SCHEME & SYLLABUS

B.Sc.(IT) 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: UG003 (Academic Session 2026-30 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: 2026-2030 onwards (As Per NEP 2020)

SCHEME & SYLLABUS

(04 YEARS B.Sc. (IT) PROGRAMME)

Session: 2026-30

ABOUT THE B.Sc. (IT)

B.Sc. (IT) (Information Technology) is a 3-year undergraduate degree that imparts learners with intricate knowledge of storing, securing, processing and managing data and information. Pursuing B.Sc. (IT), students get to know about databases, software and networking. Further, you will be exploring the intricacies of software testing, software development, software engineering, web design, programming databases, computer networking and computer systems. Some of the major B.Sc. (IT) subjects are Foundation of Information Technology, Advanced-Data Structure, and DBMS using FoxPro, Foundation of Mathematics and Statistics, amongst others.

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 information technology/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 labs and software labs.

B.Sc. (IT) (BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY)

- The Program outcomes in B.Sc.(IT) 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 B.Sc.(IT) courses, in outcome-based curriculum framework, help students learn solving problems, accomplishing IT tasks, and expressing creativity, both individually and collaboratively. The proposed framework will help Students learn programming techniques and the syntax of one or more programming languages. **After graduating with a 4 year degree, the students are eligible for 1 year MCA (Master in Computer**

Application) and M.Sc. (IT) (Master in Science in Information Technology) 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 B.Sc. (IT) degrees is intended to facilitate the students to achieve the following:

Some of the subjects taught in the B.Sc.IT course include computer architecture and organization, database system, operating system, electronics, computer networking, foundations of a computer system, java programming, website design, etc. B.Sc.IT course has excellent job scope and career prospects. Aspirants looking for a professional career, then there are various job openings available for them. Some important career profiles are IT Support Analyst, Network Engineer, IT Consultant and Technical Sales.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

PEO1: To provide opportunity for the study of modern methods of information processing and its applications.

PEO2: By using technical methods, students are able to solve the real time computerized problems by analyzing, designing, implementing and evaluating the problems.

PEO3: To develop among students the programming techniques and the problem solving skills through programming.

PEO4: To prepare students who wish to go on to further studies in computer science and related subjects.

PROGRAMME OUTCOMES (PO)

PO1: Research and development: Developing with the idea of new research and technology.

PO2: Designing Product: Information Technology design products based on AI motion, and it includes the act of development in the range of Software development, Information technology, Computer Forensic Analyst, Information Technology Business Analyst, and Computer Network Architect.

PO3: Systems Management: Involves basic skills for analyzing and solving problems related to the technical system.

PO4: Marketing: The market of Information Technology is growing day by day and can grow during the working time and date. The work has been easy and dependable upon the Information Technology that doing without is unthinkable.

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: IT graduates assume the responsibility of the development and selection of the appropriate computer hardware and software products and systems for an organization; and the installation, customization, implementation, management, and maintenance of such products and systems for the organization's computer users. IT will have a curriculum with Syllabi 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**
- **Interdisciplinary 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.

- **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 another discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

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.

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 of Science in Information Technology, Bachelor of Science in Information Technology (Honours) and Bachelor of Science in Information Technology (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 B.Sc.(IT) Research Program:

a. **One year:** Under Graduate Certificate in Information Technology (**Total Credits:50**)
b. **Two years**: Under Graduate Diploma in Information Technology (**Total Credits:97**)
c. **Three years**: Bachelor of Science in Information Technology [B.Sc.(IT)] (**Total Credits:147**)
d. **Four years**: Bachelor of Science in Information Technology with Honours: B.Sc.(IT) (Honours) or Bachelor of Science in Information Technology with Research: B.Sc.(IT) (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. **B.Sc.(IT) (Honours with Research):** B.Sc.(IT) Degree
2. **For B.Sc.(IT) (Honours)**: B.Sc.(IT) Degree

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

SEMESTER WISE CREDIT DISTRIBUTION:

SEMESTER WISE CREDIT DISTRIBUTION OF PROPOSED B.Sc.(IT) ***[B.Sc.(IT) (HONOURS) AND B.Sc.(IT) (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	-	-	-	6	23
II	15	-	-	4	3	-	4	26
III	11	-	1	6	-	-	5	23
IV	12	3	-	2	-	-	4	21
V	19	-	-	-	-	-	4	23
VI	-	-	-	-	-	-	-	20
B.Sc.(IT) (Research)								
VII	19	-	-	2	-	-	6	27

B.Sc.(IT) (Research With Honours)								
VII	**19**	**-**	**-**	**-**	**2**	**-**	**6**	**27**

