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: 2025-2029 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

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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:

a. **One year:** Under Graduate Certificate in Computer Application (**Total Credits:50**)
b. **Two years**: Under Graduate Diploma in Computer Application (**Total Credits:97**)
c. **Three years**: Bachelor in Computer Application (BCA) (**Total Credits:147**)
d. **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	PT101/ PT103/ PT105	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-Filling of Tax Returns - Theory)	3:0:0	3:0:0	3	3
8	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	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	Computer Oriented Statistical Methods	4:0:0	4:0:0	4	4
4	Major Course	CSA258	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

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**

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: **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: **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, 3rd Edition	Andrew S. Tanenbaum	Prentice Hall
2.	Data Communication & Networking	Behrouz A. Forouzan	Tata McGraw Hill
3.	Computer Networks and Internet	D.E. Cormer	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: **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	**CSA163**
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)	The students will be able to: **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 Algorithmsand 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

CSA157 Fundamentals of IT (P)

L T P
0 0 4

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.

CSA159 C Programming (P)

L T P
0 0 4

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.

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)	The students will be able to: **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: **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)	The students will be able to: **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)	The students will be able to: **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-Filling 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: **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	PrenticeHall 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

CSA158 Object Oriented Programming with C++ (P)

L	T	P
0	0	4

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 un parameterized 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.

CSA160 Introduction to Web Technology (P)

L T P
0 0 4

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. CATOLOGUE 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.

Third Semester

Course Code	**CSA251**
Course Title	**Simplified Approach to Data Structure**
Type of Course	Major
L T P	3:1:0
Credits	4
Course Prerequisites	Understanding of programming language either C or C++.
Course Objective(s)	The objective of the course is to introduce the fundamentals of Data Structures, Abstract concepts and how these concepts are useful in problem solving.
Course Outcome (CO)	The students will be able to: **1.** Understand and identify the performance characteristics of fundamental algorithms and data structures. **2.** Check the correctness of algorithms using inductive proofs and loop invariants. **3.** Compare functions using asymptotic analysis. **4.** Familiar with a variety of sorting algorithms.

SYLLABUS

UNIT I:

Introduction to Data Structures: Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation. Algorithms and flowcharts. Basics Analysis on Algorithm, Complexity of Algorithm.

UNIT II:

Stacks and Queue: Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.

UNIT III:

Linked Lists: Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List and Circular Doubly Linked List. Trees **Introduction to Tree:** Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.

UNIT IV:

Graphs: Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms. **Searching and Sorting:** Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Data Structures using C & C++	Tanen Baum	Prenctice-Hall International
2.	An Introduction to Data Structures with Applications	Jean-Paul Tremblay & Paul G. Sorenson	Tata McGraw Hill
3.	Fundamentals of Computer Algorithms	Sahni	Galgotia

Course Code	**CSA253**
Course Title	**Introduction to Database Management System**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic computer fundamentals and programming concepts.
Course Objective(s)	To understand Database Management System as well as to construct queries using SQL.
Course Outcome (CO)	The students will be able to: **1.** Learn the concept of Database Management System. **2.** Design the database for the given problem. **3.** Manage database using SQL. **4.** Understand control structure of DBMS.

SYLLABUS

UNIT I:

Introduction To Database System: Database concepts:-Data, Database, Database management system, File system Vs DBMS, Applications of DBMS, Data Abstraction, Data Independence, Database Schema, The Codd's rules, Overall structure of DBMS. **DBMS Architecture:** Two tier and three tier architecture of database. **Data Models:** Hierarchical, Networking, Relational Data Models.

UNIT II:

Relational Data Model: Relational Structure: Tables (Relations), Rows (Tuples), Domains, Attributes, Entities. **Keys:** Super Keys, Candidate Key, Primary Key, Foreign Key. **Data Constraints:** Domain Constraints, Referential Integrity Constraints. **Entity Relationship Model:** Strong Entity set, Weak Entity set, Types of Attributes, Symbols for ER diagram, ER Diagrams.

UNIT III:

Normalization: Functional dependencies, Normal forms: 1NF, 2NF, 3NF. **Transaction management:** ACID properties, Serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management. **SQL:** Data-types, Data Definition Language (DDL), Data Manipulation language (DML), Data Control Language (DCL), Transaction Control Language (TCL).

UNIT IV:

Joins: Types of Joins, Nested queries. **Clauses:** Different types of clauses- Where, Group by, Order by, having. **Cursors:** Implicit and Explicit Cursors, Declaring, opening and closing cursor, fetching a record from cursor, cursor for loops, parameterized cursors. **Procedures:** Advantages, Create, Execute and Delete a Stored Procedure. **Functions:** Advantages, Create, Execute and Delete a Function. **Database Triggers:** Use of Database Triggers, Types of Triggers, Create Trigger, Delete Trigger.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Data base System Concepts	Silberschatz, Korth	McGraw Hill
2.	Data base Management Systems	R. Krishnan, J. Gehrke	TATA McGraw Hill
3.	An Introduction to Database systems	C.J. Date, A.Kannan, S.Swami Nadhan	Pearson

Course Code	**CSA255**
Course Title	**Essentials of Software Engineering**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	Basic Knowledge About Computers
Course Objective(s)	This course will provide knowledge about testing and maintenance of software.
Course Outcome (CO)	The students will be able to: **1.** Describe key techniques and standards in software testing. **2.** Explain and evaluate strategies for software testing for both complete program life cycles and individual phases. **3.** Develop correct, stable, maintainable and efficient software. **4.** Specify and design test cases and test, debug and optimize programs and produce appropriate documentation.

SYLLABUS

UNIT I:

Software Engineering introduction: software development models. Testing and its concepts: significance and potentials Testability and features of test cases.

