Shreyarth University

Gujarat Bhavan, Nr M. J. Library, Ashram Road, Ahmedabad – 380 006

NOTIFICATION-AC0802

No.: SU/ACD/AC/NOT/2026/1436 **Date:** 15/04/2026

Subject: Approval of syllabus of various programmes of School of Computer Science and Applications.

Read following with respect to the subject mentioned above:

i. Resolution no. 3,4,5,6,7 of the 10th meeting of the Board of Studies of the School of Computer Science and Applications dated 02/03/2026. (Attached as Appendix-1)
ii. Resolution No. 2 of the 8th meeting of the Academic Council dated 16/03/2026. (Attached as Appendix-2)

In pursuance of the above-mentioned read i and ii, the following decision is notified with regard to the approval of the syllabus of various programmes of School of Computer Science and Applications:

iii. Resolved that the Academic Council, after reviewing the recommendations of the Board of Studies of the School of Computer Science and Applications, be approved the new Syllabus, Teaching and Examination Scheme of the programmes and semesters as detailed in Appendix-4, to be implemented with effect from the Academic Year 2026–27 onwards in alignment with the provisions of NEP 2020. (Attached as Appendix-3)

Programme	Sem.	New / Modified Syllabus
BCA, Int. B.Sc.-M.Sc. (CA&IT)	VII	New
Int. B.Sc.-M.Sc. (CA&IT)	IX	New
M. Sc. (IT)	III	New
B.Sc. Cyber Security Cloud Computing and Networking	V	New
B. Sc. Animation, VFX & Gaming	VII	New

Dr. Suresh Sorathia,
Registrar (I/C),
Shreyarth University, Ahmedabad.

SHREYARTH UNIVERSITY Ahmedabad

Attachments: As mentioned above

Copy forwarded for information and necessary action to:

- President, Shreyarth University
- Provost, Shreyarth University
- Library, Shreyarth University
- Director / Head of School of Computer Science and Applications
- All the employees of the School of Computer Science and Applications
- All academic and administrative sections of the University
- Select File

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SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

The 10th meeting of the Board of Studies of School of Computer Science and Applications, Shreyarth University, was held on 02/03/2026 at 10:00 am at Shreyarth University campus in which the following members were present:

1. Dr. Nikita Shah — Chairperson,
2. Prof. R. P. Soni,
3. Dr. Bhavin Shah,
4. Prof. Ashutosh Trivedi,
5. Prof. Haresh Solanki,
6. Prof. Anisha Gajjar
7. Prof. Ankita Chauhan
8. Dr. Suresh Sorathia — Member Secretory

Following Attendees have attended the meeting:

1. Dr. Apurv Raval
2. Prof. Jinal Bhatt,
3. Prof. Jalak Modi
4. Prof. Kuntal Ghose,
5. Prof. Amit Patil,
6. Prof. Harish Luhar
7. Prof. Kush Shah
8. Prof. Hiral Vora

In the beginning of the meeting, the Chairperson welcomed all and gave brief idea about the meeting, and discussed progress of the school.

After the above deliberation following agenda was taken into consideration:

Item No 1- Consideration of the confirmation of the Minutes of the 9th meeting of Board of Studies held on 19.11.2025 at Shreyarth University Campus (Appendix-I).

(Minutes of this meeting was circulated to the committee on 15.12.2025 and no comments were received.)

Resolution:

Resolved that the Minutes of the 9th Meeting of the Board of Studies of the School of Computer Science and Applications held on 19.11.2025 be and are hereby confirmed, as attached with the agenda.

Item No 2- Consideration of note on the actions taken on the decisions of the 9th meeting of the Board of Studies held on 19.11.2025 at Shreyarth University Campus (Appendix-II).

Resolution:

Resolved the note on the actions taken on the decisions of the 9th Meeting of the Board of Studies of the School of Computer Science and Applications held on 19.11.2025 be and is hereby noted as attached with the agenda.

Item No 3- Consideration of Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme of BCA(H) Semester VII programme and to make appropriate recommendations to the Academic Council as per NEP 2020 (Appendix-III)

Resolution:

Resolved to recommend to the Academic Council that approval be given to the Syllabus with Course Learning Outcomes (CLOs) and Teaching & Examination Scheme of BCA(H) Semester VII programme as attached with the agenda with effect from academic year 2026 – 2027 onwards.

Item No 4- Consideration of Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme of Integrated B.Sc.-M.Sc.-CA&IT Semester IX programme and to make appropriate recommendations to the Academic Council as per NEP 2020 PG Guideline (Appendix-IV).

Resolution:

Resolved to recommend to the academic council that the approval be given to the Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme of Integrated B.Sc.-M.Sc.-CA&IT Semester IX programme as attached with the agenda with effect from academic year 2026 – 2027 onwards.

Item No 5- Consideration of Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme of M.Sc.IT Semester III programme and to make appropriate recommendations to the Academic Council as per NEP 2020 PG Guideline (Appendix-IV).

Resolution:

Resolved to recommend to the academic council that the Approval be given to the Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme M.Sc.IT Semester III programme as attached with the agenda with effect from academic year 2026 – 2027 onwards.

Item No 6- Consideration of Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme of B.Sc. (H) Cyber Security, Cloud Computing and Network Semester V programme and to make appropriate recommendations to the Academic Council as per NEP 2020 Guideline (Appendix-V).

Resolution:

Resolved to recommend to the academic council that the Approval be given to the Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme of B.Sc. (H) Cyber Security, Cloud Computing and Network Semester V programme as attached with the agenda with effect from academic year 2026 – 2027 onwards.

Item No 7- Consideration of Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme of B.Sc.(H) Animation, VFX and Gaming Semester VII programme and to make appropriate recommendations to the Academic Council as per NEP 2020 Guideline (Appendix-VI).

Resolution:

Resolved to recommend to the academic council that the Approval be given to the Syllabus with Course Learning Outcome (CLO) & Teaching & Examination Scheme of B.Sc.(H) Animation, VFX and Gaming Semester VI programme as attached with the agenda with effect from academic year 2026 – 2027 onwards.

Item No 8- Consideration of the expert review received from the different expert form industry and academia (Appendix-VIII).

Resolution:

Resolved that the feedback and suggestions received from the experts representing industry and academia be reviewed in detail. The recommendations shall be incorporated into the curriculum wherever found necessary, relevant, and feasible. The revised curriculum, if amended accordingly, shall be implemented with effect from the admission year 2026–27 onwards.

Item No 9- Consideration of review of Programme: BCA(H), Integrated B.Sc.-M.Sc.-CA&IT, M.Sc.IT, B.Sc.(H) Cyber Security Cloud Computing and Network, B.Sc.(H) Animation and VFX Gaming, MCA Semester: I, III, V, VII Semester End Examinations Question Papers on various parameters and formats (Appendix-VII).

Resolution:

Resolved that the quality of the University examinations question papers of past Semester End Examinations of Programme: BCA(H), Integrated B.Sc.-M.Sc.-CA&IT, M.Sc.IT,

B.Sc.(H) Cyber Security Cloud Computing and Network, B.Sc.(H) Animation and VFX Gaming, MCA Semester: I, III, V, VII as attached with the agenda was reviewed on various factors and found satisfactory.

Registrar (I/C)
Shreyarth University

Shreyarth University

Gujarat Bhavan, Nr M. J. Library, Ashram Road, Ahmedabad – 380 006

SU/AC/MOM/2026/ 1408 Date: 19/03/2026

ACADEMIC COUNCIL

Minutes of the Meeting

The 8th Meeting of the Academic Council of the Shreyarth University constituted under section 19 (c) of the Gujarat Private Universities Act, 2009, (read with Section 22 (1) of the Gujarat Private Universities Act, 2009 and proposed draft first Statute 3 of the University) was held on 16/03/2026 at 02:00 pm at the Conference Room of the University, Gujarat Bhavan, Near M. J. Library, Ashram Road, Ahmedabad, where following members were present:

1. Prof. (Dr.) Apurv Raval - Chairman
2. Dr. Hemant Trivedi (Online – Google Meeting)
3. Prof. Malti Mehta
4. Dr. Kinjal Adhvaryu
5. Prof. Krupal Acharya
6. Dr. Nikita Shah
7. Prof. Milan Vyas
8. Dr. Jayraj Pandya
9. Prof. Jinal Bhatt
10. Prof. Zalak Modi
11. Prof. Riddhi Zala
12. Dr. Suresh Sorathia, I/C Registrar – Member Secretary

The following member have attended the meeting as Special Invitee:

1. Hiral Vora – Academic Coordinator.

Leave of absence was granted to following member:

1. Dr. Dharmesh Shah

In the absence of the Provost, the Hon'ble President nominated the Dean and Director of Academics and Research, Prof. (Dr.) Apurv Raval, to chair the meeting, and he accordingly accepted and presided over it. At the outset, the Chairman introduced the new members and provided a brief overview of the meeting agenda. Following these initial proceedings, the agenda items were taken up for consideration.

Item No. 1: Consideration of the confirmation of the Minutes of the 7th meeting of the Academic Council held on 01/12/2025 at Shreyarth University Campus **(Appendix-1).**

Dr Suresh Sorathia

SHREYARTH UNIVERSITY Ahmedabad

(Note: Minutes of the previous meeting were circulated on 16.12.2025 and no comments were received thereafter)

Resolution:

Resolved that the minutes of the 7th meeting of the Academic Council held at Shreyarth University on 01/12/2025, which were circulated on 16.12.2025 and on which no comments were received thereafter, be and are hereby confirmed.

Item No. 2: Consideration of note on the actions taken on the decisions of the 7th meeting of the Academic Council held on 01.12.2025 at Shreyarth University Campus **(Appendix-2).**

Resolution:

Resolved that the Academic Council noted the actions taken on the decisions of the 7th meeting of the Academic Council held on 01.12.2025 at Shreyarth University Campus, as placed before the members, and the same be and are hereby taken on record.

Item No. 3: Considerations of the recommendations of the Board of Studies of School of Managements to accord approval to the Syllabus & Teaching & Examination Scheme of, BBA (Hons.) Sem.-VII, Integrated BBA-MBA Semester-VII, B. Com (Hons) V Programmes to be made effective from academic year 2026-27 as aligned with NEP 2020. **(Appendix-3A,3B,3C),** respectively.

Resolution:

Resolved that the Academic Council, after reviewing the recommendations of the Board of Studies of the School of Management, be approved the Syllabus, Teaching and Examination Scheme of BBA (Hons.) Semester VII, Integrated BBA-MBA Semester VII, and B.Com (Hons.) Semester V programmes, as placed at Appendix-3A, 3B, and 3C respectively, to be implemented with effect from the Academic Year 2026–27 in alignment with the provisions of NEP 2020.

Item No. 4: Considerations of the recommendations of the Board of Studies of School of Computer Science and Applications to accord approval to the new Syllabus & Teaching & Examination Scheme of following programmes and semesters to be made effective from academic year 2026-27 and onward as aligned with NEP-2020. **(Appendix-4).**

SHREYARTH UNIVERSITY Ahmedabad

DR SURESH SORATHIA

Programme	Sem.	New / Modified Syllabus
BCA, Int. B.Sc.-M.Sc. (CA&IT)	VII	New
Int. B.Sc.-M.Sc. (CA&IT)	IX	New
M. Sc. (IT)	III	New
B.Sc. Cyber Security Cloud Computing and Networking	V	New
B. Sc. Animation, VFX & Gaming	VII	New

Resolution:

Resolved that the Academic Council, after reviewing the recommendations of the Board of Studies of the School of Computer Science and Applications, be approved the new Syllabus, Teaching and Examination Scheme of the programmes and semesters as detailed in Appendix-4, to be implemented with effect from the Academic Year 2026–27 onwards in alignment with the provisions of NEP 2020.

Item No. 5: Considerations of the recommendations of the Board of Studies of School of Engineering to accord approval to the Syllabus & Teaching & Examination Scheme of Diploma in Computer Science Engineering Sem-III and Diploma in Information Technology, Semester-V programmes to be made effective from academic year 2026-27 and onward as per AICTE 2022 guidelines. **(Appendix-5).**

Resolution:

Resolved that the Academic Council, after reviewing the recommendations of the Board of Studies of the School of Engineering, be approved the Syllabus, Teaching and Examination Scheme of Diploma in Computer Science Engineering Semester III and Diploma in Information Technology Semester V programmes, as placed at Appendix-5, to be implemented with effect from the Academic Year 2026–27 onwards in accordance with the AICTE 2022 guidelines.

Item No. 6: Consideration to constitute the following new authorities under the Section 19 (d) of the Gujarat Private Universities Act, 2009, Statute-4, Sub-sequent Statute 1 (1) of the University. (Appendix-6).

- **Constitution of the Board of Studies for the B.Com. Programme under the School of Management.**

Resolution:

Resolved to recommend to the Board of Management and the Governing Body that the Academic Council, after reviewing the agenda for the constitution of new authorities under Section 19(d) of the Gujarat Private Universities Act, 2009, read with Statute-4 and subsequent Statute 1(1) of the University, proposed the constitution of a separate Board of Studies for the B.Com. Programme under the School of Management, considering the need for specialized academic guidance in the domain of accountancy and commerce.

Item No. 7: Considerations of the recommendations of the Board of Studies of School of Management to accord post facto approval to the Modification in Syllabus & Teaching &E Examination Scheme of the Internship course of BBA(Hons.) Sem VI, Integrated BBA-MBA Semester VI, programmes to be made effective from academic year 2025-26 as aligned with NEP 2020 (Appendix – 7).