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
B.Sc.(IT)	**89**	**05**	**04**	**12**	**03**	**-**	**23**	**136**
B.Sc.(IT) (Research)	**19**	**00**	**00**	**02**	**00**	**-**	**6**	**47**
B.Sc.(IT) (Research With Honours)	**19**	**00**	**00**	**00**	**02**	**-**	**6**	**47**

3 Years B.Sc.(IT) Program	**Total Credits = 136**
4 Years B.Sc.(IT) (Research) and B.Sc.(IT) (Research With Honours)	**Total Credits = 183**

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

Course Scheme (B.Sc. (IT) 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	CSA175	Fundamentals of IT Tools	4:0:0	4:0:0	4	4
2	Major Course	CSA177	Data Communication and Networks	4:0:0	4:0:0	4	4
3	Minor Course	CSA179	Programming with C	4:0:0	4:0:0	4	4
4	MDC	MDC023	Indian Knowledge System	3:0:0	3:0:0	3	3
5	AEC	AEC/JK (LS)-I	Jeevan Kaushal Life Skills 2.0 (Communication Skills in English-I)	2:0:0	2:0:0	2	2
6	PT	PT101/ PT103/ PT105	Physical Training (NSO/NCC/NSS)	0:0:2	NC	2	NC

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA181	Fundamentals of IT Tools (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA183	Programming with C (P)	0:0:4	0:0:2	4	2
3	Major Course	CSA185	Data Communication and Networks (P)	0:0:4	0:0:2	4	2

Total Credits: 23
Total Contact Hours: 31


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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	CSA176	Programming in C++	4:0:0	4:0:0	4	4
2	Major Course	CSA178	Operating System	4:0:0	4:0:0	4	4
3	Minor Course	CSA180	Software Engineering	3:0:0	3:0:0	3	3
4	Major Course	MAT174	Fundamentals of Elementary Mathematics	4:0:0	4:0:0	4	4
5	VAC	AEC-II	Jeevan Kaushal 2.0 (Communication Skills in English -II)	2:0:0	2:0:0	2	2
6	VAC	VAC050	Nirmal Sampradaya: History, Literature & Philosophy	2:0:0	2:0:0	2	2
7	SEC	SEC	Skill Enhancement Course	3:0:0	3:0:0	3	3
8	PT	PT102/ PT104/ PT106	Physical Training (NSO/NCC/NSS)	0:0:2	NC	2	NC

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA182	Programming in C++ (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA184	Operating System (P)	0:0:4	0:0:2	4	2

Total Credits: 26

Total Contact Hours: 32

***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 INFORMATION TECHNOLOGY will be awarded, if a student wishes to exit at the end of First year.

Exit Criteria after First Year of B.Sc. (IT)

Programme

Students will have the option to exit the Bachelor of Science in Information Technology [B.Sc.(IT)] program after successfully completing the first year. Upon exit, they will be awarded a **UG Certificate in Information Technology**. 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 information technology.
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 B.Sc.(IT) 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	CSA275	Data Structure and Algorithms	3:1:0	3:1:0	4	4
2	Major Course	CSA277	Web System and Technologies	4:0:0	4:0:0	4	4
3	Minor Course	CSA279	Cyber Security	3:0:0	3:0:0	3	3
4	VAC	VAC022/ EVS200	Value Added Course (Environmental Education)	4:0:0	4:0:0	4	4
5	VAC	VAC-II (JKM001)	Mulya Pravah 2.0 (Human Values and Professional Ethics)	2:0:0	2:0:0	2	2
6	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	CSA281	Data Structure and Algorithms (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA283	Web System and Technologies (P)	0:0:4	0:0:2	4	2
3	MDC	CSR002	Community Engagement and Social Responsibilities (P)	0:0:1	0:0:1	1	1

Total Credits: 23
Total Contact Hours: 27

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	CSA276	Database Management System	4:0:0	4:0:0	4	4
2	Major Course	CSA278	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	VAC	MDC019	Jeevan Kaushal Life Skills 2.0 (Universal Human Values)	2:0:0	2:0:0	2	2
5	AEC	AEC001	Ability Enhancement Course(Functional English-I)	3:0:0	3:0:0	3	3

II. Practical Subjects

Sr. No.	Course Type	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major Course	CSA280	Database Management System (P)	0:0:4	0:0:2	4	2
2	Major Course	CSA282	Java Programming (P)	0:0:4	0:0:2	4	2

