.

SYLLABUS

UNIT-I Basics: Introduction to C++, Tokens, Identifiers, data types, control statements, functions, array, structure, union, pointers. **Classes and Objects:** Classes, Structures and Classes, Unions and Classes are Related, Friend Functions, Friend Classes, Inline Functions, Constructors and its types, Static Class Members, When Constructors and Destructors are Executed, Scope Resolution Operator, Nested Classes, Local Classes, Passing and Returning Objects, Object Assignment. **Arrays, Pointers, References and the Dynamic Allocation:** Arrays of Objects, Pointers, References, Dynamic Allocation Operators, The Placement Forms of new and delete.

UNIT-II Function Overloading and Default Arguments: Function Overloading, Overloading Constructor Functions, Finding the Address of an Overloaded Function, Overload Anachronism, Default Arguments, Function Overloading and Ambiguity. **Operator Overloading:** Creating Member Operator Function, Overloading Using a Friend Function, Overloading new delete, Overloading Special Operators & Comma Operator.

UNIT-III: Inheritance: Base-Class Access Control, Inheritance and protected members, Inheriting Multiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes. **Virtual Functions & Polymorphism:** Virtual Functions, The Virtual Attribute is inherited, Virtual Functions are Hierarchical, Pure Virtual Functions, Using Virtual Functions, Early Vs Late Binding. **Templates:** Generic Functions, Applying Generic Functions, Generic Classes, Type name and export Keywords, Power of Templates.

UNIT-IV: Exception Handling: Fundamentals, Derived-Class Exceptions, Options, Terminate() and unexpected(), uncaught exception(), exception and bad exception Classes, Applying Exception Handling. **The C++ I/O System Basics:** Old Vs. Modern C++ I/O, Streams, Stream Classes, Formatted I/O, Overloading << and >>, Creating Manipulators.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Object Oriented Programming with C++	E. Balaguruswamy	Tata Mc. Graw Hill
2.	Object Oriented Programming using C++	R. Lafore	Galgotia Publications
3.	Mastering C++	A.R. Venugopal, Rajkumar, T. Ravishanker	TMH



Course Code	CSA154
Course Title	Introduction to Web Technology
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Programming
Course Objective(s)	The objective of the course is to introduce WWW, HTML, CSS and JavaScript.
Course Outcome (CO)	The students will be able to: <ol style="list-style-type: none"> 1. Create web pages. 2. Understand the concept of JavaScript. 3. Identify the difference between the HTML PHP and XML documents. 4. Understand the JSP and Servlet concepts.

SYLLABUS

UNIT-I Introduction to Web Technology: Overview of the Internet and World Wide Web (WWW) Web architecture: Client-Server model, HTTP/HTTPS protocols. Web browsers and web servers: Introduction to web development tools (e.g., text editors, IDEs, browser developer tools) Web standards and W3C recommendations Static vs. dynamic websites.

UNIT-II Client-Side Technologies: HTML and CSSHTML5: Structure, elements, attributes, semantic tags Forms, multimedia elements (audio, video), and responsive design. CSS3: Selectors, properties, box model, and layouts. Responsive web design using media queries CSS frameworks (e.g., Bootstrap basics). **Introduction to JavaScript:** Syntax, variables, data types, operators Control structures: Loops, conditionals Functions: Declaration, expressions, arrow functions Arrays and objects (Math, String, Date) DOM (Document Object Model) manipulation Event handling and event listeners Introduction to JSON (JavaScript Object Notation).

UNIT-III: Server-Side Programming with PHP: Introduction to server-side programming PHP basics: Syntax, variables, operators, constants Control structures: Conditionals, loops PHP functions and recursion String manipulation and regular expressions in PHP Embedding PHP scripts in HTML Handling forms and user input File handling and session management Introduction to object-oriented programming in PHP Connecting PHP with databases (e.g., MySQL basics).

UNIT-IV: Web Development Tools and Frameworks (4-6 Hours)Introduction to content management systems (CMS) (e.g., Word Press basics) Overview of JavaScript frameworks (e.g., React, Angular, or Vue.js introduction)Version control systems (e.g., Git basics)Debugging and testing web applications. Web hosting and deployment basics

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Web Technologies	Uttam K. Roy	Oxford
2.	Learning PHP, MySQL, JavaScript, CSS & HTML5	Robin Nixon	O' Reilly

Course Code	CSA156
Course Title	Operating System Principles
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic computer knowledge and OS DOS Windows
Course objective(s)	The objective of this course is to help students become familiar with the fundamental concepts of operating systems and provide students with sufficient understanding of operating system design.
Course Outcome (CO)	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the importance of computer system resources and the role of operating system in their management policies and algorithms 2. Understand the process management policies and scheduling of processes by CPU 3. Evaluate the requirement for process synchronization and coordination handled by operating system 4. Describe and analyze the memory management and its allocation policies

SYLLABUS

UNIT-I: Introduction: Importance of Operating system. Basic concepts and terminology, An Operating system Resource manager, Operating Systems functions, Services provided by operating system, Types of operating systems, An Operating system- Process and system calls, Operating system architecture, Processor and user modes, Virtual Machine.

