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 2024-28 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: 2024-2028 onwards (As Per NEP 2020)

SCHEME & SYLLABUS

(04 YEARS BCA PROGRAMME)

Session: 2024-28

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	12	2	3	3	-	-	4	24
II	12	2	-	3	3	-	4	24
III	16	-	1	6	3	-	4	30
IV	18	2	3	-	-	-	2	25
V	20	-	-	-	-	-	10	30
VI	18	-	-	-	-	-	4	22
BCA (Research)								
VII	19	-	-	-	-	-	6	25
VIII	19	-	-	-	-	-	4	23
BCA (Research With Honours)								
VII	19	-	-	-	-	-	6	25
VIII	15	-	-	-	-	-	8	23

*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	**96**	**06**	**07**	**12**	**06**	**-**	**28**	**155**
BCA (Research)	**38**	**00**	**00**	**00**	**00**	**-**	**10**	**48**
BCA (Research With Honours)	**34**	**00**	**00**	**00**	**00**	**-**	**14**	**48**

3 Years BCA Program	**Total Credits = 155**
4 Years BCA (Research) and BCA (Research With Honours)	**Total Credits = 203**

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	4:0:0	4:0:0	4	4
2	Major Course	CSA153	Introduction to Data Communication and Networks	4:0:0	4:0:0	4	4
3	Major Course	CSA155	C Programming	4:0:0	4:0:0	4	4
4	VAC	VAC VAC011	Value Added Course (Ethics and Culture)	3:0:0	3:0:0	3	3
5	AEC	AEC AEC0010	Ability Enhancement Course (Communication Skill -I)	2:0:0	2:0:0	2	2
6	MDC	MDC MDC017	Multidisciplinary Course (Nutrition and Health Education)	3:0:0	3:0:0	3	3
7	PT	PT102/ PT104/ PT106	Physical Training (NSO/NCC/NSS)	0:0:2	NC	2	NC

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA157	Fundamentals of IT Tools (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA159	Programming with C (P)	0:0:4	0:0:2	4	2

Total Credits: 24
Total Contact Hours: 30

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	4:0:0	4	4
3	Major Course	CSA156	Operating System Principles	4:0:0	4:0:0	4	4
5	AEC	AEC0015	Ability Enhancement Course (Effective Technical Communication Skills)	2:0:0	2:0:0	2	2
6	VAC	VAC	Value Added Course	3:0:0	3:0:0	3	3
7	SEC	SEC008	Skill Enhancement Course (E-Filling of Income Tax Return)	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	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
3	PT	PT102/ PT104/ PT106	Physical Training (NSO/NCC/NSS)	0:0:2	NC	2	NC

Total Credits: 24
Total Contact Hours: 30

***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	Major Course	MAT174	Fundamentals of Elementary Mathematics	4:0:0	4:0:0	4	4
4	Major Course	CSA259	Indian Knowledge System (Ancient Indian Innovations in Computer Technology)	4:0:0	4:0:0	4	4
5	VAC	VAC-I (EVS100)	Value Added Course (Environmental Education)	4:0:0	4:0:0	4	4
6	SEC	SEC007	Skill Enhancement Course (E-Commerce)	3:0:0	3:0:0	3	3
7	VAC	VAC-II (JKM001)	Mulya Pravah 2.0 (Human Values and Professional Ethics)	2:0:0	2:0:0	2	2
8	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	CSA255	Simplified Approach to Data Structure (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA257	Introduction to Database Management System (P)	0:0:4	0:0:2	4	2

Total Credits: 30
Total Contact Hours: 34

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	CSA260	Indian Knowledge System (Artificial Intelligence)	3:0:0	3:0:0	3	3
5	Minor Course	CSA256	Essentials of Software Engineering	3:0:0	3:0:0	3	3
6	VAC	MDC019	Jeevan Kaushal Life Skills 2.0 (Universal Human Values)	3:0:0	3:0:0	3	3
7	AEC	AEC001	Ability Enhancement Course(Functional English-I)	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	CSA258	Basics of Java Programming (P)	0:0:4	0:0:2	4	2

Note: Six Weeks Industrial/Institutional training to be evaluated in 5th Semester.