Total Credits: 21
Total Contact Hours: 25

Exit Criteria after Second Year of B.Sc.(IT) Programme

Students will have the option to exit the Bachelor of Science in Information Technology (B.Sc.(IT)] program after successfully completing the second year. Upon exit, they will be awarded a **UG Diploma in Information Technology**. 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 information technology.
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 information technology 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 B.Sc.(IT) 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	CSA375	Computer System Architecture	4:0:0	4:0:0	4	4
2	Major Course	CSA377	Computer Graphics	4:0:0	4:0:0	4	4
3	Minor Course	CSA379	Systems and Network Administration	3:0:0	3:0:0	3	3
4	Minor Course	CSA381	Fundamentals of Digital Electronics	3:0:0	3:0:0	3	3
5	Minor Course	CSA383	Basics of Information Technology Management	3:0:0	3:0:0	3	3
6	Minor Course	CSA389	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 Course	CSA385	Computer Graphics (P)	0:0:4	0:0:2	4	2
2	Major	CSA387	Fundamentals of Digital Electronics (P)	0:0:4	0:0:2	4	2

Total Credits: 23
Total Contact Hours: 27

Semester 6
Apprenticeship/Internship Training (ATS001)

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

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

2. Duration: Typically 4 to 6 months. Covers the entire 6th semester of the B.Sc.(IT) programme.

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

4. Work Scope: Students may work on:

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

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

6. Evaluation:

Generally includes:

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

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

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

Total Credits: 20

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY Degree will be awarded, if a student wishes to exit at the end of Third year.

National Higher Education Qualifications Framework (NHEQF 5.5)

Exit Criteria after Third Year of B.Sc.(IT) Programme

The students shall have an option to exit after the 3rd year of the Information Technology Program and will be awarded with a Bachelor of Science in Information Technology.

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

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

Semester 7 (For Research Opting Student)

I. Theory Subjects

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

II. Practical Subjects

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

Total Credits: 27
Total Contact Hours: 33

Semester 7 (For Honours Students)

I. Theory Subjects

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

II. Practical Subjects

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

Total Credits: 27
Total Contact Hours: 33

Semester 8 (For Honours/Research Opting Students)

Apprenticeship/Internship Training (ATS002)

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

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

2. Duration: Typically 4 to 6 months. Covers the entire 6th semester of the B.Sc.(IT) programme.

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

4. Work Scope: Students may work on:

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

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

6. Evaluation:

Generally includes:

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

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

8. Certification: A certificate of completion must be obtained from the organization, detailing the nature of work and duration.
A Bachelor's degree 'Honours with research' after a 4-year (eight semesters) programme of study if the student completes a rigorous research project in her/his major area(s) of study as specified by the HEI.

Total Credits: 20

National Higher Education Qualifications Framework (NHEQF 6)

Summary of Scheme

Semester	L	T	P	Contact Hours Per Week	Credits
1	17	0	6	31	23
2	22	0	4	32	26
3	17	1	5	27	23
4	17	0	4	25	21
5	19	0	4	27	23
6	--	--	--	--	20
7 (RS)	19	2	6	33	27
7 (HS)	19	2	6	33	27
8	--	--	--	--	20
Total (RS)	**151**	**3**	**29**	**181**	**183**
Total (HS)	**151**	**3**	**29**	**181**	**183**

First Semester

Course Code	**CSA175**
Course Title	**Fundamentals of IT Tools**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic Knowledge About Computers
Course Objective(s)	To gain experience about MS-Office. To help students to understand the basic concepts of computer.
Course Outcome (CO)	The students will be able to: **1.** Understand the basic concepts of computer **2.** Understand the various storage devices **3.** Learn basics of Word Processing, Spread Sheets and Presentation. **4.** Learn new concepts used in IT world.

SYLLABUS

UNIT I:

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

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

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

UNIT II:

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

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

UNIT III:

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

UNIT IV:

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

RECOMMENDED BOOKS

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

Course Code	**CSA177**
Course Title	**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	**CSA179**
Course Title	**Programming With C**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	+2 in any stream
Course Objective(s)	The objective of this course is to provide the students an overview of computer programming.
Course Outcome (CO)	The students will be able to: **1.** Understand how to create flowcharts. **2.** Perform logical proofs. **3.** Apply recursive functions. **4.** Determine equivalent logic expressions

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

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

Course Code	**MDC023**

Course Title	**Indian Knowledge System**
Type of Course	MDC
L T P	3:0:0
Credits	3
Course Prerequisites	N.A.
Course Objective(s)	**1.** Comprehend the core principles of the Indian knowledge system, including health, spirituality, and cultural preservation. **2.** Explore the contributions of ancient Indian mathematicians to number systems, geometry, and astronomy.
Course Outcome (CO)	The students will be able to: **1.** Students will grasp the essence of the Indian knowledge system, encompassing health, mathematics, and cultural heritage. **2.** Upon completion, students will appreciate the influence of ancient Indian texts, mathematicians, and cultural practices on contemporary society.