UNIT II:

Software Testing Techniques: Definition of Software Testing, Need for software Testing, various approaches to Software Testing, defect distribution, Software Testing Fundamentals. General characteristics of testing. Seven principles of testing.

UNIT III:

Comparative Evaluation of Techniques: Testing tools, dynamic analysis tools, test data generators, debugger and test drivers. Water fall model, V-model, Spiral model, agile model, Life cycle testing concepts, testing methods, testing levels. Static Testing, static analysis tools, dynamic testing, White box testing, block box testing, Regression testing, dynamic testing tools.

UNIT IV:

Technical Metrics for Software: Quality factors, framework, metrics for analysis, design, testing source code, Software maintenance and Reengineering. **Access Project Management** Development Estimate and status, Requirement Phase Testing, Design Phase Testing program Phase Testing, Execute Test and record results, Acceptance Test Report Test results, Testing Software Installation, Test Software Change, Evaluate Test Effectiveness. Testing calculating model (TCM).

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Learning Software Testing with Test Studio	Rawane Madi	Shroff and Pactt
2.	Exploratory Software Testing:	James A. Whittaker	Addison Wesley
3.	Mobile Software Testing	Narayanan Palani	Wiley

Course Code	**VACO22/EVS200**
Course Title	**Value Added Course (Environmental Education)**
Type of Course	VAC
L T P	4:0:0
Credits	4
Course Prerequisites	10+2
Course Objective(s)	To connect and sensitize the students towards the environment and prevailing Environmental issues (natural, physical, social and cultural).
Course Outcome (CO)	On successful completion of the course, the students will be able to: **1.** Appreciate the historical context of human interactions with the environment. **2.** Develop an understanding of pollution and its types **3.** Learn about the concept of Ecosystem, Ecosystem services **4.** Learn about climate change and biodiversity conservation **5.** Understand the relation between social issues and environment. **6.** Learn about the major international treaties and our country's stand on and responses to the major international agreements.

SYLLABUS

UNIT I:

Historical Prospective: Brief introduction of Humans as hunter-gatherers; Mastery of fire; Origin of agriculture, Emergence of city-states; Indic Knowledge and Culture of sustainability, Industrial revolution and its impact on the environment; Population growth and natural resource Exploitation Environment Definition and scope and importance. Environmental Ethics and emergence of environmentalism: World Commission on Environment and Development and the concept of sustainable development; Rio Summit and subsequent international efforts. Natural Resources: Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources, soil and mineral resources. Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.

UNIT II:

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Biodiversity loss: past and current trends, impact Global change: Ozone layer depletion; Climate change. Disasters – Natural and Man-made (Anthropogenic). Biodiversity and its distribution: Biodiversity as a natural resource. Biodiversity in India and the world; Biodiversity hotspots; Species and ecosystem threat categories. Ecosystems in brief: forests, wetlands, grasslands, agriculture, coastal and marine. Ecosystem services- classification and their Significance, Threats to biodiversity and ecosystems Biodiversity Conservation: Major conservation policies: in-situ and ex-situ conservation approaches the role of traditional knowledge, community-based conservation.

UNIT III:

Understanding climate change: Anthropogenic climate change from greenhouse gas emissions, Climate change impact on global warming and its effect on Indian Subcontinent, rise of sea level, Changes in marine and coastal ecosystems, Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment. Mitigation of climate change, National climate action plan. Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g)

and other derived environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control. Environmental management system: ISO 14001 Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis. Environmental audit and impact assessment; Waste Management-Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Eco labeling /Eco mark scheme.

UNIT IV:

Social Issues and the Environment: Unsustainable to Sustainable development, urban problems related to energy, Water conservation, rain water harvesting, and watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Major International Environmental Agreements and National Acts: CBD, Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing, (CITES); Ramseur Convention on Wetlands of International Importance; Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness. Case Studies and Field Work (Any two): Discussion on one national and one international case study related to the environment and sustainable development. Or Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report or Participation in plantation drive and nature camps or Documentation of campus biodiversity.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Environmental Biology Agarwal	K.C. 2001 Nidi Publ. Ltd. Bikaner.	Environmental Biology Agarwal
2.	Environmental Science Miller T.G. Jr. Wadsworth	Environmental Science Miller T.G. Jr. Wadsworth	Environmental Science Miller T.G. Jr. Wadsworth
3.	Perspectives in Environmental Studies	Anubha Kaushik and Gaurav Garg	New Age International Publishers
4.	A Handbook on International Environment Conventions & Programmes	Dr. Kalipada Chatterjee, Shri Samrat Sengupta, Dr. Swayamprabha Das, and Shri Rajesh Sehgal.	Ministry of Environment, Forest and Climate Change
5.	Introduction to Environmental Management 2nd Edition	Theodore, M. K. and Theodore, Louis (2021)	CRC Press.
6.	Climate Change: The Science, Impacts and Solutions. 2nd Edition	Pittock, Barrie (2009)	Routledge
7.	Textbook of Biodiversity	Krishnamurthy, K.V. (2003)	Science Publishers, Plymouth, U

Course Code	**SEC006**
Course Title	**Skill Enhancement Course (Tally Computer Based Accounting Practical)**
Type of Course	SEC
L T P	3:0:0
Credits	3
Course Prerequisites	Basics of Accounting Information
Course Objective(s)	This course is designed to impart knowledge regarding concepts of Financial Accounting Tally is an accounting package which is used for learning to maintain accounts.
Course Outcome (CO)	On successful completion of the course, the students will be able to: **1.** This course is designed to impart knowledge regarding concepts of Financial Accounting Tally is an accounting package which is used for learning to maintain accounts. **2.** To make students aware about the use of accounting software named as Tally.ERP 9 in the accounting field. **3.** To inculcate the required skills on students and make them employable as Tally data entry operator

SYLLABUS

UNIT I:

Introduction to Tally ERP 9: Components of gateway of tally, creating a company, selecting and shutting a company, altering details of a company, features and configurations. Ledgers and Groups: Creating a chart of accounts, ledger and group creation.