Resolution:

Resolved that the Academic Council accorded post facto approval to the modifications in the Syllabus, Teaching and Examination Scheme of the Internship course for BBA (Hons.) Semester VI and Integrated BBA-MBA Semester VI programmes, as placed at Appendix–7. The Council further resolved that the same be implemented with effect from the Academic Year 2025–26, in alignment with the provisions of NEP 2020.

As there being no other business to transact, the meeting concluded with a vote of thanks to the Hon'ble Chair.

SHREYARTH UNIVERSITY Ahmedabad

Dr. Suresh Sorathia
Registrar (I/C),
Shreyarth University, Ahmedabad

SHREYARTH UNIVERSITY

School of Computer Science and Applications

Bachelors of Computer Applications (Hons.) - NEP

Teaching Scheme W.E.F- Year 2025 - 2026

Abbriviation used in this Teaching Scheme

MDC : Multi-Disciplinary Course

AEC : Ability Enhancement Course

SEC : Skill Enhancement Course

VAC : Value Added Course

IKS : Indian Knowledge System

CCE :

BCA (Hons.) Semester - 1

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	I	CSM101-1C	Fundamental Concepts of Programming Language	Major Course-1	2	1	1	4	5	50	50	100
2	I	CSM102-1C	Introduction to Web Designing	Major Course-2	2	1	1	4	5	50	50	100
3	I	CSE101-1C	Computer Organization and Digital Electronics	Minor Course– 1	4	0	0	4	4	50	50	100
4	I	MDC102-1C	Fundamentals of Mathematics	MDC-1	3	1	0	4	4	50	50	100
5	I	AEC101-1C	Basics of English Grammar	AEC-1	2	0	0	2	2	25	25	50
6	I	SEC103-1C	Communication Skills	SEC-1	2	0	0	2	2	25	25	50
7	I	IKS101-1C	Indian Knowledge System - I	IKS-1	2	0	0	2	2	25	25	50
Total					17	3	2	22	24	275	275	550

BCA (Hons.) Semester - 2

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	II	CSM105-1C	Advance Programming Language	Major Course-1	3	0	1	4	5	50	50	100
2	II	CSM106-1C	Database Management System	Major Course-2	3	0	1	4	5	50	50	100
3	II	CSE103-1C	Web Application Development	Minor Course– 1	3	0	1	4	5	50	50	100
4	II	MDC105-1C	Linear Algebra	MDC-1	4	0	0	4	4	50	50	100
5	II	AEC103-1C	Visual Design	AEC-1	0	0	2	2	4	25	25	50
6	II	SEC101-1C	Soft Skills	SEC-1	2	0	0	2	2	25	25	50

7	II	VAC101-1C	Yoga and Nutritions	VAC-1	0	1	2	2	3	25	25	50
8	II		Summer Internship (Additional Credit)		4 Weeks			2		25	25	50
Total					15	1	7	22	28	275	275	550
Remark: This semester is of 22 credit + additional 2 credit for Summer Internship done by the students in summer vacation after 2nd semester. The credit will be shown in the												
Summer Internship 4 Weeks												
Recommended Internship Areas:												

BCA (Hons.) Semester - 3

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	III	CSM201-2C	Object Oriented Programming Using C++	Major Course-1	3	0	1	4	5	50	50	100
2	III	CSM202-2C	Data Structures	Major Course-2	3	0	1	4	5	50	50	100
3	III	CSM203-2C	Advanced Database Management System	Major Course-3	3	0	1	4	5	50	50	100
4	III	MDC201-2C	Discrete Maths	MDC-1	3	1	0	4	4	50	50	100
5	III	AEC201-2C	Cyber Security	AEC-1	2	0	0	2	2	25	25	50
6	III	SEC201-2C	Digital Marketing	SEC-1	2	0	0	2	2	25	25	50
7	III	IKS201-2C	Indian Knowledge System II	VAC-1	2	0	0	2	2	25	25	50
Total					18	1	3	22	25	275	275	550

BCA (Hons.) Semester - 4

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	IV	CSM204-2C	Introduction to Operating Systems	Major Course-1	3	0	1	4	5	50	50	100
2	IV	CSM205-2C	Introduction to Core Java	Major Course-2	3	0	1	4	5	50	50	100
3	IV	CSM206-2C	Introduction to Python	Major Course-3	3	0	1	4	5	50	50	100
4	IV	MDC205-2C	Unified Modelling Language	Minor Course– 1	4	0	0	4	4	50	50	100
5	IV	AEC205-2C	Numerical Methods	AEC-1	1	1	0	2	2	25	25	50
6	IV	SEC204-2C	Statistical Skills	SEC-1	1	1	0	2	2	25	25	50
7	IV	VAC202-2C	Environmental Science	VAC-1	2	0	0	2	2	25	25	50
7	IV		Summer Internship (Additional Credit)		6 Weeks			2		25	25	50
Total					17	2	3	22	25	275	275	550
Remark: This semester is of 22 credit + additional 2 credit for Summer Internship done by the students in summer vacation after 4th semester. The credit will be shown in the												
Summer Internship 6 Weeks												
Recommended Internship Areas:												

BCA (Hons.) Semester - 5												
					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	V	CSM301-3C	Advanced Java	Major Course-1	3	0	1	4	5	50	50	100
2	V	CSM302-3C	PROJECT	Major Course-2	0	0	4	4	8	50	50	100
3												
4	V	CSE301-3C	PHP with MySQL	Minor Course– 1	3	0	1	4	5	50	50	100
5	V	CSE302-3C	Linux Shell Scripting	Minor Course– 2	3	0	1	4	5	50	50	100
6	V	SEC302-3C	Software Engineering	SEC-1	2	0	0	2	2	25	25	50
Total					15	0	7	22	29	275	275	550

BCA (Hons.) Semester - 6												
					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	VI		Cloud Computing (MOOC)	Major Course-1	3	0	1	4	5	50	50	100
2	VI		Mobile Application Development	Major Course-2	0	1	3	4	7	50	50	100
3	VI		Information Security	Major Course-3	3	0	1	4	5	50	50	100
4	VI		Foundation of Artificial Intelligence	Minor Course– 1	2	0	2	4	6	50	50	100
5	VI		Web Technologies	AEC-1	0	0	2	2	4	25	25	50
6	VI		Internship		0	0	4	4	8	50	50	100
Total					8	1	13	22	35	275	275	550
On job training 4 weeks												

BCA (Hons.) Semester - 7												
					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	VII		Data Mining and Business Intelligance	Major Course-1	3	0	1	4	5	50	50	100
2	VII		Advanced Databases (SQL + NoSQL)	Major Course-2	3	0	1	4	5	50	50	100
3	VII		Software Project Management	Major Course-3	4	0	0	4	4	50	50	100
4	VII		Advanced Data Structures	Minor Course– 1	3	0	1	4	5	50	50	100
6	VII		On Job Training / Research Project-I		0	0	6	6	12	75	75	150
Total					**13**	**0**	**9**	**22**	**31**	**275**	**275**	**550**
BCA (Hons.) Semester - 8												
					Teaching Scheme					Exam Scheme		

Sr. No	Semester	Course Code	Course Name	Curricular Components	Lecture	Tutorial	Practical	Credit	Contact Hours	CCE	SEE	Total
1	VIII		Big Data and Data Analytics	Major Course-1	3	0	2	5	7	50	50	100
2	VIII		Internet of Things	Major Course-2	2	0	1	3	4	50	50	100
3	VIII		Distributed Operating Systems	Major Course-3	4	0	1	5	4	50	50	100
4	VIII		Introduction to Block Chain	Minor Course– 1	2	0	1	3	4	50	50	100
6	VIII		On Job Training / Research Project-II		0	0	6	6	12	75	75	150
Total					**11**	**0**	**11**	**22**	**31**	**275**	**275**	**550**

SHREYARTH UNIVERSITY

School of Computer Science and Applications

BCA (Hons.) Semester VII

Syllabus

With effective from academic year

2026 - 2027

Program Outcomes (POs)

After completing the BCA program, graduates will be able to:

PO1: Computational Knowledge
Apply knowledge of mathematics, computing fundamentals, programming concepts, and computer applications to analyse and solve real-world computing problems.

PO2: Problem Analysis and Solution Development
Identify, analyse, and formulate computing problems and design, develop, test, and implement software solutions using appropriate algorithms, data structures, and programming techniques.

PO3: Modern Tool Usage
Use appropriate programming languages, software tools, and emerging technologies to develop computer-based applications and solve practical problems.

PO4: Professional Ethics and Societal Impact
Understand professional responsibilities, ethical practices, cyber regulations, and evaluate the societal, environmental, and economic impact of computing solutions.

PO5: Communication, Teamwork, and Project Management
Communicate effectively in oral and written forms, work efficiently as an individual or team member, and apply project management principles in software development projects.

PO6: Life-long Learning and Innovation
Recognize the need for continuous learning, adapt to emerging technologies, and demonstrate innovative and entrepreneurial thinking in the field of computer applications.

Program Specific Outcomes (PSOs)

After completing the BCA program, graduates will be able to:

PSO1: Software Development
Design, develop, test, and maintain software applications using programming languages, data structures, databases, and web technologies.

PSO2: Database and Web Technologies
Develop and manage database-driven applications and dynamic web solutions using modern development frameworks and tools.

PSO3: Emerging Technologies and Professional Practice
Apply computing knowledge and emerging technologies to develop innovative IT solutions while following professional ethics and industry practices.

BCA (Hons.) Semester – 7										
			Teaching Scheme					Exam Scheme		
Sr. No	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	Data Mining and Business Intelligence	Major Course-1	3	0	1	4	5	50	50	100
2	Advanced Databases (SQL + NoSQL)	Major Course-2	3	0	1	4	5	50	50	100
3	Software Project Management	Major Course-3	4	0	0	4	4	50	50	100
4	Advanced Data Structures	Minor Course– 1	3	0	1	4	5	50	50	100
6	On the Job Training		0	0	6	6	12	50	50	100
Total			**13**	**0**	**09**	**22**	**31**	**250**	**250**	**500**

Course: Data Mining and Business Intelligence								
Course Code: -			**Credit: 4**	**Semester: VII**		**Programme: BCA(H)**		
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		**Total**
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	
3	**0**	**1**	**5**	**9/25**	**9/25**	**18/50**	**-**	**36/100**

Course Objectives:

- To introduce the concepts of Data Warehousing and Business Intelligence and their importance in decision-making.
- To provide understanding of data warehouse architecture, OLAP operations, and multidimensional schema design.
- To develop knowledge of data mining techniques and data preprocessing methods.
- To enable application of data mining techniques for real-world business intelligence problems.

Course Learning Outcomes (CLOs)

CO1: Explain the fundamentals of **Data Warehousing, Business Intelligence, and OLAP systems**.

CO2: Apply **data preprocessing and data mining techniques** such as association rule mining and concept description.

CO3: Implement **classification and prediction methods** including decision trees, Bayesian techniques, and regression models.

CO4: Analyze and apply **data mining in business applications** such as fraud detection, market segmentation, and CRM.

Course Content

Module	Topics	Weightage (%)
1	**Overview and concepts Data Warehousing and Business Intelligence:** Why reporting and Analysing data, Raw data to valuable information-Lifecycle of Data - What is Business Intelligence - BI and DW in today's perspective - What is data warehousing - The building Blocks: Defining Features – Data warehouses and data 1marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing. **The Architecture of BI and DW:** BI and DW architectures and its types - Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis - What are cubes? Drill-down and roll-up - slice and dice or rotation - OLAP models - ROLAP versus MOLAP - defining schemas: Stars, snowflakes and fact constellations	20

2	**Introduction to data mining (DM) and Data Pre-processing** Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process **Data Pre-processing:** Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy.	25
3	**Concept Description and Association Rule Mining** What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining	30
4	**Classification and Prediction and Data Mining for Business Intelligence Applications** **What is classification and prediction? –** Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression **Data Mining for Business Intelligence Applications:** Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc.	25

Practical List:

1. Study of Data Warehouse architecture and components (Module 1)
2. Perform OLAP operations: Drill-down, Roll-up, Slice and Dice (Module 1)
3. Design Star Schema and Snowflake Schema (Module 1)
4. Data cleaning: Handling missing values and noisy data (Module 2)
5. Data integration and transformation techniques (Module 2)
6. Data reduction: Aggregation and dimensionality reduction (Module 2)
7. Implementation of Apriori algorithm for frequent itemset mining (Module 3)
8. Generation of association rules with support and confidence (Module 3)
9. Classification using Decision Tree (Module 4)
10. Classification using Naïve Bayes (Module 4)
11. Prediction using Linear/Logistic Regression (Module 4)
12. Case study using data mining for business application (Module 4)

Text Books:

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
2. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India.

Reference Books:

1. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc
2. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	–	–	1
CO2	2	2	3	–	–	1
CO3	2	3	3	–	–	1
CO4	2	2	3	1	1	2

Course: Advanced Databases (SQL + NoSQL)								
Course Code: -			Credit: 4	Semester: VII			Programme: BCA(H)	
Teaching Scheme				Evaluation Scheme				
				CCE		SEE		Total
Lecture	Tutorial	Practical	Contact Hours	CIE Theory	CIE Practical	SEE Theory	SEE Practical	
3	0	1	5	9/25	9/25	18/50		36/100

Course Objectives:

- Understand the need for databases, data models, and DBMS architecture over traditional file systems.
- Design relational schemas using E-R modeling and apply normalization for efficient database design.
- Develop SQL skills for data definition, manipulation, and implement transaction management principles.
- Explore data storage techniques, indexing, and gain basic knowledge of NoSQL and its comparison with relational databases.

Course Outcomes (COs):

CO1: Explain the need for database systems, data models, and DBMS architecture comparedto traditional file systems.