SYLLABUS

UNIT I:

Overview of Indian Knowledge System: Introduction to Indian knowledge system, its uniqueness; Vedic literature: Rigveda, Samaveda, Yajurveda, Atharvaveda; Ayurveda: holistic health principles, natural remedies; Yoga, meditation: physical, mental well-being; Art, architecture: monuments, preservation of cultural heritage.

UNIT II:

Scientific and Mathematical Contributions: Introduction to science and math; Ancient Indian mathematicians: Aryabhata, Brahmagupta, Bhaskara; Number systems, invention of zero, basic arithmetic; Geometry, trigonometry: shapes, angles, trigonometric ratios; Astronomy, calendar systems, ancient Indian discoveries.

UNIT III:

Simple Philosophical Ideas: Importance of Kindness, Power of Imagination, Respect for Nature, Golden Rule, Mindfulness and Self-awareness, Curiosity and Asking Questions, Journey of Learning, Gratitude and Appreciation, Value of Friendship, Power of Positive Thinking, Existence of Truth, Ethics and Morality, Importance of Justice, and Nature of Reality

UNIT IV:

Art, Culture, and Society Made Simple: Traditional Indian Festivals, Indian Folk Dances, Indian Classical Music, Indian Clothing Styles, Indian Cuisine, Indian Mythology, Traditional Indian Art Forms, and Historical Monuments, Languages of India, and Indian Wildlife and Nature, Family Structure in India, Caste System, Education System, Indian Weddings, Role of Women in Indian Society, Religious Diversity, Rural vs. Urban Life, Social Issues, Traditional Occupations, and Community Celebrations.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	The Story of Numbers	David M. Burton	McGraw Hill Education
2.	Introduction to Indian Philosophy	Sati Chandra Chatterjee	Rupa & Co.

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

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

RECOMMENDED BOOKS

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

CSA181 Fundamentals of IT Tools (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 Programming with C (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.

CSA185 Data Communication and Networks (P)

L T P
0 0 4

Objective: The objective of this practical course is to understand networking concepts and to analyze network traffic and protocols.

1. Study of different types of Network cables.
2. Study of Network Devices in detail.
3. Study of network IP.
4. Connect the computers in Local Area Network.
5. Study of basic network command and Network configuration Commands.
6. Performing an Initial Switch Configuration.
7. Performing an Initial Router Configuration.
8. Configuring and Troubleshooting a Switched Network.
9. Connecting a Switch.
10. Interpreting Ping and Traceroute Output.
11. Demonstrating Distribution Layer Functions.
12. Implementing an IP Addressing Scheme.
13. Configuring RIP.
14. Examining Network Address Translation (NAT).
15. Observing Static and Dynamic Routing.

Second Semester

Course Code	**CSA176**
Course Title	**Programming in 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.

Course Code	CSA178

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 Title	**Operating System**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic computer knowledge and OS DOS Windows
Course Objective(s)	The objective of this course is to help students become familiar with the fundamental concepts of operating systems and provide students with sufficient understanding of operating system design.
Course Outcome (CO)	The students will be able to: **1.** Describe the importance of computer system resources and the role of operating system in their management policies and algorithms **2.** Understand the process management policies and scheduling of processes by CPU **3.** Evaluate the requirement for process synchronization and coordination handled by operating system **4.** Describe and analyze the memory management and its allocation policies

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

RECOMMENDED BOOKS

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

Course Code	**CSA180**
Course Title	**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	**MAT174**
Course Title	**Fundamentals of Elementary Mathematics**
Type of Course	Major

L T P	4:0:0
Credits	4
Course Prerequisites	Student must have the knowledge of Basic Mathematics
Course Objective(s)	This course aims to provide foundational knowledge in discrete mathematics including matrix theory, set theory, mathematical logic, graph theory, and number systems to develop analytical and problem-solving skills essential for computer applications.
Course Outcome (CO)	The students will be able to: **1.** Understand and apply the fundamental concepts of matrices and determinants, including matrix operations, eigenvalues, and the Cayley-Hamilton Theorem for solving systems of linear equations. **2.** Demonstrate the ability to use set theory and functions to model and solve real-life problems involving relations, mappings, and operations on sets. **3.** Analyze logical statements using truth tables, logical equivalence, and apply mathematical reasoning in problem-solving, including basic concepts of graph theory and trees. **4.** Apply the principles of number theory such as division algorithm, GCD, LCM and congruence relations to solve problems in discrete mathematics and computer science.

SYLLABUS

UNIT I:

(Matrix and Determinants) Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Dependence of Vectors, Eigen Values of a Matrix, Cayley-Hamilton Theorem (without proof). Determinants: Definition, Minors, Cofactors, Properties of Determinants.