UNIT II:

Inventory Masters: Creating inventory masters, displaying and altering inventory. Voucher entry and Invoicing: Creating a new voucher type, entering inventory details in accounting vouchers, creating an account invoice.

UNIT III:

Generating reports in Tally ERP 9: Financial statements, accounting books and registers, inventory books and reports. Cost centres and Cost Categories: Creating cost categories and cost centres, applying cost centres to ledger accounts, cost centre reports. Order Processing and Pre-Closure of Orders: purchase order processing, sales order processing, view order details, pre-closure of orders.

UNIT IV:

Banking: Preparation of bank reconciliation statement. Accounting for Depreciation: Charging depreciation on assets, sale of depreciated assets. Advanced features in Tally ERP 9: export and import of data, backup and restore, multi currency. Create Company and Activate GST in Company Level, Creating Master and Set GST Rates, Creating Tax Ledgers, Recording GST Sales and Printing Invoices, Recording GST Interstate Sales and Printing Invoices.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Implementing Tally ERP 9	Nadhani K.K.	BPB Publications, New Delhi
2.	Computerised Accounting and Business Systems	Sharma Neeraj	Kalyani Publishers Ludhiana
3.	E-Accounting: Theory and Practice.	Sharma Neeraj	Regal Books Publications, New Delhi

Course Code	**VAC-II (JKM001)**
Course Title	**Mulya Pravah 2.0 (Human Values and Professional Ethics)**
Type of Course	Major
L T P	2:0:0
Credits	2
Course Prerequisites	NA
Course Objective(s)	**1.** To help the students to discriminate between valuable and superficial in the life. **2.** To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. **3.** This Course will encourage the students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. **4.** This course is an effort to fulfill our responsibility to provide our students significant input about understanding.
Course Outcome (CO)	The students will able to: **1.** Understand the significance of value inputs in a classroom and startapplying them in their life and profession. **2.** Distinguish between values and skills, happiness and accumulation ofphysical facilities, the Self and the Body etc. **3.** Understand the value of harmonious relationship based on trust and respect in their life and profession. **4.** Distinguish between ethical and unethical practices, and start workingout the strategy to actualize a harmonious environment wherever the work.

SYLLABUS

UNIT I:

Course Introduction-Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education, Understanding Happiness and Prosperity correctly.

UNIT II:

Harmony in Human Relationship: Understanding harmony in the Family - the basic unit of human interaction, visualizing a universal harmonious order in society.

UNIT III:

Understanding of Harmony on Professional Ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.

UNIT IV:

Understanding of Harmony on Professional Ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	A Foundation Course in Value Education	R.R. Gaur, R. Sangal, G.P. Bagaria	Excel Book Publishers
2.	Human Values and Professional Ethics	Rishabh Anand	Satya Prakashan, New Delhi

Course Code	**CSR001**
Course Title	**Community Engagement and Social Responsibilities**
Type of Course	MDC
L T P	1:0:0
Credits	1
Course Prerequisites	Students must be willing to learn and understand the responsibility of Indian citizens towards community development and role of community engagement in national development.
Course Objective(s)	The objective of the study is to enhance students' appreciation of rural culture, knowledge about agricultural and development programs, and understand causes of poverty.
Course Outcome (CO)	After completing this course, students will be able to: CO1: Gain an understanding of rural life, Indian culture and ethos and social realities CO2: Develop a sense of empathy and bonds of mutuality with the local community CO3: Appreciate significant contributions of local communities to Indian society and economy CO4: Learn to value the local knowledge and wisdom of the community CO5: Identify opportunities for contributing to community's socio-economic improvements.

SYLLABUS

UNIT I:

Introduction: Concept, Ethics and Spectrum of Community engagement. Appreciation of Rural Society: Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages' (Gandhi), rural infrastructure.

UNIT II:

Understanding rural and local economy and livelihood: Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets, migrant labour.

UNIT III:

Rural and local Institutions: Traditional rural and community organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), Nagarpalikas and municipalities, local civil society, local administration.

UNIT IV:

Rural and National Development Programmes: History of rural development and current national programmes in India: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM AwaasYojana, Skill India, Gram Panchayat Decentralised Planning, National Rural Livelihood Mission (NRLM), Mahatma Gandhi National Rural Employment Guarantee Act 2005 (MGNREGA), SHRAM, Jal Jeevan Mission, Scheme of Fund for Regeneration of Traditional Industries(SFURTI), Atma Nirbhar Bharat, etc.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Principles of Community Engagement, 2nd Edition	CTSA	NIH Publication No. 11-7782. (2011)
2.	Principles of Community Engagement, 3rd Edition	Elizabeth Cohn et al.	US Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR). (2016)
3.	Handbook on Family and Community Engagement	Sam Redding, Marilyn Murphy, & Pam Sheley	Academic Development Institute/Center on Innovation & Improvement 121 N. Kickapoo Street Lincoln, IL 62656

CSA257 Simplified Approach to Data Structure (P)

L T P

0 0 4

Objective: The course is designed to develop skills to design and analyze simple linear and non linear data structures. It enables them to gain knowledge in practical applications of data structures.

Perform the following programs in C++ programming language and make a record in a practical notebook with relevant outputs.

1. Program to implement queue using arrays.
2. Program to perform Linear Search and Binary Search on an array.
3. Create a stack and perform Pop and Push operations on the stack using Linear Linked list.
4. Program to represent Binary Tree using arrays.
5. Program to Implement a Binary Search Tree using Linked Lists.
6. Program to Implement Singly Linked List.
7. Program to Implement Stack using Linked List.
8. Program to Implement Queue using Linked List.
9. Program to Find Number of Cycles in a Graph.
10. Write a C program to implement bubble sort using function.
11. Write a C program to implement selection sort.
12. Write a C program to implement quick sort.
13. Write a C program to implement merge sort.