CO2: Design relational database schemas using E-R modeling and normalization techniques for efficient data organization.

CO3: Apply SQL for data definition and manipulation, including advanced queries and transaction management concepts.

CO4: Analyze data storage methods and compare NoSQL and relational databases in terms of structure, performance, and scalability.

Course Content:

Module	Topics	Weightage (%)

1	**Relational Database Concepts & SQL Review:** Introduction to DBMS and RDBMS, Data Models (Relational, Hierarchical, Network),Entity-Relationship (ER) Model and ER Diagrams, Relational Algebra and Calculus (Basics),SQL Review: DDL, DML, DCL, TCL, Joins, Subqueries, Views, Indexing, Stored Procedures, Triggers	25
2	**Database Design and Normalization:** Functional Dependencies, Normal Forms (1NF to BCNF, 4NF, 5NF),Decomposition and Lossless, Join, Dependency Preservation, Schema Refinement, Design Using ER-to-Relational Mapping	25
3	**Transaction Management and Query Optimization:** Transactions and ACID Properties, Concurrency Control (Locking protocols, Deadlock handling) Recovery Techniques, Database Security and Authorization, Query Processing and Optimization	25
4	**Introduction to NoSQL Databases and applications:** Evolution of NoSQL, Differences between SQL and NoSQL, CAP Theorem (Consistency, Availability, Partition Tolerance),Types of NoSQL Databases: Document-Oriented, Column-Oriented, Key-Value Stores, Graph-Based, MongoDB: Installation and Configuration, CRUD Operations, Aggregation, Indexing, Data Modeling, Cassandra: Architecture and CQL (Cassandra Query Language), Neo4j: Introduction to Graph Databases and Cypher Queries, Use Cases and Applications of NoSQL in Big Data, IoT, Social Media, etc	25

Practical List:

1. Define a University database with tables like Students, Courses, and Enrollments using SQL DDL.
2. Insert sample records, update student names, and delete a course record using DML commands.
3. Write SQL queries using INNER JOIN, LEFT JOIN, and nested subqueries to fetch student-course details.
4. Create a view to display enrolled students and use indexing on student roll numbers for faster retrieval.
5. Write a trigger that logs deletions in a log table and a stored procedure to assign grades based on marks.
6. Design an ER diagram for a Library Management System and map it into relational tables.
7. Given a relation schema with anomalies, identify functional dependencies (FDs) and normalize from 1NF → 2NF → 3NF.
8. Prove lossless decomposition and dependency preservation for a sample relation.
9. Take a relation and decompose it to BCNF and further to 4NF with explanation.
10. Given a business case (e.g., Hospital), refine the schema using normalization and ER-to-relational mapping.
11. Use SQL to implement transactions and illustrate atomicity, consistency, isolation, and durability (ACID) properties.
12. Simulate two transactions with shared/exclusive locks and show possible deadlock or serializability.
13. Use EXPLAIN or QUERY PLAN to analyze query cost and suggest improvements (e.g., using indexes).
14. Write transaction control code using SAVEPOINT, ROLLBACK TO, and COMMIT.
15. Grant and revoke privileges using DCL commands and demonstrate different user access levels.
16. Create a collection products and perform Create, Read, Update, Delete (CRUD) operations.
17. Perform group-by operations using an aggregation pipeline and create an index on a field.
18. Install Cassandra, create a keyspace and tables, and perform basic CQL queries.
19. Create a simple social network graph and write Cypher queries to find friends-of-friends.
20. Store a sample dataset (e.g., user comments) in both MySQL and MongoDB, and compare performance of similar queries.

Text Book(s):

1. Database System Concepts by Silberschatz, Korth, and Sudarshan
2. NoSQL Distilled by Pramod J. Sadalage & Martin Fowler

Reference Book(s):

1. MongoDB: The Definitive Guide by Kristina Chodorow
2. Cassandra: The Definitive Guide by Eben Hewitt
3. Learning Neo4j by Rik Van Bruggen

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
- Assignments / Tutorials
- Practical / Lab Performance
- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	–	–	–
CO2	2	3	2	–	–	–
CO3	2	3	3	–	–	–
CO4	2	2	3	–	–	1

Course: Software Project Managements								
Course Code: -			Credit: 4	Semester: VII		Programme: BCA		
Teaching Scheme				Evaluation Scheme				
				CCE		SEE		
Lecture	Tutorial	Practical	Contact Hours	CIE Theory	CIE Practical	SEE Theory	SEE Practical	Total
4	-	-	4	18 / 50	-	18/50	-	36 /100

Course Objectives:

- Understand the fundamentals of software project management, including project life cycles, process models, and the role of a project manager in software development.
- Apply project planning techniques such as effort estimation, scheduling, budgeting, and resource allocation for software projects.
- Identify and manage project risks, including technical, managerial, and organizational risks, using appropriate risk management strategies.
- Apply project management knowledge to real-world software projects, integrating theory with practical case studies and simulations.

Course Outcomes (COs):

CO1: Explain the principles, processes, and life cycle models used in software project management.

CO2: Apply software project planning techniques to estimate effort, cost, schedule, and resources.

CO3: Identify, analyse, and manage risks associated with software projects using appropriate risk Management strategies.

CO4: Use project management tools and techniques to monitor, control, and report software project Progress.

Course Content:

Module	Topics	Weightage (%)
1	**Introduction to Software Project Management (SPM):** Rationale, Software Projects Vs other types of Projects, Contract Management and Technical Project Management, Activities Covered by SPM, Plans, Methods and Methodologies, Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, Project	25

	Success and Failure, Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices.	
2	**Project Planning Scheduling, Monitoring & Control:** Tasks in Project Planning; Work Breakdown Structures (WBS), SDLC, Software Processes and Process Models, Choice of Process Models, A Generic Project Model, Software Cost Estimation; COCOMO Model; Budgeting. Scheduling Techniques, Program Evaluation and Review Technique (PERT), Gantt Chart, Critical Path Method (CPM), Automated Tools. Project Metrics; Earned Value Analysis (EVA)	25
3	**Risk Management:** Concepts of Risks and Risk Management; Risk Management Activities; Effective Risk Management; Risk Categories; Aids for Risk Identification; Potential Risk Treatments; Risk Components and Drivers; Risk Prioritization.	25
4	**Quality Assurance:** Software Quality Assurance Activities, Software Qualities, Software Quality Standards – ISO Standards for Software Organization, Capability Maturity Model (CMM), Comparison between ISO 9001 & SEI CMM, Other Standards.	25

Text Book(s):

1) Ramesh,"Managing Global software Projects", Tata McGraw Hill, 2001

2) Shailesh Mehta, "Project Management and Tools & Technologies – An overview", SPD, 2017

Reference Book(s):

1) S. A. Kelkar, "Software Project Management", PHI Publication, 15th edition, 2013.

2) Roger S. Pressman , "Software Engineering – A Practitioner's approach", Tata McGraw Hill, 2009

Continuous Internal Evaluation (CIE) Components:

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	–	1	–
CO2	2	3	2	–	2	–
CO3	1	2	2	1	2	–
CO4	1	2	3	–	3	1

Course: Advanced Data Structures								
Course Code:			**Credit: 4**	**Semester: VII**			**Programme: BCA(H)**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**5**	**9/ 25**	9/25	**18/ 50**		**36/ 100**

Course Objectives:

- To understand the concept of an efficient algorithm.
- To analyze algorithms using best, average, and worst-case analysis.
- To study asymptotic notations and amortized analysis.
- To analyze and compare sorting algorithms, including linear-time sorting methods.

Course Outcomes (COs):

CO1. Students will be able to analyze algorithm efficiency using different complexity measures.
CO2. Students will be able to apply asymptotic notations to represent algorithm performance.
CO3. Students will be able to verify correctness of algorithms using loop invariants.
CO4. Students will be able to compare and analyze sorting algorithms based on time complexity.

Course Content:

Module	Topics	Weightage (%)
1	**Analysis of Algorithm:** The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations, Analyzing control statement, Loop invariant and the correctness of the algorithm, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort	25
2	**Divide and Conquer Algorithm:** Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.	25

3	**Greedy Algorithm:** General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Activity selection problem, Elements of Greedy Strategy, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code.	25
4	**Exploring Graphs:** An introduction using graphs and games, Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search, Topological sort, Connected components.	25

Practical List:

1. Write a program to analyze time complexity (best, average, worst case) of a given algorithm.
2. Write a program to demonstrate asymptotic notations (Big-O, Big-Ω, Big-Θ).
3. Analyze control statements and loops to determine time complexity.
4. Write a program to demonstrate loop invariant and correctness of algorithm.
5. Implement and analyze Bubble Sort algorithm.
6. Implement and analyze Selection Sort algorithm.
7. Implement and analyze Insertion Sort algorithm.
8. Implement and analyze Shell Sort algorithm.
9. Implement and analyze Heap Sort algorithm.
10. Implement linear time sorting algorithms:
    a. Counting Sort
    b. Bucket Sort
    c. Radix Sort
11. Solve recurrence relations using substitution / master method.
12. Implement Binary Search using divide and conquer approach.
13. Implement Merge Sort using divide and conquer technique.
14. Implement Quick Sort using divide and conquer technique.
15. Implement Matrix Multiplication using divide and conquer method.
16. Implement Activity Selection Problem using greedy strategy.
17. Implement Minimum Spanning Tree using Kruskal's Algorithm.
18. Implement Minimum Spanning Tree using Prim's Algorithm.

Text Book(s):

1. Anany Levitin, Analysis and Design of Algorithms, Pearson Education.

Reference Book(s):

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.
2. Fundamentals of Algorithms – E. Horowitz et al.
3. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
4. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
5. Foundations of Algorithms, Shailesh R Sathe, Penram
6. Design and Analysis of Algorithms, Dave and Dave, Pearson.

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
- Assignments / Tutorials
- Practical / Lab Performance
- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	–	–	–
CO2	3	3	1	–	–	–
CO3	2	3	2	–	–	–
CO4	2	3	2	–	–	–

SHREYARTH UNIVERSITY

School of Computer Science and Application

Research Project / Dissertation Manual

Research Project

Semester: VII
Credits: 6
Course Type: Research / Project

1. Course Objectives

- To introduce students to the fundamentals of academic and applied research in the field of Computer Applications.
- To enable students to identify a research problem and conduct a systematic investigation.
- To develop skills in literature review, research methodology, experimentation, and documentation.
- To enhance analytical thinking, problem-solving, and technical writing abilities.
- To prepare students for advanced research work to be undertaken in the final semester.

2. Course Outcomes (COs)

After successful completion of the course, students will be able to:

CO1: Identify and define a research problem relevant to the domain of Computer Applications.

CO2: Conduct literature review and analyze existing research work using scholarly sources.

CO3: Design and implement a research methodology, prototype, or experimental framework to investigate the problem.

CO4: Prepare a structured research report and effectively present the research findings.

3. Course Content / Project Components

The research work carried out by the student may include the following stages:

Module 1: Research Problem Identification

- Identification of a research problem in areas such as Software Development, Data Science, Artificial Intelligence, Cyber Security, Cloud Computing, Networking, or other emerging technologies.
- Formulation of research objectives and scope of the study.
- Preparation of research proposal.

Module 2: Literature Review

- Review of relevant research papers, journals, and conference publications.
- Understanding existing methodologies and solutions.
- Identification of research gaps.

Module 3: Research Methodology and Implementation

- Designing research methodology or experimental approach.
- Development of prototype / model / algorithm / software solution where applicable.
- Data collection, experimentation, and analysis.

Module 4: Documentation and Presentation

- Preparation of structured research report including introduction, methodology, analysis, results, and conclusion.
- Citation of references using standard academic formats.
- Presentation and demonstration of research outcomes.

4. Evaluation Scheme

Component	Evaluation	Marks
Internal Evaluation	Research Proposal & Design Review	25
	Literature Review & Technical Planning	25
	Progress Review & Presentation	25
External Evaluation	Dissertation Report Evaluation	35
	Viva-Voce Examination	40
Total		**150**

5. Deliverables

Students are required to submit:

- Approved research proposal
- Literature review summary
- Implementation / prototype (if applicable)

- Final research report
- Presentation and viva voce

6. Recommended Resources

- Research papers from IEEE, ACM, Springer, Elsevier, or similar academic databases
- Relevant textbooks and technical documentation related to the chosen research domain
- Standard research methodology references

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	1	–	1	2
CO2	2	3	2	–	1	2
CO3	2	3	3	–	2	2
CO4	2	2	2	1	3	2

SHREYARTH UNIVERSITY

School of Computer Science and Application

Program: BCA (Honours) ***(Non-Research Track)***

Course Type: Core / Major
Credits: 12 (Semester VII – 6 Credits | Semester VIII – 6 Credits)
Total Marks: 150 per Semester
Duration: One Academic Year
Mode: Industrial Training, Project Work, Report Submission & Viva-Voce

1. Course Rationale

The On-the-Job Training (OJT) / Industrial Training is designed for students who are not eligible for the Research Track of the **BCA (Honours)** programme. This course provides real-world industry exposure, enabling students to apply academic knowledge in professional environments.

The training aims to:

- Develop practical technical skills
- Enhance employability and workplace readiness
- Provide exposure to industry tools, workflows, and standards
- Build professional communication and teamwork skills
- Bridge the gap between academia and industry

This course prepares students for immediate employment in IT and software-related roles.

2. Course Objectives (COs)

By the end of this course, students will be able to:

CO1: Apply theoretical knowledge of Computer Applications to perform assigned technical tasks effectively in real-world industry settings.