Total Credits: 25

Total Contact Hours: 27

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	Minor Course		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
3	IT	CSA365	Six Week Industrial/ Institutional Training	0:0:0	0:0:6	0	6

Total Credits: 30
Total Contact Hours: 28

Semester 6

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	CSA352	Concepts of Network Security and Cryptography	3:1:0	3:1:0	4	4
2	Major Course	CSA354	Programming with Python	4:0:0	4:0:0	4	4
3	Major Course	CSA356	Analysis and Design of Algorithm	4:0:0	4:0:0	4	4
4	Minor Course	CSA358	Data Mining	3:0:0	3:0:0	3	3
5	Minor Course	CSA360	Fundamentals of Microprocessor	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	CSA362	Python Programming (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA364	Design and Analysis of Algorithm (P)	0:0:4	0:0:2	4	2

Total Credits: 22
Total Contact Hours: 26

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

Exit Criteria after Third Year of BCA Programme

The students shall have an option to exit after 3rd year of Computer Application Program and will be awarded with a Bachelor's in Computer Application.

Re-entry Criteria in to Fourth Year (Seventh Semester)

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

Semester 7 (For Research Opting 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

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: 25
Total Contact Hours: 31

Semester 8 (For Research Opting 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	CSA452	Operations Research	4:0:0	4:0:0	4	4
2	Major Course	CSA454	Basics of Semantics Techniques	4:0:0	4:0:0	4	4
3	Major Course	CSA456	Advanced JAVA	4:0:0	4:0:0	4	4
4	Minor Course	CSA458	Research and Publication Ethics	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	CSA460	Dissertation	0:0:16	0:0:8	16	8

Total Credits: 23
Total Contact Hours: 31

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

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: 25
Total Contact Hours: 31

Semester 8 (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	CSA452	Basics of Semantics Techniques	4:0:0	4:0:0	4	4
2	Major Course	CSA454	Introduction to Natural Language Processing	4:0:0	4:0:0	4	4
3	Major Course	CSA456	Digital Image Processing	4:0:0	4:0:0	4	4
4	Major Course	CSA458	Advanced JAVA	4:0:0	4:0:0	4	4
5	Minor Course	CSA460	Research and Publication Ethics	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	CSA462	Digital Image Processing (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA464	Advanced JAVA (P)	0:0:4	0:0:2	4	2

Total Credits: 23
Total Contact Hours: 27

Summary of Scheme

Semester	L	T	P	Contact Hours Per Week	Credits
1	20	0	4	30	24
2	20	0	4	30	24
3	25	1	4	34	30
4	22	1	2	27	25
5	19	1	10	28	30
6	17	1	4	26	22
7 (RS)	17	2	6	31	25
7 (HS)	15	0	8	31	25
8 (RS)	17	2	6	31	25
8 (HS)	19	0	4	31	23
Total (RS)	**155**	**6**	**42**	**237**	**203**
Total (HS)	**159**	**6**	**38**	**233**	**203**

First Semester

Course Code	**CSA151**
Course Title	**Fundamentals of IT**
Type of Course	Major
L T P	3:0:0
Credits	3
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.

UNIT-II:

Storage Devices: Introduction to storage devices, types of storage devices: primary memory with its types, secondary memory with its types, cache memory.

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.

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	3:1:0
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	**VAC011**
Course Title	**Ethics and Culture**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	+2 in any stream
Course Objective(s)	The objective of this course is to help students explore ethical and cultural dimensions of their lives.
Course Outcome (CO)	The students will be able to: 1. Explore perspectives on ethics in thoughts, words and actions. 2. Evolve ethical decision-making practices. 3. Understand the need for an ethical society and culture. 4. Introspect, become conscious of and assess one's stance in life.

SYLLABUS

UNIT-I: Basics of Ethics and Culture: Definition of ethics, The Difference between Ethics and Morality, Etiquette and Manner Vs. Morality, How morality is understood as the moral institution of life, The difference between Customary morality, Religion, and Ethics, Cultural Relativism Vs. Universalism

UNIT-II: Gender Ethics: Distinction between gender and sex, Terminologies related to gender, Application of the ethical theories to gender, four options regarding gender and ethics.