CSA259 Introduction to Database Management System (P)

L T P

0 0 4

Objective: The objective of this practical course is to understand the practical applicability of database management system concepts. To work on the existing database systems, designing of database, creating relational database, analysis of table design.

1. Create Database for given application.
2. Create tables for the given application.
3. Assign Primary key for created table and modify the table as per the application needs.
4. Execute the DDL commands of Create, alter, truncate, drop, rename table.
5. Execute the DML commands of Select, Insert, delete, update table.
6. Write queries using DCL Statements for following operations: Grant, Revoke.
7. Write queries using TCL Statements for following operations: Commit, Rollback, Savepoint.
8. Implement queries using Date and Time functions.
9. Implement queries using Aggregate functions
10. Create and Execute Views, Sequence and Index in SQL.
11. Write SQL Queries using built-in Arithmetic functions.
12. Write SQL Queries using built-in String functions
13. Write the query for creating the users and their role.
14. Perform the following operation for demonstrating the insertion, updation and deletion using the referential integrity constraint.
15. Perform the queries for triggers.
16. Write the query to create the views.
17. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT ().
18. Write the query to implement the concept of Integrity constrains.

CSR002 Community Engagement and Social Responsibilities (P)

L T P

0 0 2

Objectives: The course is designed:

- To develop an appreciation for community life, local culture, and rural/urban wisdom.
- To gain firsthand experience with social realities, challenges, and developmental needs.
- To build skills in communication, teamwork, project planning, and problem-solving.
- To foster a sense of empathy and mutual aid.

Module A: Orientation and Community Mapping

1. Understanding the concept of community outreach and citizenship development.
2. Identification of needs and mapping of local resources.

Module B: Rural/Urban Community Engagement

1. Study of local lifestyle, community dynamics, and social structures.
2. Visit to villages, NGOs, or slum areas to understand social issues.

Module C: Social Awareness and Action

1. Conducting workshops on financial literacy, technical skills, or digital literacy.
2. Health and wellness awareness, including mental health and nutrition, in local schools or communities.

- **Module D: Institutional Social Responsibility**

1. Visits to old age homes, orphanages, or centers for differently-abled people.

Fourth Semester

Course Code	**CSA252**
Course Title	**Concepts of Computer Architecture**
Type of Course	Major
L T P	3:1:0
Credits	4
Course Prerequisites	Basic Computer Arithmetic
Course Objective(s)	The objective of this course is to provide a comprehensive understanding of the fundamental building blocks, organization and design principles of digital computers.
Course Outcome (CO)	The students will be able to: **1.** Understand the theory and architecture of central processing unit. **2.** Analyze some of the design issues in terms of speed, technology, cost, performance. **3.** Learn the concepts of parallel processing, pipelining and inter-processor communication. **4.** Understand the basics of hardwired and micro-programmed control of the CPU

SYLLABUS

UNIT I:

Basic computer organization and design, Instructions and instruction codes, Timing and control/ instruction cycle, Register/ Types of register/ general purpose & special purpose registers/ index registers, Register transfer and micro-operations/ register transfer instructions, Memory and memory function, Bus/ Data transfer instructions, Arithmetic logic micro-operations/ shift micro-operations, Input/ Output and interrupts, Memory reference instructions, Memory interfacing memory/ Cache memory.

UNIT II:

Central Processing Unit: General Register Organization/ stacks organizations instruction formats, addressing modes, Data transfer and manipulation. Program control reduced computer, pipeline/ RISC/ CISC pipeline vector processing/ array processing. Arithmetic Algorithms: Integer multiplication using shift and add, Booth's algorithm, Integer division, Floating-point representations. **Computer Arithmetic**: Addition, subtraction and multiplication algorithms, divisor algorithms. Floating point, arithmetic operations, decimal arithmetic operations, and decimal arithmetic operations.

UNIT III:

Input – Output Organization: Peripheral devices, Input/output interface, ALU, Asynchronous mode of data transfer, priority interrupts, Direct memory Address (DMA), Input/ Output processor, serial communication.

UNIT IV:

Evaluation of Microprocessor: Overview of Intel 8085 to Intel Pentium processors Basic microprocessors, architecture and interface, internal architecture, external architecture memory and input/ output interface. Assembly language, Assembler, Assembly level instructions, macro, use of macros in I/C instructions, program loops, programming arithmetic and logic subroutines, Input-Output programming.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Computer System Architecture	Morris Mano	Pearson Education
2.	Computer Organization & Architecture	William Stallings	PHI
3.	Computer Systems Architecture	Rob Williams	Pearson Education

Course Code	**CSA254**
Course Title	**Basics of Java Programming**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	C/C++ Programming Language.
Course Objective(s)	This subject aims to introduce students to the purely object oriented Java programming language.
Course Outcome (CO)	The students will be able to: **1.** Learn fundamental features of object oriented language and JAVA. **2.** Learn object oriented concepts using programming examples. **3.** Study the concepts of importing of packages and exception handling mechanism. **4.** Set up Java JDK environment to create, debug and run simple Java programs.

SYLLABUS

UNIT I:

An Overview of Java: Object-Oriented Programming, Simple program of Java. Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and **Arrays:** Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays and Strings.

UNIT II: Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, **Control Statements:** Java's Selection Statements, Iteration Statements, Jump Statements.

UNIT III: Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables. **Introducing Methods:** Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, Stack Class. Overloading Methods, Using Objects as Parameters, Argument Passing, Returning Objects, Recursion, Introducing Access Control, Introducing final, Arrays Revisited.