UNIT II:

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

UNIT III:

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

UNIT IV:

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

RECOMMENDED BOOKS

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



Course Code	**AEC-II**
Course Title	**Jeevan Kaushal Life Skills 2.0 (Communication Skills in English-II)**
Type of Course	AEC
L T P	2:0:0

Credits	2
Course Prerequisites	N.A.
Course Objective(s)	To enhance employability skills of the learners by enabling them to write an effective resume and face the interview with confidence.

SYLLABUS

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

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

UNIT III:
WRITING SKILLS: Resume Writing, Covering Letters, Interview Follow Up Letters, Email, Fax, Assessment through employability score card.

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

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

Course Code	**VAC050**
Course Title	**Nirmal Sampradaya: History, Literature and Philosophy**
Type of Course	VAC
L T P	2:0:0
Credits	2

Course Prerequisites	N.A.
Course Objective(s)	1. To provide information about the origin and development of the Nirmal Sampradaya. 2. To familiarize students with the philosophical and religious ideology of the Nirmal Sampradaya. 3. To introduce the prominent scholars, saints, and institutions of the Nirmal Sampradaya. 4. To study the contribution of Dera Santpura Jabbarr in the social and cultural sphere. 5. To familiarize students with the history and development of Dera Santpura Jabbarr.
	1. Students will be aware of the origin, development, philosophical and religious ideology of the Nirmal sect. 2. Students will gain knowledge about the history and development of Dera Santpura Jabbar. 3. Students will gain knowledge about the role played by Dera Santpura Jabbar in the socio-cultural field. 4. Students will be introduced to the prominent scholars, saints and institutions of the Nirmal sect.

SYLLABUS

UNIT I:
Nirmal Sampradaya: Origin and Historical Development - Beginning of Nirmal Sampradaya - Process of Development - Major Deras and Centers - Role in the Socio-Cultural Life of Punjab.

UNIT II:
Nirmal Sampradaya: Doctrines and Philosophy - Gurmat and Nirmal Ideology - Vedanta, Upanishads and Gurbani - Concept of Brahman, Jiva, Maya and Moksha - Theory of Knowledge, Bhakti and Karma - Ethics, Human Values and Public Welfare - Dialogue of Indian and Sikh Perspectives**.**

UNIT III:
Nirmal Sampradaya and Dera Santpura Jabbar - Dera Santpura Jabbar: History and Development - Dera Santpura Jabbar: Place in Nirmal Sampradaya.

UNIT IV: Dera Santpura Jabbar: Socio-Cultural Role - Social Aspects - Religious Aspects - Economic Aspects.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Shri Nirmal Panth Bodh	Gyani Balwant Singh Kotha Guru	Nirmal Panchayati Akhara, Kankhal-Haridwar
2.	History of Nirmal	Dr. Paramjit Singh	Jivan Printers,

	Panth-Part I		Amritsar
3.	History of Nirmal Panth-Part II	Dr. Paramjit Singh	Jivan Printers, Amritsar
4.	Nirmal Panth Prakash (Hindi)	Sant Jaswinder Singh Shastri	Nirmal Panchayati Akhara, Kankhal-Haridwar
5.	Nirmal Panth Di Gaurav Gatha	Gyani Balwant Singh Kotha Guru	Sukdev Kuti Rattan Bagh Haridwar
6.	Dera Santpura Di Gaurav Gatha	Prof. Hari Singh	Sant Baba Bhag Singh Memorial Society, Jalandhar
7.	Dera Santpura Jabbar and Nirmal Sect (History and Ideology)	Dr. Anita Rani, Dr. Harpreet Singh	Sumit Prakashan, Ludhiana

CSA182 Programming in 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.

CSA184 Operating System (P)

L T P
0 0 4

Objective: The goal of this course is to have students understand and appreciate the principles in the design and implementation of operating systems software.

1. Simulate the following CPU scheduling algorithms.

   a) FCFS b) SJF c) Round Robin d) Priority.

2. Write a C program to simulate producer-consumer problem using Semaphores.

3. Write a C program to simulate the concept of Dining-philosophers problem.

4. Simulate MVT and MFT.

5. Write a C program to simulate the following contiguous memory allocation Techniques

   a) Worst fit b) Best fit c) First fit

6. Simulate all page replacement algorithms

   a) FIFO b) LRU c) OPTIMAL.

7. Simulate all File Organization Techniques

   a) Single level directory b) Two level directory

8. Simulate all file allocation strategies

   a) Sequential b) Indexed c) Linked.