UNIT- III: Media Ethics: The actual, possible or apprehended instances of unethical, unlawful, unfair or inaccurate media coverage and journalistic activity (including instances of bias or misrepresentation) judged against recognized ethical standards and the law. The legal and ethical context and effect of relevant law, guidelines, policies and codes of practice of media on our society.

UNIT- IV: Culture influence ethics: Culture reflects the moral and ethical beliefs and standards that speak to how people should behave and interact with others. These normative beliefs, together with related cultural values and rituals, impose a sense of order and control on aspects of life that might otherwise appear chaotic or unpredictable.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Ethics: The Fundamentals	Julia Driver's	Blackwell Pub
2.	*Moral Prejudices: Essays on Ethics*	Baier, Annette	Cambridge: Harvard University Press.
3.	Renegotiating Ethics in Literature, Philosophy, and Theory	Adamson, Jane, Richard Freadman, and David Parker	Cambridge University Press

Course Code	**AEC0010**
Course Title	**Communication Skills in English-I**
Type of Course	Minor
L T P	2:0:0
Credits	2
Course Prerequisites	+2 in any stream
Course Objective(s)	The course is intended to familiarize students with the basics of English language and help them to learn to identify language structures for correct English usage.
Course Outcome (CO)	The students will be able to: 1. Identify common errors and rectify them. 2. Develop and expand writing skills through controlled and guided activities. 3. To develop coherence, cohesion and competence in oral discourse through intelligible pronunciation.

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

Writing Skills: 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.	Effectual Communication Skills	Bhupender Kour	S.K. Kataria and Sons
2.	Communication Skills	R. Datta Roy and K.K. Dheer	Vishal Publishing Company
3.	The Essence of effective Communication	Ludlow and Panton	Prentice Hall of India

Course Code	**MDC017**
Course Title	**Nutrition and Health Education (Education)**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	+2 in any stream
Course Objective(s)	To familiarize students with fundamentals of food, nutrients and relationship to health.
Course Outcome (CO)	The students will be able to: 1. Understand the recent developments of nutritional science and novel food usage. 2. Serve in core industry that leverages diverse food science and nutrition domains. 3. Be competent nutrition professionals to address the health related community issues. 4. Confidently pursue higher studies and research in nutrition and interdisciplinary areas.

SYLLABUS

UNIT-I Nutrition concept and relation to human health: Basic concepts in food and nutrition, Basic terms used in study of food and nutrition. Understanding relationship between food, nutrition and health. Functions of food-Physiological, psychological and social.

UNIT-II Nutritious diet and Functions for human body: Dietary sources and clinical manifestations of deficiency/ excess of the following nutrients: Carbohydrates, fats, proteins and lipids. Fat soluble vitamins- A, D, E and K. Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12, vitamin C. Techniques to prevent Water soluble vitamins lose while cooking. Minerals – calcium, iron, iodine, zinc, potassium and sodium.

UNIT-III Selection grading and usage of food: Nutritional contribution and changes during cooking of the following food groups: Cereals, Pulses, Millets, Fruits and vegetables. Milk & milk products. Eggs, Meat, poultry and fish, Fats and Oils. Nutritious values of food items and balanced diet. Benefits of eating cooked food over processed food.

UNIT-IV Methods of Cooking and Preventing Nutrient Losses: Different techniques of Cooking - Fire and without fire cooking, boil, dry, moist, frying and microwave cooking. Advantages, disadvantages and effects of various methods of cooking on food nutrient. Minimizing nutrient losses, Weights and measures for food cooking. Food consumption and health issues. Effect of sauces, appetizers, spices, preservatives, carbonated water, preserved food, liquor, fast food and plastic food container on human health.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Nutrition Science	Srilakshmi B	New Age International (P) Ltd.
2.	Food Science	Srilakshmi B	New Age International (P) Ltd.

CSA181 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.

CSA183 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	**CSA1564**
Course Title	**Introduction to Web Technology**
Type of Course	Major
L T P	3:0:0
Credits	3
Course Prerequisites	Basic computer knowledge and OS DOS Windows
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: Web Essentials: Markup languages, CSS Basics of Client side programming, Java script language, java script objects, host objects, Browsers and DOM.