UNIT-II: Memory management: Physical and virtual address space, Single Contiguous Allocation, Partitioned Allocation, Fragmentation, Paging, Segmentation, Virtual memory and Demand paging, Page replacement algorithms. **Processor Management:** Process, Process control block, State Model, Non-pre-emptive and pre-emptive scheduling, Process Scheduling Algorithms, Deadlocks- detection and prevention.

UNIT-III: Information Management: Directory structure, File operations, A Simple File System, General Model of a File System, File allocation methods.

UNIT-IV: OS and Security: Security breaches, types of attacks, attack prevention methods, security policy and access control, OS design considerations for security, access, policy and access control, OS design considerations for security, access control lists and OS support, internet and network security, Policy mechanism, Program, network and system threats, Authentication.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Operating System	William Stallings	Prentice Hall
2.	Operating System Concepts	A. Silberschatz, P.B. Galvin, G. Gagne	John Wiley Publication

Course Code	MAT174
Course Title	Fundamentals of Elementary Mathematics
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Student must have the knowledge of Basic Mathematics
Course Objective(s)	This course aims to provide foundational knowledge in discrete mathematics including matrix theory, set theory, mathematical logic, graph theory, and number systems to develop analytical and problem-solving skills essential for computer applications.
Course Outcome (CO)	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Understand and apply the fundamental concepts of matrices and determinants, including matrix operations, eigenvalues, and the Cayley-Hamilton Theorem for solving systems of linear equations. 2. Demonstrate the ability to use set theory and functions to model and solve real-life problems involving relations, mappings, and operations on sets. 3. Analyze logical statements using truth tables, logical equivalence, and apply mathematical reasoning in problem-solving, including basic concepts of graph theory and trees. 4. Apply the principles of number theory such as division algorithm, GCD, LCM and congruence relations to solve problems in discrete mathematics and computer science.

SYLLABUS

UNIT I: (Matrix and Determinants) Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Dependence of Vectors, Eigen Values of a Matrix, Cayley-

Hamilton Theorem (without proof). Determinants: Definition, Minors, Cofactors, Properties of Determinants.

UNIT II: (Basic of Set Theory) Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications, Properties of Relations, Equivalence Relation, Domain & Range, Onto, Into and One to One Functions, Composite and Inverse Functions.

UNIT III: (Mathematical Logics) Statements, logical connectives, truth tables, Tautologies, contradictions, logical equivalence, Applications to everyday reasoning, Graph theory: Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity, Euler and Hamilton paths, planar graphs, graph coloring, introduction to trees, application of trees.

UNIT IV: (Number System) Division algorithm, greatest common divisor, least common multiple, congruence relation.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Mathematical Statistics	V.K. Kapoor	S. Chand
2.	Text Book of Engineering Mathematics	NP Bali	Laxmi Publication
3.	Introduction to Analytic Number Theory	T. M. Apostol	Springer International Student Edition, Narosa Publishing House
4.	Discrete Mathematics and Its Applications	Kenneth H. Rosen	Mc Graw Hill, 6th Edition



Course Code	AEC-II
Course Title	Jeevan Kaushal Life Skills 2.0 (Communication Skills in English-II)
Type of Course	AEC
L T P	2:0:0
Credits	2
Course Prerequisites	N.A.
Course Objective(s)	To enhance employability skills of the learners by enabling them to write an effective resume and face the interview with confidence.