CO2: Demonstrate practical proficiency in relevant programming languages, tools, frameworks, platforms, and development practices used in the organization.

CO3: Work effectively in team-based software development or IT service environments while adhering to professional standards, documentation practices, and workplace ethics.

CO4: Prepare a structured industrial training report and present acquired technical knowledge, skills, and professional learning outcomes confidently.

3. Course Learning Outcomes (CLOs)

At the end of the course, the student will be able to:

CLO1: Perform assigned technical tasks under industry supervision.

CLO2: Develop or contribute to real-time projects using appropriate tools and technologies.

CLO3: Demonstrate understanding of software development lifecycle or IT operational processes.

CLO4: Present industry experience confidently during viva-voce examination.

4. Nature of On-the-Job Training

Students must undergo training in a recognized:

- IT Company
- Software Development Firm
- Web Development Agency
- Data Analytics Firm
- Cybersecurity Organization
- Start-up / Technology Company
- Corporate IT Department

Training must involve technical tasks such as:

- Software development
- Web/mobile application development
- Database management
- Testing & QA
- Data analysis
- IT support & cloud services
- DevOps practices
- UI/UX development

Clerical or non-technical roles are not permitted.

Industrial Training Report Structure

1. Title Page

2. Certificate from Organization
3. Student Declaration
4. Acknowledgement
5. Company Profile
6. Project Overview
7. Technologies Used
8. Roles and Responsibilities
9. Work Performed
10. Challenges & Learning Outcomes
11. Conclusion
12. References (if applicable)
13. Annexures (Screenshots, Code Samples, Work Proof etc.)

7. Evaluation Scheme

Total Marks: 150 (Per Semester)

Component	Evaluation	Marks
Internal Evaluation	Training Progress & Logbook	25
	Mid-term Review & Presentation	25
	Professional Discipline & Attendance	25
External Evaluation	Final Report Evaluation	35
	Viva-Voce Examination	40
Total		**150**

8. Passing Criteria

Students must:

- Complete prescribed duration of training
- Maintain minimum attendance as per university norms
- Submit all required documents
- Obtain satisfactory evaluation from industry mentor
- Secure minimum passing marks as per university rules

9. Minimum Eligibility & Guidelines

- Students not meeting eligibility criteria for **Honours with Research** shall compulsorily opt for OJT.
- Training must be approved by the School of Computer Science and Applications.
- Students must not change organization without prior approval.
- Remote internships require proper documentation and approval.
- Fabricated certificates will result in disciplinary action.

10. Professional Ethics & Conduct

- Students must follow company policies and confidentiality agreements.
- Intellectual property of the organization must be respected.
- Misconduct during training may lead to cancellation of registration.

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	–	2	1
CO2	2	3	3	–	2	1
CO3	1	2	2	1	3	1
CO4	1	1	2	–	3	2

Project Logbook

Student Name: _____

Enrollment No.: _____

Program / Semester: _____

Company / Organization: _____

Internship Duration: _____

Mentor (Company): _____

Faculty Mentor: _____

Daily Work Log for Week - ___

Date	Tasks Assigned	Tasks Completed	Skills / Tools Learned	Remarks / Challenges Faced

Date	Tasks Assigned	Tasks Completed	Skills / Tools Learned	Remarks / Challenges Faced

Final Remarks

Student Signature: _____

Company Mentor Signature & Stamp: _____

Faculty Mentor Signature: _____

SHREYARTH UNIVERSITY

School of Computer Science and Applications

Integrated B.Sc.-M.Sc. (CA&IT)

Teaching Scheme W.E.F-2023

Teaching Scheme W.E.F- Year 2025 - 2026

Integrated B.Sc.-M.Sc. (CA&IT) Semester - 1

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	I	CSM103-1C	Fundamental of Programming	Major Course-1	2	1	1	4	5	50	50	100
2	I	CSM104-1C	Internet and Web Designing	Major Course-2	2	1	1	4	5	50	50	100
3	I	CSE102-1C	Fundamentals of Computer Organization	Minor Course– 1	4	0	0	4	4	50	50	100
4	I	MDC102-1C	Fundamentals of Mathematics	MDC-1	3	1	0	4	4	50	50	100
5	I	AEC101-1C	Basics of English Grammar	AEC-1	2	0	0	2	2	25	25	50
6	I	SEC103-1C	Communication Skills	SEC-1	2	0	0	2	2	25	25	50
7	I	IKS101-1C	Indian Knowledge System	IKS-1	2	0	0	2	2	25	25	50
Total					17	3	2	22	24	275	275	550

Integrated B.Sc.-M.Sc. (CA&IT)- Semester - 2

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	II	CSM107-1C	Advance Programming language	Major Course-1	3	0	1	4	5	50	50	100
2	II	CSM108-1C	Database Management System	Major Course-2	3	0	1	4	5	50	50	100
3	II	CSE104-1C	Web application Development	Minor Course– 1	3	0	1	4	5	50	50	100
4	II	MDC105-1C	Linear algebra	MDC-1	4	0	0	4	4	50	50	100
5	II	AEC103-1C	Visual Design	AEC-1	0	0	2	2	4	25	25	50
6	II	SEC101-1C	Soft Skills	SEC-1	2	0	0	2	2	25	25	50
7	II	VAC101-1C	Yoga and Nutritions	VAC-1	0	1	2	2	3	25	25	50
8	II		Summer Internship (Additional Credit)			4 Weeks		2		25	25	50
Total					15	1	7	22	28	275	275	550

Remark: This semester is of 22 credit + additional 2 credit for Summer Internship done by the students in summer vacation after 2nd semester. The credit will be shown in the grade

Summer Internship 4 Weeks

Recommended Internship Areas:

Integrated B.Sc.-M.Sc. (CA&IT)- - 3

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**

1	III	CSM201-2C	Object Oriented Programming Using C++	Major Course-1	3	0	1	4	5	50	50	100
2	III	CSM202-2C	Data Structures	Major Course-2	3	0	1	4	5	50	50	100
3	III	CSM203-2C	Advanced Database Management System	Major Course-3	3	0	1	4	5	50	50	100
4	III	MDC201-2C	Discrete Maths	MDC-1	3	1	0	4	4	50	50	100
5	III	AEC202-2C	Implementation Of Website Frameworks I	AEC-1	0	0	2	2	4	25	25	50
6	III	SEC201-2C	Digital Marketing	SEC-1	2	0	0	2	2	25	25	50
7	III	IKS201-2C	Indian Knowledge System II	VAC-1	2	0	0	2	2	25	25	50
Total					16	1	5	22	27	275	275	550

Integrated B.Sc.-M.Sc. (CA&IT) Semester - 4

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	IV	CSM204-2C	Introduction to Operating Systems	Major Course-1	3	0	1	4	5	50	50	100
2	IV	CSM205-2C	Introduction to Core Java	Major Course-2	3	0	1	4	5	50	50	100
3	IV	CSM206-2C	Introduction to Python	Major Course-3	3	0	1	4	5	50	50	100
4	IV	MDC205-2C	Unified Modelling Language	Minor Course– 1	4	0	0	4	4	50	50	100
5	IV	AEC205-2C	Numerical Methods	AEC-1	1	1	0	2	2	25	25	50
6	IV	SEC204-2C	Statistical Skills	SEC-1	1	1	0	2	2	25	25	50
7	IV	VAC202-2C	Environmental Science	VAC-1	2	0	0	2	2	25	25	50
7	V		Summer Internship (Additional Credit)		4 Weeks			2		25	25	50
Total					17	2	3	22	25	300	300	600

Remark: This semester is of 22 credit + additional 2 credit for Summer Internship done by the students in summer vacation after 4th semester. The credit will be shown in the grade

Summer Internship 6 Weeks

Recommended Internship Areas:

Integrated B.Sc.-M.Sc. (CA&IT)- Semester - 5

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	V		Advanced Java	Major Course-1	3	0	1	4	5	50	50	100
2	V		PROJECT	Major Course-2	0	0	4	4	8	50	50	100
3	V		Data Communication and Networking	Major Course-3	4	0	0	4	4	50	50	100
4	V		PHP with MySQL	Minor Course– 1	3	0	1	4	5	50	50	100
5	V		Implementation Of Website Frameworks II	Minor Course– 1	2	0	2	4	6	50	50	100
6	V		Software Engineering	SEC-1	2	0	0	2	2	25	25	50
Total								22		275	275	550

Integrated B.Sc.-M.Sc. (CA&IT)- Semester - 6

	Teaching Scheme	Exam Scheme

Sr. No	Semester	Course Code	Course Name	Curricular Components	Lecture	Tutorial	Practical	Credit	Contact Hours	CCE	SEE	Total
1	VI		Cloud Computing (MOOC)	Major Course-1	3	0	1	4	5	50	50	100
2	VI		Mobile Application Development	Major Course-2	0	1	3	4	7	50	50	100
3	VI		Information Security	Major Course-3	3	0	1	4	5	50	50	100
4	VI		Foundation of Artificial Intelligence	Minor Course– 1	2	0	2	4	6	50	50	100
5	VI		Data Analitics	AEC-1	0	0	2	2	4	25	25	50
6	VI		Internship		0	0	4	4	8	50	50	100
Total					8	1	13	22	35	275	275	550
On job training 8 weeks												

Integrated B.Sc.-M.Sc. (CA&IT)- Semester - 7

				Teaching Scheme					Exam Scheme			
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	VII		Object Oriented Programming with Java		3	0	1	4	5	50	50	100
2	VII		Introduction to Python		3	0	1	4	5	50	50	100
3	VII		Data Structures & Algorithms		3	0	1	4	5	50	50	100
4	VII		Advanced Databases (SQL + NoSQL)		3	0	1	4	5	50	50	100
5	VII		Agile Methodologies and Development Practices		2	0	0	2	2	50	50	100
6	VII		Communication & Technical Writing		0	0	2	2	4	50	50	100
7	VII		Micro Project		0	0	2	2	4	50	50	100
Total					**14**	**0**	**8**	**22**	**30**	**350**	**350**	**700**

Integrated B.Sc.-M.Sc. (CA&IT)- Semester - 8

				Teaching Scheme					Exam Scheme			
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	VIII		Networking and Cybersecurity Fundamentals		3	0	1	4	5	50	50	100
2	VIII		Artificial Intelligence & Machine Learning		3	0	1	4	5	50	50	100
3	VIII		Continuous Integration and Delivery Practices		2	0	1	3	5	50	50	100
4	VIII		Data Analytics Principles		3	0	1	4	4	50	50	100
6	VIII		Mobile Application Development		2	0	1	3	4	50	50	100
			Mini Project I		0	0	4	4	8	50	50	100
Total					**13**	**0**	**9**	**22**	**31**	**300**	**300**	**600**

Integrated B.Sc.-M.Sc. (CA&IT)- Semester - 9

				Teaching Scheme					Exam Scheme			
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**

1	IX		Analysis and Design of Algorithm		3	0	1	4	5	50	50	100
2	IX		Research Methodology & Paper Writing		3	1	0	4	4	50	50	100
3	IX		Elective Track (Choose One Specialization)		6	0	4	10	14	50	50	100
4	IX		Mini Project II (Based on Specialization)		0	0	4	4	8	50	50	100
Total					**12**	**1**	**9**	**22**	**31**	**200**	**200**	**400**
Elective Track A - AI & Data Science												
					Teaching Scheme					**Exam Scheme**		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**ɔntact Hou**	**CCE**	**SEE**	**Total**
1	IX		Advanced Machine Learning (Scikit-learn, XGBoost)		3	0	1	4	5	50	50	100
2	IX		Deep Learning (CNNs, RNNs, TensorFlow)		3	0	1	4	5	50	50	100
3	IX		Data Visualization (Tableau/Power BI)		0	0	2	2	4	50	50	100
Total					**6**	**0**	**4**	**10**	**14**	**150**	**150**	**300**
Elective Track B - Full Stack Development												
				Teaching Scheme					**Exam Scheme**			
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**ɔntact Hou**	**CCE**	**SEE**	**Total**
1	IX		Backend with Microservices (Node/Spring Boot)		3	0	1	4	5	50	50	100
2	IX		Full Stack Web Development (React + Node)		3	0	1	4	5	50	50	100
3	IX		UI/UX Design with Figma + Design Systems		0	0	2	2	5	50	50	100
Total					**6**	**0**	**4**	**10**	**15**	**150**	**150**	**300**
Elective Track C - Cloud & DevOps Engineering												
				Teaching Scheme					**Exam Scheme**			
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**ɔntact Hou**	**CCE**	**SEE**	**Total**
1	IX		Advanced DevOps (Kubernetes, Terraform, CI/CD)		3	0	1	4	5	50	50	100
2	IX		Cloud Architecture & Services (AWS/Azure Expert)		3	0	1	4	5	50	50	100
3	IX		Infrastructure as Code + Monitoring (Ansible, Prometheus)		0	0	2	2	5	50	50	100
Total					**6**	**0**	**4**	**10**	**15**	**150**	**150**	**300**
Elective Track D - Cybersecurity & Ethical Hacking												

				Teaching Scheme					Exam Scheme			
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**ontact Hou**	**CCE**	**SEE**	**Total**
1	IX		Network Security (Firewalls, VPN, IDS)		3	0	1	4	5	50	50	100
2	IX		Ethical Hacking (Kali Linux, Metasploit)		3	0	1	4	5	50	50	100
3	IX		Secure Coding & Web App Security (OWASP)		0	0	2	2	5	50	50	100
Total					**6**	**0**	**4**	**10**	**15**	**150**	**150**	**300**
Integrated B.Sc.-M.Sc. (CA&IT)- Semester - 10												
				Teaching Scheme					**Exam Scheme**			
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	X		Major Industry Internship / Capstone Project		0	0	18	18	36	300	300	600
2	X		Portfolio Development (GitHub, Resume, LinkedIn)		0	0	2	2	4	50	50	100
3	X		Technical Seminar		0	0	2	4	4	50	50	100
Total					**0**	**0**	**22**	**24**	**44**	**400**	**400**	**800**