UNIT IV:

Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class. **Packages and Interfaces:** Packages, Access Protection, Importing Packages and Interfaces, **Exception Handling:** Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Java Fundamentals	Herbert Schildt and Dale Skrien	TATA McGraw Hill
2.	Java for Programmers	P.J.Deitel and H.M.Deitel	PHI
3.	Programming in Java	S. Malhotra and S. Choudhary	Oxford University Press

Course Code	**MAT274**
Course Title	**Computer Oriented Statistical Methods**
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)	The objective of the course is to introduce fundamental concepts of statistics and probability, focusing on data representation, measures of central tendency and dispersion, and foundational probability principles. The course will also develop the ability to analyze relationships between variables using correlation techniques, preparing students for data-driven decision-making in computing applications.
Course Outcome (CO)	At the end of the course, the students will be able to **1.** Organize and represent statistical data using frequency distributions, histograms, and frequency polygons, and compute various measures of central tendency including mean, median, mode, geometric mean, and harmonic mean. **2.** Understand and apply different measures of dispersion such as range, variance, standard deviation, and coefficients of variation to interpret data variability. **3.** Apply the fundamental rules of probability, including addition and multiplication theorems, conditional probability, and independence of events in solving real-world problems. **4.** Analyze and interpret relationships between variables using correlation techniques, including Karl Pearson's and rank correlation methods for both raw and bivariate frequency data.

SYLLABUS

UNIT I:

Frequency distribution, Histogram, Frequency Polygram, Arithmetic Mean, Median, mode, geometric Mean, Harmonic Mean.

UNIT II:

Measures of Dispersion: Concept of dispersion, Absolute and relative measure of dispersion, range variance, Standard deviation, Coefficient of variation.

UNIT III:

Probability, Addition and multiplication Theorems of Probability, Conditional Probability, Independent events Point wise independent events.

UNIT IV:

Correlation, Karl Pearson's Coefficient of correlation calculation of the correlation, coefficient of correlation for a bivariate frequency distribution, rank correlation.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Fundamental of Mathematical Statistics	Gupta, S.C. & Kapoor, V.K.	Sultan Chand & Sons.
2.	Mathematical Statistics	Kapur, J.N. & Sarema, H.C.	S. Chand & Company Ltd.
3.	Higher Engineering Mathematics	B. S. Grewal	Khanna Publication

Course Code	**CSA258**
Course Title	**Indian Knowledge System (Artificial Intelligence)**
Type of Course	Major
L T P	3:0:0
Credits	3
Course Prerequisites	Basic knowledge of computer science, mathematics and programming.
Course Objective(s)	To explore the principles of Indian Knowledge System (IKS) and their relevance to modern AI technologies.
Course Outcome (CO)	The students will be able to: **1.** Describe key concepts of IKS, including traditional Indian approaches to mathematics, health, and consciousness, and their relevance to AI. **2.** Apply AI techniques (e.g., machine learning, natural language processing) to analyze and model IKS domains. **3.** Design AI-based solutions for real-world problems inspired by IKS, such as yoga, meditation, and community wellness. **4.** Evaluate the ethical, societal, and cultural implications of AI applications in the context of IKS.

SYLLABUS

UNIT I:

Introduction to Indian Knowledge System (IKS) and AI: Overview of IKS: Historical and philosophical foundations (Vedas, Upanishads, Nyaya, Ayurveda, etc.).Key IKS domains: Mathematics, astronomy, health, wellness, consciousness, and cultural heritage. Introduction to AI: Core concepts (machine learning, neural networks, natural language processing, and computer vision).Relevance of IKS to AI: Interdisciplinary opportunities (e.g., AI for yoga, consciousness studies).

UNIT II:

IKS in Mathematics and Astronomy for AI: Indian contributions to mathematics: Contributions of Aryabhata, Brahmagupta, and Ramanujan (zero, decimal system, series).Indian astronomical models: Surya Siddhanta, planetary calculations, and their relevance to computational modeling. AI applications: Pattern recognition, predictive modeling, and optimization inspired by Indian mathematical principles.

UNIT III:

AI for Health, Wellness, and Consciousness Studies: IKS in health and wellness: Ayurveda, yoga, meditation, and mindfulness practices. AI interventions: AI-based analysis of yoga and meditation (e.g., EEG signal processing, stress detection).Consciousness studies: Indian philosophical perspectives (Advaita Vedanta, Yoga Sutras) and AI modeling of cognitive processes. Case studies: AI for community wellness, mental health, and sustainable living.

UNIT IV:

AI for Cultural Heritage and Linguistic Preservation: IKS in arts, culture, and linguistics: Sanskrit, regional languages, and traditional art forms. AI applications: Natural language processing (NLP) for Sanskrit text analysis, preservation of cultural artifacts. Ethical considerations: Bias in AI models and cultural sensitivity in IKS applications.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Indian Knowledge Systems	Kapil Kapoor, Avadesh K. Singh	D.K. Printworld
2.	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson

Course Code	**MDC019**
Course Title	Jeevan Kaushal Life Skills 2.0 (Universal Human Values)
Type of Course	VAC
L T P	2:0:0
Credits	2
Course Prerequisites	N.A.
Course Objective(s)	**The main objective of this course is to:** **1.** Develop a universal perspective based on self- exploration about themselves (human being), family, society and nature. **2.** Understand the harmony in human relations. **3.** Strengthen the Self-Reflection. **4.** Develop commitment and courage.
Course Outcome (CO)	**After the completion of the course, students will be able:** **1.** To become more aware of themselves, and their surroundings (family, society, nature). **2.** To become more responsible in life and in handling problems with sustainable solutions. **3.** To develop a sense of commitment and courage to act.