9. Simulate Bankers Algorithm for Dead Lock Avoidance.

10. Simulate Bankers Algorithm for Dead Lock Prevention.

11. Write a C program to simulate disk scheduling algorithms.

    a) FCFS b) SCAN c) C-SCAN

Third Semester

Course Code	**CSA275**
Course Title	**Data Structure and Algorithms**
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	**CSA277**
Course Title	**Web System and Technologies**
Type of Course	CSA277
L T P	4:0:0
Credits	4
Course Prerequisites	Programming

Course Objective(s)	The objective of the course is to introduce PHP, XML, Server Side Programming and Client Side Scripting.
Course Outcome (CO)	The students will be able to: **1.** Gain knowledge of client-side scripting, validation of forms and AJAX programming **2.** Understand server-side scripting with PHP language **3.** Understand what is XML and how to parse and use XML Data with Java **4.** Understand Server-side programming with Java Servlets and JSP.

SYLLABUS

UNIT I:

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies. **File Handling in PHP:** File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories

UNIT II:

HTML Common tags: List, Tables, images, forms, Frames; Cascading Style sheets; XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemas, Document Object Model, XHTML. **Parsing XML Data:** DOM and SAX Parsers in java.

UNIT III:

Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a Servlet, deployment of a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, Connection to a database using JDBC.

UNIT IV:

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, Connection to database in JSP.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Web Technologies	Uttam K. Roy	Oxford University Press
2.	The Complete Reference PHP	Steven Holzner	Tata McGraw Hill
3.	Java Script	D. Flanagan	O' Reilly

Course Code	**CSA279**
Course Title	**Cyber Security**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	Data Communication and Networks

Course Objective(s)	To analyze the evolving cyber threat landscape and technical attack vectors while evaluating the global legal frameworks and data privacy regulations governing digital security.
Course Outcome (CO)	On successful completion of the course, the students will be able to: **1.** Explain fundamental cyber security concepts, attack vectors, and the impact of threats on national critical infrastructure. **2.** Identify various cyber crimes, ranging from malware and ransom ware to social engineering tactics. **3.** Navigate the legal landscape by understanding the IT Act 2000, its amendments, and the global regulatory framework for cybercrime. **4.** Implement data privacy and security principles by assessing the compliance requirements for big data and personal data protection.

SYLLABUS

UNIT I:

Overview of Cyber security: Cyber Security increasing threat landscape, Cyber Security Terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker, Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyber warfare, Case Studies.

UNIT II:

Cyber Crimes: Cyber crimes targeting Computer systems and Mobile- data diddling attacks, spyware, logic bombs, Dos, DDoS, APT's, virus, Trojans, Ransom ware, data breach, Online scams and frauds, email scams, Pishing, Vishing, Smishing, Online Job fraud.

UNIT III:

Cyber Law: Cyber crime and legal landscape around the world, IT Act 2000 and its amendments. Limitations of IT Act 2000. Cyber crime and punishments. Cyber Laws of other countries, Case Studies.

UNIT IV:

Data Privacy and Data Security: Defining data, meta-data, big data, non-personal data, Data protection, Data Privacy and Data security, Personal Data Protection Bill and its compliance, Data Protection principles, Big data security issues and challenges.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Cyber Security For Beginners	Raef Meeuwisse	Lulu Publishing Services
2.	Social Engineering: The Science of Human Hacking	Christopher Hadnagy	Wiley
3.	The Art of Invisibility	Kevin Mitnick	Brown and Company

Course Code	**VAC022/EVS200**
Course Title	**Value Added Course (Environmental Education)**
Type of Course	VAC
L T P	4:0:0
Credits	4

Course Prerequisites	10+2
Course Objective(s)	To connect and sensitize the students towards the environment and prevailing Environmental issues (natural, physical, social and cultural).
Course Outcome (CO)	On successful completion of the course, the students will be able to: **1.** Appreciate the historical context of human interactions with the environment. **2.** Develop an understanding of pollution and its types **3.** Learn about the concept of Ecosystem, Ecosystem services **4.** Learn about climate change and biodiversity conservation **5.** Understand the relation between social issues and environment. **6.** Learn about the major international treaties and our country's stand on and responses to the major international agreements.

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

Understanding climate change: Anthropogenic climate change from greenhouse gas emissions, Climate change impact on global warming and its effect on Indian Subcontinent, rise of sea level, Changes in marine and coastal ecosystems, Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment. Mitigation of climate change, National climate action plan. Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control. Environmental management system: ISO 14001 Concept of Circular Economy, Life

cycle analysis; Cost-benefit analysis. Environmental audit and impact assessment; Waste Management-Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Eco labeling /Eco mark scheme.