UNIT II: Basics of Server side programming: Java servlets ASP/JSP, Basics of ASP/JSP objects, simple ASP and JSP pages

UNIT III: Representing Web data: Data base connectivity, JDBC.

Introduction to PHP: basics, PHP File handling, file upload, cookies, error handling, PHP MySQL introduction

UNIT IV: Middleware Technologies: Ecommerce architecture and technologies, Ajax, Advanced web technologies and tools. **Case Studies**: PHP and MySQL case studies.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Web Technology – A Computer Science Perspective	Jeffery C Jackson	Pearson Education, 2007.
2.	Web Programming – Building Internet Applications	Chris Bates	Wiley India, 2006
3.	Web Technologies	Achyut S Godbole and Atul Kahate	TATA McGraw Hill

Course Title	**Operating System Principles**
Type of Course	Major
L T P	3:0:0
Credits	3
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

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		
Name	**Author(s)**	**Publisher**
Data base System Concepts	Silberschatz, Korth	McGraw Hill
Data base Management Systems	R. Krishnan, J. Gehrke	TATA McGraw Hill
An Introduction to Database systems	C.J. Date, A.Kannan, S.Swami Nadhan	Pearson

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	**CSA260**
Course Title	**Indian Knowledge System (Ancient Indian Innovations in Computer Technology)**
Type of Course	Major
L T P	4:0:0
Credits	4
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: Early evidence of algorithmic approaches in Vedic mathematics, astronomy, and linguistics. Cultural Context: The Gurukul system and its emphasis on logic, debate, and knowledge dissemination.

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. Brahmagupta's Rules for Zero: Mathematical operations involving zero and their implications for computer arithmetic.

UNIT III: Algorithms and Mathematical Innovations: Aryabhata's Algorithms: Methods for solving linear and quadratic equations, square roots, and cube roots, and their relevance to computational algorithms. Bhaskaracharya's Contributions: Vedic Mathematics: Techniques like Nikhilam Sutra and Urdhva Tiryak for fast arithmetic computations applicable in computing.

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.IKS in Contemporary Innovation: Integrating IKS principles in sustainable computing, AI, and interdisciplinary research.

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	**VAC-I (EVS100)**
Course Title	**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)	The student will 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, 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, and 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, 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); Ramsar 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	K.C. Agrawal	Nidhi Publishers
2.	Environmental Science	G. Tyler Miller, Scott E. Spoolman	Brooks/Cole
3.	Perspectives in Environmental Studies	Anubha Kaushik, CP Kaushik	New Age International
4.	A Handbook on International Environment Conventions & Programmes	Dr. Kalipada Chatterjee, Samrat Sengupta, Seema Joshi Arya	Ministry of Environment, Forest and Climate Change
5.	Introduction to Environmental Management, 2nd Edition	Mary K. Theodore, Louis Theodore	CRC Press
6.	Climate Change: The Science Impacts and Solutions, 2nd Edition	A. Barrie Pittock	Routledge
7.	Textbook of Biodiversity	K.V. Krishnamurthy	CRC Press

Course Code	**SEC007**
Course Title	**E-Commerce**
Type of Course	SEC
L T P	3:0:0
Credits	3
Course Objective(s)	It explains the main concepts related to E-commerce. Enable students to understand the enabling technologies for E-commerce.
Course Outcome (CO)	**The students will be able to:** **1.** To impart knowledge about the fundamental principles of E-Business and E- Commerce and the role of Management. **2.** To get familiarized with underlying used technologies with emphasis on Internet Technologies. **3.** To recognize the impact of Information and Communication technologies, especially of the Internet in business operations.

SYLLABUS

UNIT I: Introduction to E-Commerce: Meaning, Definition, Scope of Ecommerce, E- commerce v/s Traditional Commerce-E- Business & E- Commerce - History of E- Commerce - EDI - Importance, features & benefits of E- Commerce - Impacts, Challenges & Limitations of E-Commerce - Supply chain management & E - Commerce infrastructure. Business models of E - Commerce: Business to Business - Business to customers- Customers to Customers – Business to Government - Business to Employee - E - Commerce strategy - Influencing factors of successful E- Commerce.