SYLLABUS

UNIT I:
Need, Basic Guidelines, Content and Process for Value Education

1. Concept of Value Education including its needs, basic guidelines, content & process.
2. Concept of Self-Exploration, Natural Acceptance & Experiential Validation as the process for Self-Exploration.
3. Happiness & Prosperity.

UNIT II:
Understanding Harmony in Human Beings

1. Understanding Human Being as a Co-existence of Self (I) & Body.
2. Understanding the needs of Self (I) & Body.
3. Understanding harmony of Self (I) with Body: Sanyam & Swasthya.

UNIT III:
Understanding Harmony in Human Relationships

1. Need and Importance of Values in Human Relationships.
2. Human Values to be practiced in a family.
3. Visualizing a Universal Human Order in Society.

UNIT IV:
Understanding Harmony in Nature & Existence

1. Need & Importance of Harmony in Nature.
2. Understanding the Interconnectedness among Four Orders of Nature.
3. Holistic Perception of Harmony at all levels of Existence.

Sessional work:

1. Organize a group discussion regarding the ways and measures to inculcate values among individuals.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Human Values and Professional Ethics	Varinder Kumar	Kalyani Publishers
2.	A Foundation Course of Value Education	R.R. Gaur and R. Sangal	Excel Books Publishers
3.	Human Values and Professional Ethics	Rishabh Anand	Satya PRakashan, New Delhi

Course Code	**AEC001**
Course Title	**Ability Enhancement Course (Functional English-I)**
Type of Course	AEC
L T P	3:0:0
Credits	4
Course Prerequisites	N.A.
Course Objective(s)	The objectives of this course is to introduce corrective measures to eliminate grammatical errors in speaking and writing, theoretical and conceptual understanding of the elements of grammar and to enhance the learners ability of communicating accurately and fluently.
Course Outcome (CO)	The students will be able to: **1.** The learners will be able to use the English language to make and communicate meaning in spoken and written contexts. **2.** The exhaustive exercises in Murphy's Grammar will remove their doubts in tenses, if they had any. **3.** With better knowledge of modals, voice and narration, the learners will confidently handle all modules of the English language.

SYLLABUS

UNIT I:
Introduction to grammar (what is grammar, its importance etc); different approaches to grammar: traditional, generative, transformative, and communicative.

UNIT II:
Articles & determiners. Forms & functions of nouns, pronouns and prepositions.

UNIT III:
Verbs (transitive & intransitive, regular & irregular), tense & aspect, auxiliaries (primary &modal), negatives, questions, agreement & concord.

UNIT IV:
Forms & functions of adjectives, adverbs, agreement & concord.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	A Communicative Grammar of English	Leech, G.& J. Svartvik	Pearson India (Third Edition)
2.	Intermediate English Grammar	Murphy, R.	Cambridge University Press, India(Second Edition)
3.	Advance English Grammar	Hewings, M.	Cambridge University Press, India

CSA256 Java Programming (P)

L T P

0 0 4

Objective: To understand the basics of JAVA programs and its execution.

1. Write a program to print hello world using java.
2. Write a program for control statement in java.
3. Write a program for function overloading in java.
4. Write a program to show the concept of classes and methods in java.
5. Write a program to implement array in java.
6. Write a program to create applet program.
7. Write a program for multilevel inheritance in java.
8. Program for interface implementation in java.
9. Write a program to show concept of exceptional handling in java.
10. Write a program to implement the concept of swings in java.
11. Write a program that handle all mouse events and show the events name at center of window when a mouse event is fixed in java.
12. Write a program that connects to a database using JDBC and does add, delete, modify and retrieve operation in java.
13. Write a java program for creating multiple catch blocks.
14. Write an applet program that displays a simple message.
15. Write a java program to display the employee details using Scanner class.
16. Write a java program to represent Abstract class with example.

Fifth Semester

Course Code	**CSA351**
Course Title	**Development of Applications using Android Programming**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	OOPS/ Java Programming
Course Objective(s)	The objective of this course aims to equip students with the essential skills to design , develop, test and deploy functional Android applications.
Course Outcome (CO)	The students will be able to: **1.** Experiment on Integrated Development Environment for Android Application Development. **2.** Design and Implement User Interfaces and Layouts of Android App. **3.** Use Intents for activity and broadcasting data in Android App and Design and Implement Database Application and Content Providers. **4.** Experiment with Camera and Location Based service and Develop Android App with Security features.

SYLLABUS

UNIT-I:

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file. Android Architecture and OOPS: Building Blocks of Android, Java Classes and Objects, Class Methods and Instances, Inheritance and Polymorphism in Java, Interface and Abstract class.

UNIT-II:

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions. **Android User Interface Design Essentials:** User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

UNIT-III:

Testing Android Applications: Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT-IV:

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Learn Java for Android Development	Jeff Friesen	Apress
2.	Android Essentials	Chris Haseman	Apress
3.	Android Essentials	Wei-Meng Lee	John Wiley & sons

Course Code	**CSA353**
Course Title	**Basics of Computer Graphics**
Type of Course	Major
L T P	3:1:0
Credits	4
Course Prerequisites	Proficiency in C Programming/ C++
Course Objective(s)	This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
Course Outcome (CO)	The students will be able to: **1.** Understand the basics of computer graphics, different graphics systems and applications of computer graphics. **2.** Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. **3.** Use the geometric transformations on graphics objects. **4.** Extract scene with different clipping methods.

SYLLABUS

UNIT I:

Introduction to Computer Graphics: Definition, Advantages of computer graphics, Applications of computer graphics, Graphics Hardware, Display devices, Raster Scan and Random Scan.

UNIT II:

Raster Scan Graphics: Points, Lines and Line segment, Line drawing algorithms, Digital Differential Algorithm, Bresenham's Line Drawing Algorithm, Midpoint Circle Generation Algorithm, Scan line Polygon Filling Algorithm.