UNIT IV:

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

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

Course Code	**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 start applying them in their life and profession. **2.** Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body etc. **3.** Understand the value of harmonious relationship based on trust and respect in their life and profession. **4.** Distinguish between ethical and unethical practices, and start working out 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

CSA281 Data Structure and Algorithms (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.

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. Create a webpage with HTML describing your department. Use paragraph and list tags.
2. Apply various colors to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags.
3. Create links on the words e.g. “Wi-Fi” and “LAN” to link them to Wikipedia pages
4. Create a table to show your class time-table. (b) Use tables to provide layout to your HTML page describing your university infrastructure.
5. Apply in-line CSS to change colors of certain text portion, bold, underline and italics certain words in your HTML web page. Also change background color of each paragraph using inline CSS.
6. Create a simple form to submit user input like his name, age, address and favorite subject, movie and singer.
7. Write a JavaScript program to display information box as soon as page loads.
8. Write a JavaScript program to dynamically bold, italic and underline words and phrases based on user actions.
9. Create a user registration web Application
10. At the server end, write code to retrieve contents of request object and show them to the user. Match user input password with predefined password and show “Valid User” or “Invalid User”
11. A web application that takes name and age from html page. If age less than 18 it should show Hello You are not authorized to visit the site. Otherwise welcome to website.
12. Create a simple JSP page, preferably for the form in experiment 3. Embed JSP in HTML page itself.
13. Modify the above program use XML file instead of database.

CSR002 Community Engagement and Social Responsibilities (P)

L T P

0 0 2

Objectives: The course is designed:

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

Module A: Orientation and Community Mapping

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

Module B: Rural/Urban Community Engagement

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

Module C: Social Awareness and Action

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

- **Module D: Institutional Social Responsibility**

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

Fourth Semester

Course Code	**CSA276**
Course Title	**Database Management System**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic computer fundamentals and programming concepts.
Course Objective(s)	To understand Database Management System as well as to construct queries using SQL.
Course Outcome (CO)	The students will be able to: **1.** Learn the concept of Database Management System. **2.** Design the database for the given problem. **3.** Manage database using SQL. **4.** Understand control structure of DBMS.

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

RECOMMENDED BOOKS

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

Course Code	**CSA278**
Course Title	**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	**MDC019**

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

SYLLABUS

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

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

UNIT II: Understanding Harmony in Human Beings

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

UNIT III: Understanding Harmony in Human Relationships

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

UNIT IV: Understanding Harmony in Nature & Existence

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

Sessional work:

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

RECOMMENDED BOOKS

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



Course Code	AEC001

Course Title	**Ability Enhancement Course (Functional English-I)**
Type of Course	AEC
L T P	3:0:0
Credits	3
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

CSA280 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.

CSA282 Java Programming (P)

L T P

0 0 4

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

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

Fifth Semester

Course Code	**CSA375**
Course Title	**Computer System Architecture**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic Computer Arithmetic
Course Objective(s)	The objective of this course is to provide a comprehensive understanding of the fundamental building blocks, organization and design principles of digital computers.
Course Outcome (CO)	The students will be able to: **1.** Understand the theory and architecture of central processing unit. **2.** Analyze some of the design issues in terms of speed, technology, cost, performance. **3.** Learn the concepts of parallel processing, pipelining and inter-processor communication. **4.** Understand the basics of hardwired and micro-programmed control of the CPU

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

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



Course Code	**CSA377**
Course Title	**Computer Graphics**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Proficiency in C Programming/ C++.
Course Objective(s)	This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
Course Outcome (CO)	The students will be able to: **1.** Understand the basics of computer graphics, different graphics systems and applications of computer graphics. **2.** Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. **3.** Use the geometric transformations on graphics objects. **4.** Extract scene with different clipping methods.

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

RECOMMENDED BOOKS

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

Course Code	**CSA379**
Course Title	**Systems and Network Administration**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	Data Communication & Operating System
Course Objective(s)	To design, configure, and manage secure multi-platform network infrastructures while automating server services and troubleshooting complex system environments to ensure high availability.
Course Outcome (CO)	The students will be able to: **1.** Install and manage Windows/Linux environments, including user accounts, permissions, and system logs. **2.** Design and configure IP addressing, subnetting, and physical hardware for robust connectivity. **3.** Deploy and maintain critical network protocols including DNS, DHCP, Web, and SSH. **4.** Apply firewalls, backup strategies, and diagnostic tools to troubleshoot and protect infrastructure.

SYLLABUS

UNIT I:

System Administration Fundamentals (Windows & Linux): Role of a System Administrator, Server Environment Components (Microsoft and Linux). Server OS installation, BIOS/UEFI configuration, dual booting, partitioning, and formatting. Creating, modifying, and deleting user accounts, managing permissions, local security policies. Process management (top, kill), system monitoring, log analysis, and file systems.