SHREYARTH UNIVERSITY

School of Computer Science and Applications

M.Sc. (CA&IT)

Teaching Scheme W.E.F- Year 2025 - 2026

M.Sc. (CA&IT)-Semester - 1

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	I		Object Oriented Programming with Java		3	0	1	4	5	50	50	100
2	I		Introduction to Python		3	0	1	4	5	50	50	100
3	I		Data Structures & Algorithms		3	0	1	4	5	50	50	100
4	I		Advanced Databases (SQL + NoSQL)		3	0	1	4	5	50	50	100
5	I		Agile Methodologies and Development Practices		2	0	0	2	2	50	50	100
6	I		Communication & Technical Writing		0	0	2	2	4	50	50	100
7	I		Micro Project		0	0	2	2	4	50	50	100
Total					14	0	8	22	30	350	350	700

M.Sc. (CA&IT) - Semester - 2

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	II		Networking and Cybersecurity Fundamentals		3	0	1	4	5	50	50	100

2	II		Artificial Intelligence & Machine Learning		3	0	1	4	5	50	50	100
3	II		Continuous Integration and Delivery Practices		2	0	1	3	5	50	50	100
4	II		Data Analytics Principles		3	0	1	4	4	50	50	100
5	II		Mobile Application Development		2	0	1	3	4	50	50	100
6	II		Mini Project I		0	0	4	4	2	50	50	100
Total					13	0	9	22	25	300	300	600

M.Sc. (CA&IT) - Semester - 3												
					Teaching Scheme					**Exam Scheme**		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	III		Foundations of Cloud Computing		3	0	1	4	5	50	50	100
2	III		Research Methodology & Paper Writing		2	0	0	2	2	50	50	100
3	III		Elective Track (Choose One Specialization)		6	0	4	10	14	50	50	100
4	III		Mini Project II (Based on Specialization)		0	0	4	4	8	50	50	100
5	III		Research and Presentation Skills		2	0	0	2	2	25	25	50
Total					13	0	9	22	31	225	225	450

Elective Track A - AI & Data Science												
					Teaching Scheme					**Exam Scheme**		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	III		Advanced Machine Learning (Scikit-learn, XGBoost)		3	0	1	4	5	50	50	100

2	III		Deep Learning (CNNs, RNNs, TensorFlow)		3	0	1	4	5	50	50	100
3	III		Data Visualization (Tableau/Power BI)		0	0	2	2	4	50	50	100
Total					6	0	4	10	14	150	150	300

Elective Track B - Full Stack Development

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	III		Backend with Microservices (Node/Spring Boot)		3	0	1	4	5	50	50	100
2	III		Full Stack Web Development (React + Node)		3	0	1	4	5	50	50	100
3	III		UI/UX Design with Figma + Design Systems		0	0	2	2	5	50	50	100
Total					6	0	4	10	15	150	150	300

Elective Track C - Cloud & DevOps Engineering

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	III		Advanced DevOps (Kubernetes, Terraform, CI/CD)		3	0	1	4	5	50	50	100
2	III		Cloud Architecture & Services (AWS/Azure Expert)		3	0	1	4	5	50	50	100
3	III		Infrastructure as Code + Monitoring (Ansible, Prometheus)		0	0	2	2	5	50	50	100
Total					6	0	4	10	15	150	150	300

Elective Track D - Cybersecurity & Ethical Hacking												
					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	III		Network Security (Firewalls, VPN, IDS)		3	0	1	4	5	50	50	100
2	III		Ethical Hacking (Kali Linux, Metasploit)		3	0	1	4	5	50	50	100
3	III		Secure Coding & Web App Security (OWASP)		0	0	2	2	5	50	50	100
Total					6	0	4	10	15	150	150	300

M.Sc. (CA&IT) - Semester - 4												
					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	IV		Major Industry Internship / Capstone Project		0	0	18	18	0	300	300	600
2	IV		Portfolio Development (GitHub, Resume, LinkedIn)		0	0	2	2	4	50	50	100
3	IV		Technical Seminar + Viva		6	0	2	8	4	50	50	100
Total					6	0	22	28	8	400	400	800

SHREYARTH UNIVERSITY

School of Computer Science and Applications

Integrated B.Sc.-M.Sc.-CA&IT Semester VII

Syllabus

With effective from academic year

2026 – 2027

Program Outcomes (POs)

After completing the **M.Sc. IT program**, graduates will be able to:

PO1: Advanced Computational Knowledge

Apply advanced knowledge of computing fundamentals, mathematics, and specialized IT domains to analyze and solve complex computing problems.

PO2: Problem Analysis and Solution Development

Identify, analyze, and formulate solutions for complex computing problems using appropriate algorithms, data structures, and computational techniques.

PO3: Design and Development of IT Systems

Design, develop, implement, and evaluate advanced computing systems, software applications, and IT solutions to meet organizational and societal requirements.

PO4: Research and Investigation

Conduct research-based investigations of complex computing problems using appropriate methodologies, experimental techniques, and analytical tools.

PO5: Modern Tool Usage

Select and apply appropriate modern computing tools, platforms, frameworks, and technologies to develop and manage IT solutions effectively.

PO6: Professional Ethics, Communication and Teamwork

Demonstrate professional ethics, effective communication, and the ability to work independently and collaboratively in multidisciplinary teams.

PO7: Lifelong Learning, Innovation and Project Management

Recognize the need for continuous learning and apply innovative thinking, entrepreneurship, and project management skills to address evolving technological challenges.

M.Sc. (CA&IT) - Semester - 3

		Teaching Scheme					Exam Scheme		
Sr. No	**Course Name**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	Analysis and Design of Algorithm	3	0	1	4	5	50	50	100
2	Research Methodology	4	0	0	4	4	50	50	100
3	Elective Track (Choose One Specialization)	6	0	4	10	14	50	50	100
4	Mini Project II (Based on Specialization)	0	0	4	4	8	50	50	100
Total		**13**	**0**	**9**	**22**	**31**	**200**	**200**	**400**

Elective Track A - AI & Data Science

		Teaching Scheme					Exam Scheme		
Sr. No	**Course Name**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	Advanced Machine Learning (Scikit-learn, XGBoost)	3	0	1	4	5	50	50	100
2	Deep Learning (CNNs, RNNs, TensorFlow)	3	0	1	4	5	50	50	100
3	Data Visualization (Tableau/Power BI)	0	0	2	2	4	50	50	100
Total		**6**	**0**	**4**	**10**	**14**	**150**	**150**	**300**

Elective Track B - Full Stack Development

		Teaching Scheme					Exam Scheme		
Sr. No	**Course Name**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	Backend with Microservices (Node/Spring Boot)	3	0	1	4	5	50	50	100
2	Full Stack Web Development (React + Node)	3	0	1	4	5	50	50	100
3	UI/UX Design with Figma + Design Systems	0	0	2	2	5	50	50	100
Total		6	0	4	10	15	150	150	300

Elective Track C - Cloud & DevOps Engineering

		Teaching Scheme					Exam Scheme		
Sr. No	**Course Name**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	Advanced DevOps (Kubernetes, Terraform, CI/CD)	3	0	1	4	5	50	50	100
2	Cloud Architecture & Services (AWS/Azure Expert)	3	0	1	4	5	50	50	100
3	Infrastructure as Code + Monitoring (Ansible, Prometheus)	0	0	2	2	5	50	50	100
Total		**6**	**0**	**4**	**10**	**15**	**150**	**150**	**300**

Elective Track D - Cybersecurity & Ethical Hacking

		Teaching Scheme					Exam Scheme		
Sr. No	**Course Name**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	Network Security (Firewalls, VPN, IDS)	3	0	1	4	5	50	50	100
2	Ethical Hacking (Kali Linux, Metasploit)	3	0	1	4	5	50	50	100
3	Secure Coding & Web App Security (OWASP)	0	0	2	2	5	50	50	100
Total		**6**	**0**	**4**	**10**	**15**	**150**	**150**	**300**

Course: Analysis and Design of Algorithm								
Course Code:			**Credit: 4**	**Semester: IX / III**			**Programme: IMSc/MSc IT**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**5**	**12.5/25**	**12.5/25**	**25/50**	**-**	**50/100**

Course Objectives:

- To understand the fundamental principles of algorithm design and analysis, including time and space complexity and asymptotic notations.
- To analyze and implement various algorithm design techniques such as Divide and Conquer, Greedy, Backtracking, and Branch and Bound.
- To apply appropriate algorithms for solving sorting, searching, graph, optimization, and string matching problems efficiently.
- To develop strong analytical and problem-solving skills for designing efficient solutions to computational problems.

Course Outcomes (COs):

CO1. Students will be able to analyze algorithm efficiency using different complexity measures.

CO2. Students will be able to apply asymptotic notations to represent algorithm performance.

CO3. Students will be able to verify correctness of algorithms using loop invariants.

CO4. Students will be able to compare and analyze sorting algorithms based on time complexity.

Course Content:

Module	Topics	Weightage (%)
1	Foundations of Algorithm Analysis Basic concepts of algorithms and their analysis,Time and space complexity, Asymptotic notation (Big-O, Omega, Theta),Best, worst, and average case analysis, Sorting and Searching Algorithms: Selection sort, Bubble sort, Insertion sort, Shell sort, Heap sort, Sorting in linear time: Bucket sort, Radix sort, Counting sort	28

2	Divide and Conquer Algorithm: Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.	25
3	General Characteristics of Greedy Algorithms, Problem Solving using Greedy Algorithms: Activity Selection Problem, Elements of Greedy Strategy, Minimum Spanning Trees (Kreskas's algorithm, Prim's algorithm),Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code, Graph Fundamentals and Traversal Techniques, Depth First Search, Breadth First Search, Topological Sort	25
4	Backtracking, Branch and Bound, and String Matching : Introduction to Backtracking and Branch and Bound, Eight Queens Problem, Knapsack Problem, Travelling Salesman Problem, Minimax Principle, String Matching Algorithms, Naive String Matching, Rabin-Karp Algorithm, Knuth-Morris-Pratt Algorithm, String Matching with Finite Automata	18

Practical List:

1. Implementation and Time analysis of sorting algorithms.
2. Bubble sort, Selection sort, Insertion sort, Merge sort and Quicksort
3. Implementation and Time analysis of linear and binary search algorithm.
4. Implementation of max-heap sort algorithm
5. Implementation and Time analysis of factorial using iterative and recursive method
6. Implementation of a knapsack problem using dynamic ming.
7. Implementation of chain matrix multiplication using dynamic ming.
8. Implementation of Graph and Searching (DFS and BFS).
9. Implement LCS problem.

Text Book(s):

1. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein - Comprehensive coverage of algorithm design and analysis techniques, including sorting, searching, dynamic ming, and graph algorithms.
2. "Algorithm Design" by Jon Kleinberg and Éva Tardos - Focuses on algorithm design techniques such as greedy algorithms, divide and conquer, and dynamic ming.
3. "Data Structures and Algorithm Analysis in C++" by Mark Allen Weiss - Provides in-depth coverage of algorithm analysis and implementation with C++.

Reference Book(s):

1. "Algorithms Unlocked" by Thomas H. Cormen - A beginner-friendly guide to understanding essential algorithm concepts.
2. "Algorithms" by Robert Sedgewick and Kevin Wayne - Comprehensive coverage of algorithms and data structures with real-world applications.
3. "Data Structures and Algorithms Made Easy" by Narasimha Karumanchi - Step-by-step algorithmic problem-solving approach.

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
- Assignments / Tutorials
- Practical / Lab Performance
- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	1	–	1	–	–
CO2	3	2	1	–	1	–	–
CO3	2	3	1	–	1	–	–
CO4	2	3	2	–	1	–	–

Course: Research Methodology and Paper writing								
Course Code: -			Credit: 4	Semester: IX / III		Programme: IMSc/MSc IT		
Teaching Scheme				Evaluation Scheme				
				CCE		SEE		
Lecture	Tutorial	Practical	Contact Hours	CIE Theory	CIE Practical	SEE Theory	SEE Practical	Total
2	0	2	6	12.5/25	12.5/25	25/50	-	50/100

Course Objectives:

- To provide students with a comprehensive understanding of research methodology, including identification of research problems and development of appropriate research designs.
- To enable students to apply scientific methods for data collection, analysis, and interpretation in research.
- To develop analytical thinking, methodological rigor, and ethical awareness necessary for conducting quality research.
- To enhance students' ability to effectively communicate research findings and produce scholarly publications in Computer Science and related disciplines.

Course Outcomes (COs):

CO1 Understand fundamental research concepts, scientific methods, and research processes, including problem identification, formulation of research questions, and hypothesis development.

CO2 Design appropriate research methodologies by selecting suitable research designs, data types, variables, and data collection techniques.

CO3 Apply measurement, scaling, sampling techniques, and statistical tools to analyze research data and test hypotheses effectively.

CO4 Interpret research findings and communicate results through well-structured research papers while adhering to ethical standards, publication practices, and plagiarism guidelines.