UNIT III:

Transformation: Two Dimensional Transformation, Matrix Representation, Translation, Rotation, Scaling, Reflection, Shear. **Clipping & Windowing:** Viewing transformation, 2-D clipping, Simple Visibility Algorithm, End point codes, Midpoint Subdivision Algorithm, Cohen Sutherland Line Clipping Algorithm, Polygon Clipping Algorithm (Sutherland-Hodgman algorithm), Windowing Transformation.

UNIT IV:

Three Dimensional Viewing: Viewing Coordinates, 3D Viewing Pipeline, Projections, Types of Projections- Perspective Projection-Transformation matrix, Applications, Anomalies and types of perspective projections, Parallel Projection-Transformation matrix, Applications and types of parallel projections, Comparison of perspective and parallel projections, 3D Clipping, Fractals and their classification.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Computer Graphics	Donald Hearn & Pauline Baker	PHI
2.	Computer Graphics	Hill Jr	Prentice Hall
3.	Computer Graphics	Steven Harrington	McGraw Hill

Course Code	**CSA355**
Course Title	**Introduction to Internet Applications**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Computer Fundamentals/ Fundamentals of IT
Course Objective(s)	This course is designed to provide a foundational understanding of internet architecture and services while developing practical skills in static and dynamic web development using HTML, CSS, and JavaScript.
Course Outcome (CO)	The students will be able to: **1.** Understand the fundamental infrastructure and protocols of the Internet. **2.** Proficiently use Internet tools, email services, and search engines. **3.** Create, format, and publish web pages using HTML5 and CSS. **4.** Develop basic interactive web pages using JavaScript and understand web security basics.

SYLLABUS

UNIT I:

Internet Fundamentals & Architecture: ARPANET, Origins of the Internet. Growth of the World Wide Web (WWW). ISPs, Dial-up, Broadband, Cable, Wi-Fi, Wireless, 5G. Basics of TCP/IP, IP Addressing (IPv4/IPv6), Domain Name System (DNS), HTTP/HTTPS.

UNIT II:

Internet Services & Tools: Working of Browsers (Chrome, Firefox), Search Engine Mechanisms (Google, Bing), Optimization. Protocols (SMTP, POP3, IMAP), Email clients, Managing Webmail, Attachments, Security. VoIP, Video Conferencing (Zoom, Teams, Meet), File Transfer Protocols (FTP), Cloud Storage (Google Drive). Overview of Social Media apps, Online Payments, and E-commerce platforms.

UNIT III:

Web Page Design Fundamentals: Document Structure, Headings, Paragraphs, Text Formatting, Lists, Hyperlinks. Embedding Images, Audio, Video, Creating Tables, Frames, and Forms. Inline, Internal, and External CSS, Box Model, Colors, Fonts, Page Layout. Introduction to Bootstrap or Mobile-friendly design concepts.

UNIT IV:

Web Scripting & Advanced Applications: Introduction to JavaScript, DOM manipulation, Handling events, Form Validation. Difference between Static and Dynamic sites, Introduction to AJAX, XML/JSON basics. Overview of PHP or Node.js, Web Databases (SQL Basics). Malware, Firewalls, Phishing, Cookies, Data Privacy, Netiquette.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Internet and World Wide Web: How to Program	Harvey M. Deitel, Tem R. Nieto	Pearson Education
2.	Web Programming: Building Internet Applications	Chris Bates	Willey India Pvt. Ltd.
3.	Internet Applications	Ikvinderpal Singh	Khanna Publishing House

Course Code	**CSA357**
Course Title	**IT Management**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	Information Technology
Course Objective(s)	The objective of this course is to equip students with the strategic, technical, and managerial skills required to effectively plan, implement, and govern Information Technology resources and infrastructure within a modern business environment.
Course Outcome (CO)	The students will be able to: **1.** Demonstrate the ability to align IT strategies with core business goals to enhance organizational efficiency and competitive advantage. **2.** Apply project management methodologies to effectively oversee IT infrastructure, human resources, and software development lifecycles. **3.** Evaluate and select appropriate Enterprise Systems (ERP, CRM, SCM) to streamline transaction processing and support executive decision-making. **4.** Identify and mitigate cyber security risks while adhering to legal frameworks, data privacy laws, and ethical standards in a global digital environment.

SYLLABUS

UNIT I:

Foundations of IT & Management: Introduction: Definition and role of Information Systems (IS); components of IS (Hardware, Software, Data, People, Procedures). **Management Essentials:** Functions of management (Planning, Organizing, Leading, and Controlling) applied to technology. **Strategic Role of IT:** How IT creates competitive advantages and supports business processes

UNIT II:

Information Systems & Business Processes: Types of Systems: Transaction Processing Systems (TPS), Management Information Systems (MIS), and Decision Support Systems (DSS). **Enterprise Systems:** Overview of Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Supply Chain Management (SCM). **E-Commerce:** Models (B2B, B2C, C2C) and digital payment systems.

UNIT III:

IT Project & Resource Management: Software Development Life Cycle (SDLC) models like Waterfall and Agile. **Resource Management:** Techniques for managing human resources, hardware assets, and cloud infrastructure. **Risk & Quality:** Identifying IT risks, security protocols, and quality assurance in software projects.

UNIT IV:

Ethical, Legal, and Global Trends: Intellectual property rights, data privacy, and IT laws. **Modern Trends:** Impact of AI, Big Data, Cloud Computing, and Green IT on modern management. **Security Management:** Disaster recovery, backup strategies, and auditing IT infrastructures.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Information Technology for Management	Efraim Turban	Wiley
2.	IT Strategy and Management	Sanjiva Shankar Dubey	PHI
3.	Management Information System	Jawedkar	McGraw Hill

Course Code	**CSA359**
Course Title	**Basics of Electronics**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	Students should know about the various electronics components and physics concepts.
Course Objective(s)	Demonstrate the operation of simple digital gates, identify the symbols, truth table for gates; change binary, hexadecimal, octal numbers to their decimal equivalent and vice versa, demonstrate the operation of a flip flop. Convert digital into analog and vice versa.
Course Outcome (CO)	The students will be able to: **1.** Develop a digital logic. **2.** Apply it to solve real life problems. **3.** Understand, analyze and design various combinational and sequential circuits. **4.** Learn how to convert signals.