UNIT II:

Networking Fundamentals and Management: Data Communication concepts (LAN, MAN, WAN), network topologies, and OSI Model layers. IPv4 and IPv6 addressing, subnet masking, static and dynamic configuration. Switches, Routers, Bridges, Firewalls, Cables (Twisted pair, Optical Fiber). TCP/IP utilities (ping, traceroute, netstat, ifconfig/ipconfig).

UNIT III:

Network Services and Server Administration: DHCP Server installation and management, DNS Server configuration, FTP and Samba server setup, SSH, Telnet, Virtual Network Computing (VNC), and Remote Desktop Protocols.

UNIT IV:

Troubleshooting: Diagnostic tools, cable testing, diagnosing system performance issues, and disaster recovery. Introduction to Virtualization (VMware/VirtualBox), managing Virtual Machines, Introduction to Cloud (IaaS/SaaS). Threats and Mitigation, VPN configuration, User Authentication (Active Directory basics).

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	The Practice of System and Network Administration	Thomas A. Limoncelli, Christina J. Hogan, and Strata R. Chalup	Addison-Wesley Professional
2.	UNIX and Linux System Administration Handbook	Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, and Dan Mackin	Pearson Education
3.	Networking All-in-One For Dummies	Doug Lowe	John Wiley & Sons



Course Code	**CSA381**
Course Title	**Fundamentals of Digital Electronics**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	Students should know about the various electronics components and physics concepts.
Course Objective(s)	Demonstrate the operation of simple digital gates, identify the symbols, truth table for gates; change binary, hexadecimal, octal numbers to their decimal equivalent and vice versa, demonstrate the operation of a flip flop. Convert digital into analog and vice versa.
Course Outcome (CO)	The students will be able to: **1.** Develop a digital logic. **2.** Apply it to solve real life problems. **3.** Understand, analyze and design various combinational and sequential circuits. **4.** Learn how to convert signals.

SYLLABUS

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

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

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

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

RECOMMENDED BOOKS

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

Course Code	**CSA383**
Course Title	**Basics of Information Technology Management**
Type of Course	Minor

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

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**

1.	Information Technology for Management	Efraim Turban	Wiley
2.	IT Strategy and Management	Sanjiva Shankar Dubey	PHI
3.	Management Information System	Jawedkar	McGraw Hill

Course Code	**CSA389**
Course Title	**Leadership and Management Skills**

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

SYLLABUS

UNIT I:

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

UNIT II:

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

UNIT III:

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

UNIT IV:

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

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**

1.	Leadership and Management Skills	Dr. C.S.G. Krishnamacharyulu, Dr. Lalitha Ramakrishnan	Himalaya Publishing House
2.	Leadership and Management Skills	SIA Editorial Board	SIA Publishers
3.	Leadership Skills (Life Skill Course)	Dr. D. Sahadevudu	Technical Publishers

CSA385 Computer Graphics (P)

L T P

0 0 4

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

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

L T P

0 0 4

Objective: To provide hands-on experience in designing, building, and troubleshooting combinational and sequential digital circuits using basic logic gates, flip-flops, and ICs.

1. Verification of Truth Tables for Basic Gates (AND, OR, NOT) using ICs (e.g., 7408, 7432, 7404).
2. Verification of Truth Tables for Universal Gates (NAND, NOR) using ICs (e.g., 7400, 7402).
3. Implementation of Basic Gates (AND, OR, NOT) using only Universal Gates (NAND/NOR).
4. Design and implement a Half Adder and Full Adder circuit.
5. Design and implement a Half Subtractor and Full Subtractor circuit.
6. Implementation of a 2x1 or 4x1 Multiplexer using logic gates.
7. Verification of Decoder (e.g., 2 to 4 line) and Encoder (e.g., Decimal to BCD) ICs.
8. Displaying binary data using a BCD to 7-Segment Decoder/Driver (IC 7447/7448).
9. Verification of Truth Tables for Flip-Flops: SR, JK, and D Flip-Flops (using IC 7476/7474).
10. Implementation of a 4-bit Asynchronous (Ripple) Counter using JK Flip-Flop ICs.
11. Design and verify a 4-bit Shift Register (SISO/SIPO).
12. Construct a simple Digital Clock or Timer using a 555 timer and counter IC.
13. Build a 2-bit Magnitude Comparator.

Sixth Semester

Apprenticeship/Internship Training (ATS001)

L T P

0 0 20

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

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

2. Duration: Typically 4 to 6 months. Covers the entire 6th semester of the B.Sc.(IT) programme.

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

4. Work Scope: Students may work on:

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

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

6. Evaluation:

Generally includes:

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

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

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

Total Credits: 20