Course Content:

Module	Topics	Weightage (%)
1	**A - Introduction to Research Methodology** Meaning of Research, Objectives of Research, Types of Research, and Process of Research, Structuring of Research Proposal empiricism, deductive and inductive theory. Characteristics of scientific method – **B - Understanding the language of research** Concept, Construct, Problem Identification & Formulation, Research Question, Investigation Question – Measurement Issues, Hypothesis, Qualities of a good Hypothesis, Null Hypothesis & Alternative Hypothesis. Hypothesis Testing, Logic & Importance	25
2	**A - Research Design and Data Collection** Concept and Importance in Research, features of a good research design – Exploratory Research Design, concept, types and uses, Descriptive Research Designs, – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables, Classification of Data, Research Applications of Secondary Data, Benefits and Drawbacks of Secondary Data, Evaluation and Classification of Secondary Data **B - Measurement and Scaling** Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches. Measurement: Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio. Primary Scales of Measurement, Single vs Multiple item Scale and Comparative vs Non-comparative Scales, Comparative Scaling Techniques, No comparative Scaling Techniques, graphic Rating Scale, Itemized Rating Scale, No itemized Rating Scale, Multi item Scale, Measurement Error	25
3	**A - Sampling and Data Analysis** Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size. Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association, t-test ANOVA , Correlation Analysis **B - Questionnaire Design** Types of questionnaires, Determining the type of questions, Criteria for question designing, Questionnaire structure, Physical characteristics of Questionnaire, Pilot testing of the Questionnaire, Administering the Questionnaire	25
4	**A -Interpretation of Data and Paper Writing** Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish? Ethical issues related to publishing, Plagiarism and Self- Plagiarism. **B - Use of Encyclopaedias, Research Guides, Handbook etc**., Academic Databases for Computer Science Discipline. Use of tools / techniques for Research: methods to search required information effectively Reference Management Software like Zotero/Mendeley	25

	Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism	

Text Book(s):

1. Research Methodology: Concepts and Cases, Deepak Chawla and Neena Sondhi, Vikas Publishing House, 2nd edition
2. Marketing Research and Applied Orientation, Naresh Malhotra, Daniel Nunan, David Briks, Pearson Education, Above 5th edition.

Reference Book(s):

1. Research Methodology – C.R.Kothari

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
- Assignments / Tutorials
- Practical / Lab Performance
- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

CO PO Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	–	3	–	1	2
CO2	1	2	1	3	–	1	2
CO3	1	2	1	3	1	–	2
CO4	–	1	1	2	–	3	2

Course: Advanced Machine Learning								
Course Code: Insert here			**Credit:4**	**Semester: IX / III**		**Programme: IMSc/MSc IT**		
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**5**	**12.5 / 25**	**12.5/25**	**25/50**	**-**	**50/100**

Course Objectives:

- To introduce the fundamental concepts of supervised and unsupervised advanced machine learning techniques.
- To develop an understanding of various machine learning algorithms used for data analysis and prediction.
- To enable students to implement machine learning algorithms using Python.
- To apply machine learning models for solving real-world data analysis and predictive problems.

Course Learning Outcomes (CLOs)

CO1: Explain the basic concepts, types, and applications of supervised and unsupervised machine learning.
CO2: Implement regression and classification algorithms such as Linear Regression, Logistic Regression, KNN, SVM, and Decision Tree using Python.
CO3: Apply unsupervised learning techniques such as K-means, Hierarchical Clustering, and DBSCAN to discover patterns in data.
CO4: Evaluate and compare machine learning models using appropriate performance measures and interpret the results.

Course Content:

Module	Topics	Weightage (%)
1	**Supervised Machine Learning -Part 1** Regression Algorithm: Develop various algorithms viz Simple Linear regression, Multiple Linear regression, Logistic regression, Polynomial regression, Pros and Cons of each algorithm. Classification Algorithm: Logistic Regression, K-Nearest Neighbour (K-NN), Support Vector Machine (SVM), Naive Bayes, Pros and Cons of each algorithm.	25
2	**Supervised Machine Learning - Part 2** Develop more advanced algorithms viz Decision Tree, Introduction to Ensemble Learning, commonly used Ensemble Methods (Bagging and Boosting, Random Forest, AdaBoost etc.), Pros and Cons of each algorithm.	25

3	**Unsupervised Machine Learning - Part 1** Different Distance methods, Develop various algorithms viz K-means, Fuzzy C means and Mean Shift Clustering. Pros and Cons of each algorithm, Importance of Dimensionality Reduction, PCA-Dimensionality Reduction, Singular Value Decomposition (SVD), Factor Analysis	25
4	**Unsupervised Machine Learning - Part 2** Implementation of Hierarchical Clustering algorithm, Density-Based Spatial Clustering (DBSCAN) and Gaussian Mixed Models (GMM). Pros and Cons of each algorithm	25

Practical List:

1. Implement Simple Linear Regression using Python to predict output for a single input variable.
2. Implement Multiple Linear Regression using Python with more than one input feature.
3. Implement Logistic Regression for a basic classification problem using a sample dataset.
4. Implement K-Nearest Neighbour (K-NN) Algorithm for classification and observe its accuracy.
5. Implement Support Vector Machine (SVM) for a simple binary classification problem.
6. Implement Decision Tree Algorithm for classification and analyze the results.
7. Implement Random Forest Algorithm and compare its performance with Decision Tree.
8. Implement K-Means Clustering Algorithm to group data into clusters.
9. Implement Hierarchical Clustering Algorithm and visualize the dendrogram.

Text Book(s):

1. Pattern Recognition and Machine Learning, Christopher M. Bishop
2. John Shawe-Taylor and NelloCristianini, Kernel Methods for Pattern Analysis.

Reference Book(s):

1. The Elements of Statistical Learning, Springer 2009
2. Machine Learning Algorithms, 2nd Edition, Giuseppe Bonaccorso, Packt Publication.

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
- Assignments / Tutorials
- Practical / Lab Performance
- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

CO PO Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	1	–	1	–	–
CO2	2	3	2	–	2	–	–
CO3	2	3	2	–	2	–	–
CO4	2	2	2	1	2	–	1

Course: Deep Learning								
Course Code: Insert here			**Credit:4**	**Semester: IX / III**		**Programme: IMSc/MSc IT**		
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**5**	**12.5/25**	**12.5/25**	**25/50**	**-**	**50/100**

Course Objectives:

- To introduce students to the fundamental concepts of artificial neural networks, including neuron models, activation functions, and learning mechanisms.
- To provide knowledge of deep neural network architectures and enable students to apply optimization and regularization techniques for improved model performance.
- To develop skills in designing, implementing, and training convolutional neural networks (CNNs) for image processing applications.
- To enable students to understand and apply recurrent neural networks (RNNs) and LSTM models for solving sequence-based problems such as time series analysis, speech recognition, and natural language processing.

Course Outcomes (COs):

CO1: Explain the fundamentals of artificial neural networks, including neuron models, activation functions, learning processes, and backpropagation.
CO2: Analyze deep neural network architectures and apply optimization and regularization techniques to improve model performance and generalization.
CO3: Implement and train convolutional neural networks (CNNs) for image-related tasks and understand popular CNN architectures.
CO4: Apply recurrent neural networks (RNNs) and LSTM models for sequence-based problems such as time series prediction, speech recognition, and natural language processing.

Course Content:

Module	Topics	Weightage (%)
1	**Basics of artificial neural networks (ANN)** Introduction to biological and artificial neural networks, computational model of a neuron, activation functions, perceptron model, feedforward neural networks, multilayer perceptron, learning process of neural networks, loss functions, weight adjustment mechanisms, basic concept of backpropagation, and applications of Artificial Neural Networks.	25

2	**Deep neural networks (DNNs)** Overview of deep neural networks, deep network architectures, challenges in training deep models, vanishing gradient problem, gradient descent optimization, adaptive optimization methods including Adam, regularization techniques such as dropout and batch normalization, concepts of overfitting and generalization, and introductory study of auto encoders.	25
3	**Convolution neural networks (CNNs)** Introduction to Convolution neural networks (CNNs), convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, Training a CNNs: weights initialization, batch normalization, hyper parameter optimization, Understanding and visualizing CNNs	25
4	**Recurrent neural networks (RNNs)** Introduction to sequence modelling, architecture and working of Recurrent Neural Networks, types of RNN, limitations of basic RNNs, Long Short-Term Memory networks, applications in natural language processing, speech recognition, sentiment analysis, and time series prediction.	25

Practical List:

1. Study and implementation of a basic Artificial Neuron (Perceptron) using Python.
2. Implementation of a Multilayer Perceptron (MLP) for a simple classification problem.
3. Implementation of a simple Deep Neural Network (DNN) using gradient descent.
4. Study and implementation of different activation functions used in neural networks.
5. Implementation of a basic Convolutional Neural Network (CNN) for image classification.
6. Visualization of feature maps in a CNN to understand convolution and pooling.
7. Implementation of a simple Recurrent Neural Network (RNN) for sequence prediction.
8. Implementation of LSTM network for time series or text-based prediction.

Text Book(s):

1. Deep Learning with Python by Francois Chollet Manning Publications Co., Latest Edition

2. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron An MIT Press book

Reference Book(s):

1. Neural Networks and Deep Learning by Michael Nielsen
http://neuralnetworksanddeeplearning.com

2. Pattern Classification by Richard O. Duda, Peter E. Hart, David G. Stork John Wiley & Sons Inc.

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
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- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

CO PO Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	1	–	1	–	–
CO2	2	3	2	–	2	–	–
CO3	2	2	2	–	3	–	–
CO4	2	3	2	–	2	–	1

Course: Data Visualization								
Course Code: -			**Credit: 2**	**Semester: IX / III**		**Programme: IMSc/MSc IT**		
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
-	**-**	**2**	**4**	**-**	**25/50**	**-**	**25/50**	**50/100**

Course Objectives:

- To provide practical knowledge of data analysis and business intelligence concepts.
- To develop hands-on skills in using tools such as Excel, Tableau, and Power BI.
- To enable students to transform and visualize data effectively for meaningful insights.
- To enhance the ability to present data-driven findings to support informed decision-making.

Course Outcomes (COs):

CO1: Use advanced Excel features such as formulas, pivot tables, data validation, and formatting to clean and analyze data.
CO2: Create effective data visualizations and interactive dashboards using Tableau for business insights.
CO3: Import, clean, transform, and visualize data using Power BI Desktop and its visualization tools.
CO4: Apply data modeling concepts and DAX functions in Power BI and publish interactive reports using Power BI Service.

Course Content:

Module	Topics	Weightage (%)
1	Excel Essentials and Tableau Introduction Text-to-columns, Remove duplicates, Lookup functions, Conditional formulas, Conditional formatting, Data validation, Pivot Tables, important keyboard shortcuts, Introduction to Business Intelligence, Tableau Products and Tableau Public setup, Tableau UI, connect to CSV and Excel files, Dimensions vs Measures Bar, Line, Pie, and Treemap charts, Filters, sorting, labels, and tooltips	25
2	Tableau Fundamentals Text and Highlight tables, Geographic roles and basic maps, Scatter plots, Histograms, Aggregation and granularity, Groups, Sets, and Parameters, Basic calculations, Formatting fonts, colors, axes, and tooltips, Create a basic dashboard with interactivity, Export views and save to Tableau Public,	25

3	Power BI - Power Query and Visualizations Introduction to Power BI and Power BI Desktop, Import data from multiple sources, Data cleaning and transformation using Power Query, Conditional and custom columns, Basic data preparation for analysis, Bar, Column, Line, Pie, and Treemap charts, Tables, Matrix, Cards, and Slicers, Sorting, filtering, and formatting visuals	25
4	Power BI - DAX, Data Modelling and Power BI Service Fact and Dimension tables, Manage relationships, Introduction to DAX, Calculated columns and basic aggregation functions, Logical and Date functions, Create hierarchies and quick measures, Basic analytics on charts, Introduction to Power BI Service, Publish reports to Power BI Service	25

Practical List:

1. Perform data cleaning in Excel using Text-to-Columns and Remove Duplicates.
2. Apply lookup and conditional formulas to analyze a given dataset.
3. Use conditional formatting and data validation for data accuracy.
4. Create and analyze data using Pivot Tables.
5. Use important Excel keyboard shortcuts to improve productivity.
6. Install Tableau Public and connect to Excel/CSV data.
7. Create basic charts in Tableau (Bar, Line, Pie, Treemap).
8. Apply filters, sorting, labels, and tooltips to Tableau views.
9. Create maps and scatter plots using geographic roles.
10. Build a simple interactive dashboard in Tableau and export the view.
11. Install Power BI Desktop and import data from multiple sources.
12. Clean and transform data using Power Query Editor.
13. Create basic visualizations in Power BI (Bar, Line, Pie, Cards).
14. Create simple DAX calculated columns and measures.
15. Publish a basic report to Power BI Service.

Text Book(s):

1. Paul McFedries – Excel 2019 Formulas and Functions, Microsoft Press, For Excel essentials including formulas, pivot tables, formatting, and data cleaning.
2. Ryan Sleeper – Practical Tableau: 100 Tips, Tutorials, and Strategies, O'Reilly Media, For Tableau fundamentals, charts, dashboards, filters, maps, and interactivity.

Reference Book(s):

1. Bill Jelen & Michael Alexander – Excel 2019 Bible, Wiley
2. Documentation of Power BI & Tableau

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
- Assignments / Tutorials
- Practical / Lab Performance
- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	1	–	3	–	–
CO2	1	2	2	–	3	–	–
CO3	1	2	2	–	3	–	–
CO4	1	2	2	–	3	–	1

Course: Backend with Microservices(Spring boot)								
Course Code: -			**Credit:4**	**Semester: IX / III**			**Programme: IMSc/MSc IT**	
Teaching Scheme				**Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**4**	12.5/25	12.5/25	25/50	-	**50/100**

Course Objectives:

- To understand modern backend development concepts.
- To understand microservices architecture and its advantages.
- Develop RESTful backend services using Spring Boot.
- To design backend systems using microservices principles.
- To develop and deploy a basic micro services-based backend application.