SYLLABUS

UNIT I:

Fundamental concepts: Introduction, Digital Signals, Basic Gates and derived Gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR, Boolean Algebra Number System and codes: Introduction to number systems, Decimal, Binary, Octal, Hexadecimal, And Conversation from one number system to another number system. Binary Arithmetic: Addition, Subtraction, Multiplication, Division, Half adder, full adder.1's and 2's compliment of Binary Number. Codes: BCD Code, Excess-3 Code, Gray Code Error detecting and correcting codes.

UNIT II:

Combinational Logic Design: Standard Representation of logical functions, SOP, POS Forms, K-map Representation of logical functions, and Simplification of logical functions using K-map. Multiplexer, De-multiplexer. Encoder, Decoder.

UNIT III:

Flip Flops: 1-Bit Memory Cell, Clocked S-R Flip Flop, J-K Flip Flop, Master Slave Flip Flop, D-type Flip Flop, T-type Flip Flop **Sequential Logic Design:** Registers, Shift Register, Counter, Synchronous and asynchronous Counter, examples of each.

UNIT IV:

Timing Circuits and Converters: 555 Timer, Digital To Analog Converter, Analog To Digital Converter.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Modern Digital Electronics	R.P. Jain	Mc-Graw Hill
2.	Digital Electronics	A. Anand Kumar	PHI
3.	Digital Electronics	Anil K. Maini	Wiley

Course Code	**CSA367**
Course Title	**Leadership and Management Skills**
Type of Course	Minor
L T P	2:0:0
Credits	2
Course Prerequisites	English and Digital Proficiency
Course Objective(s)	The objective is to develop leadership vision, managerial efficiency, and an innovative mindset while fostering professional integrity and financial literacy for holistic career success.
Course Outcome (CO)	The students will be able to: **1.** Apply diverse leadership styles to motivate technical teams and influence project outcomes. **2.** Handle time, resolve conflicts, and make effective decisions in high-pressure IT environments. **3.** Use Design Thinking to identify user problems and pitch entrepreneurial ideas. **4.** Maintain professional integrity and manage personal finances/investments effectively.

SYLLABUS

UNIT I:

Leadership Skills & Style: Understanding leadership in the modern, technology-driven workplace. Overview of different leadership styles and their applications. Emotional intelligence, self-awareness, and developing a leadership vision. **Motivating Teams:** Techniques to influence, motivate, and build high-performance teams.

UNIT II:

Managerial Skills & Team Building: Strategies for prioritization and productivity (crucial for IT projects). Techniques for handling disagreements and fostering collaboration. Trust building, delegation, and effective internal communication. Problem-solving techniques and critical thinking.

UNIT III:

Entrepreneurial Skills & Innovation: Identifying opportunities and taking initiatives (intrapreneurship). **Innovation & Design Thinking:** thinking using human-centric design thinking to solve complex problems. **Business Planning:** Basics of identifying problems, ideation, and validation. **Pitching:** Preparing and presenting ideas/projects.

UNIT IV:

Ethics, Integrity & Personal Finance: Importance of ethical decision-making in personal and professional contexts. Understanding workplace ethics, compliance, and accountability. Budgeting, setting financial goals, and understanding savings. Investment & Future Value: Introduction to managing personal funds.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Leadership and Management Skills	Dr. C.S.G. Krishnamacharyulu, Dr. Lalitha Ramakrishnan	Himalaya Publishing House
2.	Leadership and Management Skills	SIA Editorial Board	SIA Publishers
3.	Leadership Skills (Life Skill Course)	Dr. D. Sahadevudu	Technical Publishers

CSA361 Development of Applications using Android Programming (P)

L T P

0 0 4

Objective: To become familiar with the operation of Android and Acquire knowledge about the basic concept of writing a program in Android.

1. Introduction to android operating system and study of basic widgets.
2. Study of android life cycle and demonstration of it.
3. Study of intents and its types.
4. Study of list views and adapters.
5. Study of sensors in android.
6. Study of services in android.
7. Study of dialog interfaces in android.
8. Study of touch in android. 9. Study of android database (SQLite).

CSA385 Computer Graphics (P)

L T P

0 0 4

Objective: To implement fundamental 2D/3D graphical algorithms, transformations, and rendering techniques using C/C++ programming.

1. Write a program for 2D line drawing using Breshenham's algorithm.
2. Write a program for 2D line drawing using DDA algorithm.
3. Write a program for circle drawing using Breshenham's algorithm.
4. Write a program for drawing ellipse using mid-point algorithm.
5. Write a program for Line Clipping.
6. Write a program for rotation of an object.
7. Write a program for scaling of an object to a desired scale.
8. Write a program for translation.
9. Write a program for reflection of an object.
10. Write a program for Polygon filling as Raster Graphics Display.
11. Write a program for Polygon Clipping.
12. To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
13. Write a program to draw a complex object of your choice such as a hut using simple graphic functions.

Sixth Semester

Apprenticeship/Internship Training (ATS001)

L	T	P
0	0	20

Guidelines for the Apprenticeship in the Sixth Semester of the B.Sc.(IT) Programme can vary slightly depending on the university or institution, but here's a general structure that many B.Sc.(IT) 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 B.Sc.(IT) programme.

3. Eligibility: Students must have successfully completed the first five semesters of B.Sc.(IT).

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