SYLLABUS

UNIT I:

PUBLIC SPEAKING: Introduction to Public Speaking, Business Conversation, Effective Public Speaking Art of Persuasion

UNIT II:

INTERVIEW SKILLS: Types of Interview, Styles of Interview, Facing Interviews-Fundamentals and Practice Session, Conducting Interviews- Fundamentals and Practice Session, Mock interview sessions

UNIT III:

Writing Skills: Resume Writing, Covering Letters, Interview Follow Up Letters, Email, Fax, Assessment through employability score card

UNIT IV:

ETIQUETTES: Business Etiquette, Dressing up Sense, Exchanging Business card, Shaking hands, Dining etiquette

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Jeremy Comfort	Speaking Effectively	CUP
2.	N. Krishnaswamy	Creative English for Communication	Macmillan
3.	Raman Prakash	Business Communication	CUP

Course Code	SEC008
Course Title	Skill Enhancement Course (E-Filing of Tax Returns - Theory)
Type of Course	SEC
L T P	3:0:0
Credits	3
Course Prerequisites	Basics of marketing information
Course Objective(s)	The course aims at making the students understand concepts, processes and techniques of managing the marketing operations of a firm with a view to better understand the Complexities associated with the marketing function.
Course Outcome (CO)	On successful completion of the course, the students will be able to: <ol style="list-style-type: none"> 1. Understand the basic concepts of marketing and asses the marketing environment. 2. Discover the new product development & identify the factors affecting the price of a Product in the present context. 3. Judge the impact of promotional techniques on the customers & importance of channels of distribution. 4. Outline the recent developments in the field of marketing.

SYLLABUS

UNIT I: Introduction of E-Filing: Meaning of e filing, Difference between e filing and manual filing of returns, Benefits and limitations of e filing, Types of e-filing

UNIT II: Introduction to Income Tax: Basic terminology, Types of assesses, income taxable under different heads, Basics of computation of total income and tax liability, Deductions available from gross total income, Application for PAN card, Due date of filing of income tax return

UNIT III: DS and E Filing of TDS Return: Introduction to TDS, Provisions relating to advance payment of tax, schedule for deposit of TDS, schedule for submission of TDS returns prescribed forms for filing TDS return

UNIT IV: Introduction to GST Concepts and returns: Output tax liability of CGST, SGST, UTGST, IGST, compensation cess, GST Network, Input tax credit and its utilization, Composition supplier, Schedule for payment of GST, GSTR 1,2,3 and 3B.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Self-Preparation and Filing of Income Tax Returns by Individuals	Kotler, P	Prentice Hall of India, New Delhi
2.	Students' Guide to Income Tax	Dr. Vinod K. Singhania & Dr. Monica Singhania	Taxmann Publications, New Delhi
3.	Income Tax Law and Accounts	Dr. H. C. Mehrotra & Dr. S.P. Goyal	Sahitya Bhawan Publications, Agra

Objectives: Acquire knowledge about the basic concept of writing a program. Understanding the practical use of functions, classes, objects, inheritance and polymorphism.

1. Write and execute simple program to show the working of input/output statements.
2. Write and execute programs to show the use of different types of operators.
3. Write and execute programs based on use of functions.
4. Write and execute programs to demonstrate function call by value and call by reference.
5. Write and execute programs to demonstrate inline functions.
6. Write and execute programs to demonstrate function overloading.
7. Write and execute programs to show concept of classes using public, private, protected members.
8. Write and execute programs to demonstrate use of constructor (parameterized and unparameterized constructor, copy constructor, multiple constructors in a class, and constructors with default parameters).
9. Write and execute programs to demonstrate use of destructor.
10. Write and execute programs to demonstrate use of static variables and static functions.
11. Write and execute programs to illustrate different types of inheritance.
12. Write and execute programs to illustrate different access specifiers in inheritance (public, private, protected).
13. Write and execute programs to show the use of pointers to classes.
14. Write and execute programs to show the use of this pointer.
15. Write and execute programs to show the use of friend function.
16. Write and execute programs to show the concept of friend class.
17. Write and execute programs to demonstrate method overloading in classes using different parameters and different return types.
18. Write and execute programs to show the use of virtual function and pure virtual function.
19. Write and execute programs to demonstrate operator overloading in classes with different operators.
20. Write and execute programs using concept of dynamic memory allocation.

Objective: The objectives of this course are to understand different Internet Technologies, learn java-specific web services architecture to Develop web applications using frameworks.

1. Basic HTML Tags, Table Tags, List Tags, Image Tags, Forms .
2. Design the following static web pages required for an online book store web site.
 - i. HOME PAGE: The static home page must contain three frames.
 - ii. LOGIN PAGE
 - iii. CATALOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
 - iv. REGISTRATION PAGE
3. Write JavaScript to validate the following fields of the Registration page.
 - i. First Name (Name should contains alphabets and the length should not be less than 6 characters).
 - ii. Password (Password should not be less than 6 characters length).
 - iii. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
 - iv. Mobile Number (Phone number should contain 10 digits only).
 - v. Last Name and Address (should not be Empty).
4. Develop and demonstrate the usage of inline, internal and external style sheet using CSS.
5. Design a dynamic website with the help of PHP.