Course Outcomes (COs):

CO1: Understand backend fundamentals and micro services architecture.
CO2: Develop RESTful backend services using Spring Boot.
CO3: Apply micro services principles in backend system design.
CO4: Develop and deploy basic micro services-based backend applications.

Course Content:

Module	Topics	Weightage (%)
1	Backend Fundamentals & Microservices Architecture : Overview of Backend Development, Client–Server Architecture, Monolithic Architecture, Introduction to Microservices Architecture, Monolithic vs Microservices, RESTful Web Services, HTTP Methods & Status Codes, Advantages and Challenges of Microservices	25%
2	Backend Development using Spring Boot: Introduction to Spring Framework, Introduction to Spring Boot, Spring Boot Architecture, Creating Spring Boot Application, REST API Development using Spring Boot, Controllers, Services and Repositories, Dependency Injection, Configuration using application. Properties / application	25
3	Spring Boot Advanced Concepts & Service Design : Request and Response Handling, Exception Handling in Spring Boot, Data Persistence using JPA (Basic), Database Connectivity, Basic Authentication and Authorization Concepts, Introduction to Microservices using Spring Boot, Inter-service Communication (Conceptual)	25

4	Microservices Implementation & Deployment : Designing Microservices-based Backend Systems, Service Separation and Responsibility Design, API Communication between Services (Conceptual), Environment-based Configuration, Basic Security Practices, Introduction to Containerization (Docker – Conceptual), Mini Project using Spring Boot Microservices	25

Practical List:

1. Development of REST API using Spring Boot.
2. Database connectivity using JPA.
3. Exception handling in Spring Boot.
4. Microservices-based backend design (conceptual implementation).
5. Mini project using Spring Boot microservices.

Text Book(s):

1. Spring Boot in Action – Craig Walls

Reference Book(s):

1. Spring Microservices in Action – John Carnell
2. Building Microservices – Sam Newman

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
- Assignments / Tutorials
- Practical / Lab Performance
- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	2	–	2	–	–
CO2	1	2	3	–	2	–	–
CO3	1	2	3	–	2	–	–
CO4	1	2	3	–	2	–	1

Course: Full Stack Web Development (React + Node)								
Course Code: -			**Credit:4**	**Semester: IX / III**			**Programme: IMSc/MSc IT**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**4**	12.5/25	12.5/25	25/50	-	**50/100**

Course Objectives:

- Understand fundamentals of full stack web development.
- Develop frontend applications using React.
- Build backend services using Node.js and Express.js.
- Integrate database and frontend-backend components.
- Develop and deploy a basic MERN stack application.

Course Outcomes (COs):

CO1: Understand web fundamentals and modern JavaScript concepts.
CO2: Develop frontend applications using React.
CO3: Build backend APIs using Node.js and Express.js.
CO4: Integrate MongoDB with full stack applications and deploy them.

Course Content:

Module	Topics	Weightage (%)
1	Web Fundamentals & Modern JavaScript : Overview of Full Stack Development, Client–Server Architecture, HTTP / HTTPS & REST API concepts, Introduction to SPA (Single Page Applications), JavaScript Refresher Variables, Data Types, Functions, ES6+ Features (let/cost, arrow functions, spread, restructuring), Callbacks, Promises, Async/Await, JSON & API Communication.	25
2	Frontend Development using React : Introduction to React & Virtual DOM, React Project Setup (Vite + React), JSX & Rendering Elements, Functional Components, Props & State, React Hooks, useState, useEffect, useContext, useCallback, Custom Hooks, Event Handling & Forms, Conditional Rendering, Routing using React Router, API Integration using Fetch / Axios	25
3	Backend Development using Node.js & Express.js : Introduction to Node.js, Node.js Architecture & Event Loop, NPM & Package Management, Express.js Framework, Routing & Middleware, RESTful API Development, Handling Requests & Responses, Error Handling, Authentication Basics (JWT concept)	25
4	Database, Integration & Deployment : Introduction to MongoDB, NoSQL Database Concepts, CRUD Operations, Mongoose ODM, Schema & Models, Frontend–Backend Integration, Environment Variables, Basic Security Practices.	25

Practical List:

1. Setup React development environment using Vite
2. Create a basic React application and understand project structure
3. Implement JSX and rendering of elements
4. Develop functional components using Props and State
5. Implement state management using useState hook
6. Handle side effects using useEffect hook
7. Implement global state using useContext hook
8. Optimize component performance using useCallback hook
9. Handle events and forms in React
10. Implement client-side routing using React Router
11. Integrate REST APIs in React using Fetch / Axios
12. Setup backend server using Node.js and Express.js
13. Develop RESTful APIs using Express.js
14. Perform CRUD operations using MongoDB and Mongoose
15. Mini Project: Develop a full stack MERN application

Text Book(s):

1. Web Technologies – Achyut Godbole & Atul Kahate

Reference Book(s):

1. JavaScript: The Definitive Guide – David Flanagan
2. Learning React – Alex Banks & Eve Porcello
3. Full-Stack Web Development with Node, Express, and MongoDB – Ethan Brown

Continuous Internal Evaluation (CIE) Components:

- Internal Written Test
- Assignments / Tutorials
- Practical / Lab Performance
- Quiz / MCQ Test
- Attendance & Class Participation
- Presentation

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	2	–	2	–	–
CO2	1	2	3	–	2	–	–
CO3	1	2	3	–	2	–	–
CO4	1	2	3	–	2	1	1

Course: UI/UX Design with Figma + Design Systems								
Course Code: Insert here			**Credit:2**	**Semester: IX / III**			**Programme: IMSc/MSc IT**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**ESE Theory**	**ESE Practical**	**Total**
0	**0**	**2**	**4**		**25 / 50**		**25 / 50**	**50 / 100**

Course Objectives:

- Understand user-centered design principles.
- Apply UX research and interface design techniques.
- Design user interfaces using Figma.
- Create prototypes and design systems.
- Evaluate usability of applications.

Course Outcomes (COs):

CO1: Explain UI/UX design principles and usability concepts.
CO2: Apply UX design methods such as personas and user journeys.
CO3: Design and prototype interfaces using Figma.
CO4: Develop reusable UI components and design systems.

Course Content:

Module	Topics	Weightage (%)
1	Introduction to UI and UX, User-centered design principles, Design thinking process, Usability heuristics, User personas, User journey mapping, Information architecture, Wireframing concepts	25
2	Figma interface and workspace, Frames, layout grids, and alignment, Typography and color systems, Auto-layout and constraints, Responsive UI layout design, Component creation	25
3	Interactive prototyping in Figma, Reusable components and variants, Design systems fundamentals, Style guides and UI consistency, Accessibility basics	25
4	Usability testing concepts, Design iteration and feedback, UI developer handoff using Figma, Design documentation, End-to-end UI design workflow	25

Practical List (If applicable):

1. Create user persona
2. Create user journey map
3. Low-fidelity wireframe design
4. High-fidelity UI screen design in Figma
5. Interactive prototype creation
6. Component creation in Figma
7. Design system creation
8. Responsive UI layout design
9. Usability testing demonstration
10. Final UI prototype presentation

Text Book(s):

- Don Norman — *The Design of Everyday Things*

Reference Book(s):

- Steve Krug — *Don't Make Me Think*
- Figma Documentation
- Material Design Guidelines

Continuous Internal Evaluation (CIE) Components:

Design Exercises

Prototype Project

Design System Assignment

Viva / Presentation

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	–	1	1	–	1	2	–
CO2	–	1	2	–	1	2	–
CO3	–	1	2	–	2	2	–
CO4	–	1	2	–	2	2	1

Course: Advanced DevOps								
Course Code: Insert here			**Credit:4**	**Semester: IX / III**		**Programme: IMSc/MSc IT**		
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**5**	**12.5/25**	**12.5/25**	**25/50**	**-**	**50/100**

Course Objectives:

- To introduce students to DevOps principles, lifecycle, and cloud-native architecture for modern software development and deployment.
- To develop skills in building and deploying containerized applications using Docker and orchestration tools like Kubernetes.
- To enable students to implement automated CI/CD pipelines using version control systems such as Git and tools like Jenkins or GitHub Actions.
- To provide knowledge of infrastructure provisioning using Terraform and applying monitoring and management practices for reliable system operations.

Course Outcomes (COs):

CO1: Explain DevOps concepts, lifecycle, and cloud-native architecture.
CO2: Build and deploy containerized applications using Docker and Kubernetes.
CO3: Implement automated CI/CD pipelines using Git and Jenkins/GitHub Actions.
CO4: Provision and manage infrastructure using Terraform and apply monitoring practices.

Course Content:

Module	Topics	Weightage (%)
1	Advanced Docker & Container Management Containerization in software deployment, Docker architecture (engine, daemon, registry),Image optimization and multi-stage builds, Docker networking (bridge, host, overlay),Volume management and persistent data, Container logs and debugging, Docker Compose for multi-service applications, Private Docker registry concept, Container security basics (image scanning, vulnerabilities)	25
2	Kubernetes Administration & Deployment Kubernetes cluster architecture (master & worker components),Pod lifecycle and scheduling, Deployments, Replica Sets and scaling, Resource limits and requests, Liveness and readiness probes, Services and networking (ClusterIP, NodePort, LoadBalancer),Ingress controller and domain routing,ConfigMaps and Secrets, Persistent Volume and Persistent Volume Claim,Autoscaling (HPA),Helm charts (application packaging)	25

3	Infrastructure as Code using Terraform Manual provisioning vs Infrastructure as Code, Terraform architecture and workflow, providers and resources, Terraform configuration files, variables and outputs, state file and remote state, creating virtual machines automatically, network configuration and security groups, provisioning cloud infrastructure, Terraform modules and reusable infrastructure deployment.	25
4	Monitoring, Logging & DevOps Operations DevOps operations and SRE concepts, monitoring and logging fundamentals, metrics and alerting, Prometheus monitoring, Grafana dashboards, centralized logging concepts, application health monitoring, backup and recovery strategies, incident management process, DevSecOps basics and secret management.	25

Practical List:

1. Install Docker and verify installation using basic commands (pull, run, ps, images).
2. Create a Dockerfile to containerize a simple web application and run it in a container.
3. Implement Docker volumes/bind mounts to store persistent data.
4. Deploy a multi-container application using Docker Compose (web server + database).
5. Install Kubernetes (Minikube/Docker Desktop) and verify cluster using kubectl commands.
6. Create Pods and Deployments in Kubernetes and scale the application replicas.
7. Expose application using Kubernetes Service (NodePort/LoadBalancer) and perform rolling update.
8. Configure ConfigMaps or Secrets and attach persistent storage (PV & PVC) to an application.
9. Install Terraform and write configuration to automatically create a virtual machine/server.
10. Provision infrastructure using Terraform and deploy a containerized application on the created server/Kubernetes environment.

Text Book(s):

1. Kelsey Hightower, Brendan Burns, Joe Beda — *Kubernetes: Up & Running*, O'Reilly Media (Latest Edition).

Reference Book(s):

1. Yevgeniy Brikman — *Terraform: Up & Running*, O'Reilly Media (Latest Edition).
2. Karl Matthias, Sean P. Kane — *Docker: Up & Running*, O'Reilly Media (Latest Edition).
3. Gene Kim, Jez Humble, Patrick Debois, John Willis — *The DevOps Handbook*, O'Reilly Media.
4. Nigel Poulton — *The Kubernetes Book*, Packt Publishing.

Continuous Internal Evaluation (CIE) Components:

- Mid Semester Examination
- Assignments
- Quiz (MCQ based)
- Descriptive Class Test
- Practical Performance / Lab Work
- Viva Voce
- Mini Project / Case Study
- Presentation
- Attendance

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	–	2	–	1
CO2	1	2	2	–	3	–	1
CO3	1	2	2	–	3	–	1
CO4	1	2	2	–	3	–	2

Course: Cloud Architecture & Services (AWS Expert)								
Course Code: Insert here			**Credit:4**	**Semester: III**			**Programme: MSc(CA&IT)**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**5**	**12.5/25**	**12.5/25**	**25 / 50**	**-**	**50/ 100**

Course Objectives:

- Understand AWS cloud architecture principles.
- Design scalable and fault-tolerant systems on AWS.
- Implement AWS compute, storage, and networking services.
- Apply AWS security and monitoring practices.