UNIT II: E-commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective. Business Strategy in an Electronic Age: Supply Chains. Inter Organizational Value Chains, Competitive Strategy, Competitive Advantage using E Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT. Technology, Business Environment, Business Capability, Exiting Business Strategy, Strategy Formulation & Implementation Planning. E-Commerce Implementation. E-Commerce Evaluation, Electronic Data Interchange (EDI). Multi - Media & E-commerce: push & pull technologies, alternative methods of customer communication.

UNIT III: Introduction to HTML: HTML Fundamentals HTML Browsers, HTML tags, Elements and Attributes, Structure of HTML code, Lists, Ordered List, Unordered List Definition. List Nesting List ,Block Level Tags ,Block formatting, Heading, Paragraph, Comments. Text alignment, Font size, Text Level Tags, Bold, Italic, Underlined, Strikethrough, Subscript, superscript, Inserting graphics, Scaling images, Frameset, Forms. Web - site Design: Role of web - site in B2C e-commerce; web-site strategies & web-site design principles: push & pull technologies, alternative methods of customer communication.

UNIT IV: Internet and Extranet: Automotive Network Exchange, The Largest Extranet, Architecture of the Internet. Intranet and Extranet. Electronic Payment Svstems : Flectronic Payments & Protocols. Security Schemes in Electronic payment systems, Electronic Credit card system on the Internet. Electronic Fund transfer and Debit cards on the Internet, Stored - value Cards and E- Cash. Electronic Check Systems, Prospect of Electronic Payment Systems, Managerial Issues.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	E-Commerce	David Whiteley	Tata McGraw Hill
2.	Electronic Commerce	E frami Turban, Jae Lee, David King	Pearson Education
3.	E-Commerce	Laudon, K.C. and Traver, C.G.	Prentice Hill

Course Code	**VAC-II (JKM001)**
Course Title	**Mulya Pravah 2.0 (Human Values and Professional Ethics)**
Type of Course	VAC
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 andrespect 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

CSA255 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.

CSA257 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.

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	Programming fundamentals and computer networks.
Course Objective(s)	This subject aims to introduce structure and operation of a digital computer including the architecture.
Course Outcome (CO)	The students will be able to: **1.** Logic gates, flip flops and counters. **2.** Computer Architecture **3.** Computer Organization **4.** CPU and parallel processing.

SYLLABUS

UNIT-I: Boolean Algebra and Logic Gates: Basic definition, Axiomatic Definition, Basic theorem and Properties of Boolean algebra, Minterms and Maxterms, Logic Operations, Digital logic gates, IC digital logic families. Different types of map methods, product of sum simplification, NAND or NOR implementation, Don't care condition, Tabulation method, Adder, Subtractor, Code Conversion, Universal Gate.

UNIT-II: Sequential Logic: Flip-flops, Triggering of Flip-flops, Analysis of clocked sequential circuits, State reduction and Assignment, Flip-flop excitation, Design of counters, Design with state equations.
Register Transfer and Micro-operations: Logic Micro-operations, Arithmetic Micro-operations. Bus and Memory transfer, Register Transfer Language, Register transfer. Shift Micro-operations, Arithmetic Logic Shift Unit.

UNIT-III: Basic Computer Organization and Design: Instruction codes, Computer registers, Computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Design of Basic computer, Design of Accumulator Unit.

UNIT-IV: Central Processing Unit: Introduction, General Register Organization, Stack Organization Data transfer and manipulation, Addressing Modes, Instruction format. Program Control, Reduced Instruction Set Computer (RISC), Subroutines, Parallel Processing.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Computer System Architecture	M. Morris Mano	Pearson
2.	Structured Computer Organization	Tanenbaum	Pearson
3.	Computer Architecture and Organization	Hayes	TATA McGraw Hill

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	**CSA260**
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, 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	**CSA256**
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	**MDC019**
Course Title	**Jeevan Kaushal Life Skills 2.0 (Universal Human Values)**
Type of Course	VAC
L T P	3:0:0
Credits	3
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:

- 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	2:0:0
Credits	2
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

CSA258 Basics of 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.