Course Outcomes (COs):

CO1: Explain AWS architecture and service models.
CO2: Design AWS infrastructure using core services.
CO3: Implement AWS networking, storage, and compute solutions.
CO4: Apply AWS security, monitoring, and cost-optimization practices**.**

Course Content:

Module	Topics	Weightage (%)
1	AWS Cloud Architecture Fundamentals: Cloud computing concepts, AWS global infrastructure (Regions, Availability Zones), shared responsibility model, scalability and elasticity, high availability design, cloud architecture best practices.	25
2	AWS Compute & Storage Services: EC2 instances, AMI, Auto Scaling, Elastic Load Balancer, S3 storage, EBS volumes, S3 lifecycle management, storage classes, AWS Elastic File System (EFS).	25
3	AWS Networking & Database Services: VPC architecture, subnets, route tables, Internet Gateway, NAT Gateway, security groups, AWS Route 53, RDS overview, DynamoDB basics, backup strategies.	25
4	AWS Security, Monitoring & Cost Management: IAM users, roles, and policies, encryption concepts, AWS CloudWatch monitoring, logging basics, billing dashboard, cost optimization techniques, AWS Well-Architected Framework overview.	25

Practical List:

1. Launch and configure EC2 instance
2. Create and configure S3 bucket
3. Configure Auto Scaling group
4. Create Elastic Load Balancer
5. Configure VPC with public and private subnets
6. Configure security groups and routing
7. Attach EBS volume to EC2 instance
8. IAM user and role configuration
9. Monitor EC2 using CloudWatch
10. Deploy simple web application on AWS EC2

Text Book(s):

1. AWS Training Documentation

Reference Book(s):

1. AWS Well-Architected Framework
2. AWS Solutions Architect Study Guide
3. Rajkumar Buyya — Cloud Computing: Principles and Paradigms

Continuous Internal Evaluation (CIE) Components:

- Lab Performance & Experiment Execution
- AWS Configuration Assignment / Mini Deployment Task
- Cloud Architecture Case Study / Report
- Viva-Voce

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	–	2	–	–
CO2	1	2	2	–	3	–	–
CO3	1	2	2	–	3	–	–
CO4	1	1	2	–	3	–	1

Course: Infrastructure as Code + Monitoring								
Course Code: Insert here			**Credit:4**	**Semester: IX / III**			**Programme: IMSc/MSc IT**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**5**	**12.5/25**	**12.5/25**	**25/50**	**-**	**50/100**

Course Objectives:

- To introduce students to modern Infrastructure as Code (IaC) practices.
- To develop automation skills for infrastructure provisioning and configuration.
- To implement monitoring and observability solutions for IT systems.
- To integrate automation and monitoring in DevOps workflows.

Course Outcomes (COs):

1. Explain DevOps concepts, lifecycle, and cloud-native architecture.
2. Build and deploy containerized applications using Docker and Kubernetes.
3. Implement automated CI/CD pipelines using Git and Jenkins/GitHub Actions.
4. Provision and manage infrastructure using Terraform and apply monitoring practices.

Course Content:

Module	Topics	Weightage (%)
1	Fundamentals of Infrastructure as Code and DevOps Evolution of IT Infrastructure Management, Introduction to DevOps Culture and Workflow, Infrastructure as Code (IaC) – Concepts, Benefits, and Challenges, Version Control Systems and Git Workflow, Introduction to Cloud Computing Models (IaaS, PaaS, SaaS), Virtualization and Containerization Concepts, Overview of IaC Tools (Terraform, Ansible), Security and Best Practices in IaC	25
2	Infrastructure Provisioning and Configuration Management Terraform Architecture and Components, Providers, Resources, Variables, Outputs, Terraform State Management and Backends Modules and Reusability, Introduction to Configuration Management, Ansible Architecture – Inventory, Playbooks, Modules, Roles, Templates, and Handlers, Secrets Management and Security Practices	25
3	CI/CD and Automation Integration Continuous Integration and Continuous Deployment Concepts, GitHub Actions / GitLab CI – Workflow Automation, Automated Infrastructure Deployment Pipelines, Containerization using Docker Infrastructure Testing and Validation, Infrastructure Versioning and Rollback Strategies, Integration of IaC with CI/CD pipelines DevSecOps Basics in Infrastructure Automation	25

4	Monitoring, Logging and Observability Monitoring Concepts – Metrics, Logs, Traces, Infrastructure and Application Monitoring, Prometheus Architecture and Data Collection, Exporters and Service Discovery,Grafana Dashboards and Visualization, Alerting Mechanisms and Notification Systems Centralized Logging Concepts, Introduction to ELK Stack (Elasticsearch, Logstash, Kibana), Integration of Monitoring with Automated Infrastructure	25

Practical List:

1. Installation and configuration of Git, Terraform, Ansible, Docker.
2. Create and manage repositories using Git and implement branching strategy.
3. Provision a cloud virtual machine using Terraform.
4. Implement Terraform variables, outputs and state management.
5. Develop reusable Terraform modules.
6. Write Ansible playbooks to configure a web server.
7. Implement Ansible roles and templates for automated configuration.
8. Create CI/CD pipeline for validating and deploying infrastructure code.
9. Containerize an application using Docker and deploy via automation.
10. Install and configure Prometheus for infrastructure monitoring.
11. Create Grafana dashboards for system metrics visualization.
12. Configure alert rules and notification channels.
13. Implement centralized logging using ELK stack.
14. Automate deployment of monitoring stack using Terraform/Ansible.
15. Design and deploy automated infrastructure with monitoring and alerting for a sample web application

Text Book(s):

1. Kubernetes: Up & Running
2. Kelsey Hightower, Brendan Burns, Joe Beda — *Kubernetes: Up & Running*, O'Reilly Media (Latest Edition).

Reference Book(s):

1. Terraform: Up & Running Yevgeniy Brikman — *Terraform: Up & Running*, O'Reilly Media (Latest Edition).
2. Docker: Up & Running Karl Matthias, Sean P. Kane — *Docker: Up & Running*, O'Reilly Media (Latest Edition).
3. The DevOps Handbook Gene Kim, Jez Humble, Patrick Debois, John Willis — *The DevOps Handbook*, O'Reilly Media.
4. The Kubernetes Book Nigel Poulton — *The Kubernetes Book*, Packt Publishing..

Continuous Internal Evaluation (CIE) Components:

- Mid Semester Examination
- Assignments
- Quiz (MCQ based)
- Descriptive Class Test
- Practical Performance / Lab Work
- Viva Voce

- Mini Project / Case Study
- Presentation
- Attendance

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1	1	–	2	–	1
CO2	1	2	2	–	3	–	1
CO3	1	2	2	–	3	–	1
CO4	1	2	2	–	3	–	2

Course: Ethical Hacking (Kali Linux, Metasploit)								
Course Code: Insert here			**Credit:**	**Semester: IX / III**			**Programme: IMSc/MSc IT**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**-**	**1**	**5**	**12.5 / 25**	**12.5/25**	**25 / 50**	**-**	**50 / 100**

Course Objectives:

- Understand penetration testing methodology.
- Perform reconnaissance, scanning, and enumeration.
- Use Kali Linux security tools.
- Perform exploitation using Metasploit.

Course Outcomes (COs):

CO1: Explain ethical hacking lifecycle and legal considerations.
CO2: Perform reconnaissance, scanning, and enumeration.
CO3: Use Kali Linux tools for vulnerability assessment.
CO4: Demonstrate exploitation and reporting in a controlled lab.

Course Content:

Module	Topics	Weightage (%)
1	Introduction to ethical hacking, Penetration testing lifecycle, Legal and ethical considerations, Kali Linux environment, Virtual lab setup (VirtualBox / VMware), Information gathering concepts Passive vs active reconnaissance, Open-source intelligence (OSINT) basics	25
2	Network scanning using Nmap, Host discovery techniques, Port scanning methods, Banner grabbing, OS fingerprinting, Service enumeration, Vulnerability scanning concepts, SNMP and DNS enumeration basics	25
3	Metasploit architecture, Exploit modules and payloads, Meterpreter basics, Auxiliary modules, Vulnerability exploitation workflow, Privilege escalation concepts, Client-side attacks overview	25
4	Password attacks overview, Maintaining access concepts, Log analysis basics, Web attack overview (XSS, SQL injection concepts), Wireless security basics, Penetration testing, report writing, Mitigation and security recommendations	25

Practical List (If applicable):

1. Kali Linux installation and lab setup
2. Host discovery and network scanning using Nmap
3. Banner grabbing and OS fingerprinting
4. DNS enumeration demonstration
5. Vulnerability scanning demonstration
6. Metasploit basic usage
7. Exploiting vulnerable service using Metasploit
8. Meterpreter session demonstration
9. Password attack demonstration (lab environment)
10. Penetration testing report preparation

Text Book(s):

1. Michael Gregg — *Certified Ethical Hacker (CEH) Guide to Ethical Hacking*
2. Georgia Weidman — *Penetration Testing: A Hands-On Introduction to Hacking*

Reference Book(s):

1. Kali Linux Documentation
2. Metasploit Unleashed — Offensive Security
3. OWASP Testing Guide
4. Jon Erickson — *Hacking: The Art of Exploitation*

Continuous Internal Evaluation (CIE) Components:

- Lab Performance & Experiment Execution
- Vulnerability Assessment Assignment / Case Study
- Penetration Testing Report Submission
- Viva-Voce

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	1	–	2	1	–
CO2	1	2	2	–	3	1	–
CO3	1	2	2	–	3	1	–
CO4	1	2	2	–	3	2	1

Course: Network Security (Firewalls, VPN, IDS)								
Course Code: Insert here			**Credit:4**	**Semester: IX / III**			**Programme: IMSc/MSc IT**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	**0**	**1**	**5**	**12.5 / 25**	**12.5/25**	**25 / 50**	**-**	**50/ 100**

Course Objectives:

- Design secure enterprise network architecture.
- Implement firewall, IDS/IPS, and VPN solutions.
- Analyze advanced network attacks.
- Apply Zero-Trust security concepts.

Course Outcomes (COs):

CO1. Design secure network architecture using modern security models.
CO2. Configure advanced firewall and VPN systems.
CO3. Deploy IDS/IPS and monitoring tools.
CO4. Analyse and mitigate network attacks**.**

Course Content:

Module	Topics	Weightage (%)
1	Secure Network Architecture: Defence-in-depth, Zero Trust Architecture, Micro segmentation, VLAN security, DMZ design, NAC, Cloud network security, SDN security	25
2	Advanced Firewall Security: Stateful firewall, NGFW, WAF, firewall rule design, logging & monitoring, DPI, load balancing, high-availability firewall architecture	25
3	VPN & Secure Protocols: Enterprise VPN design, IPsec architecture, IKEv2, SSL VPN, PKI, certificate lifecycle, Kerberos, RADIUS, TACACS+	25
4	IDS/IPS & Network Attacks: IDS/IPS architecture, anomaly detection, SIEM basics, packet monitoring, DoS attacks, MITM, DNS attacks, ARP poisoning, session hijacking, brute force attacks	25

Practical List (If applicable):

1. Firewall Configuration using pfSense
2. Create firewall rules
3. Configure NAT
4. Monitor firewall logs
5. VLAN Segmentation and Network Isolation
6. Configure VLANs
7. Test inter-VLAN security policies
8. Access Control List (ACL) Configuration
9. Configure ACL rules on router/simulation
10. Test traffic filtering
11. IPsec Site-to-Site VPN Configuration
12. Configure VPN tunnel
13. Verify encrypted communication
14. Remote Access VPN Setup
15. Configure client-to-site VPN
16. Test secure remote connectivity
17. Snort IDS Installation and Configuration
18. Install Snort
19. Run IDS monitoring
20. Creating Custom IDS Rules
21. Write Snort rules
22. Generate alerts
23. Packet Analysis using Wireshark
24. Capture packets
25. Analyze protocols and suspicious traffic
26. Network Scanning and Vulnerability Detection
27. Host discovery
28. Port scanning
29. Banner grabbing
30. Generate scan report
31. Network Attack Simulation
32. MITM simulation
33. ARP spoofing demonstration
34. Brute-force attack demonstration (controlled environment)

Text Book(s):

- **William Stallings — *Network Security Essentials***

Reference Book(s):

- **Charlie Kaufman — *Network Security***
- **Ross Anderson — *Security Engineering***
- **Eric Cole — *Network Security Bible***

Continuous Internal Evaluation (CIE) Components:

- Assignment / Case Study
- Lab performance
- Quiz / Test
- Security configuration exercises

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	1	–	2	1	–
CO2	1	2	2	–	3	1	–
CO3	1	2	2	–	3	1	–
CO4	1	2	2	–	3	1	1

Course: Secure Coding & Web App Security (OWASP)								
Course Code: Insert here			**Credit:2**	**Semester: IX / III**			**Programme: IMSc/MSc IT**	
Teaching Scheme				**Evaluation Scheme**				
				CCE		**SEE**		
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**SEE Theory**	**SEE Practical**	**Total**
0	**0**	**2**	**4**	**-**	**25/50**	**-**	**25/50**	**50/ 100**

Course Objectives:

- To introduce students to secure coding principles and secure software development practices.
- To understand OWASP Top-10 web application vulnerabilities and mitigation techniques.
- To develop skills in implementing authentication, session management, and input validation securely.
- To perform web application vulnerability testing using security tools.

Course Outcomes (COs):

CO1: Explain secure coding principles and the Secure Software Development Life Cycle.
CO2: Identify and analyze OWASP Top-10 web application vulnerabilities.
CO3: Implement secure coding techniques for web applications.
CO4: Perform web application security testing using industry tools.

Course Content:

Module	Topics	Weightage (%)
1	Web Application Security Foundations — Introduction to web application security, Secure Software Development Life Cycle (SSDLC), integrating security into design, development, testing, and maintenance. Threat modeling concepts and attack surface identification. Security principles: least privilege, defense in depth, secure defaults.	25
2	OWASP Top-10 Vulnerabilities — Broken Access Control (IDOR, authorization bypass), Cryptographic Failures, Injection attacks (SQL/OS/LDAP), Insecure Design, Security Misconfiguration, Vulnerable & Outdated Components, Identification & Authentication Failures, Software & Data Integrity Failures, Security Logging & Monitoring Failures, Server-Side Request Forgery (SSRF).	25

3	Secure Coding Practices — Input validation (whitelisting, prepared statements), output encoding (XSS prevention), authentication & session management (bcrypt/Argon2, secure cookies), cryptographic practices and key management, secure error handling and logging.	25
4	Security Tools, DevSecOps & Compliance — DevSecOps concepts, SAST & DAST tools, CI/CD security integration, Web Application	25
	Firewall (WAF) fundamentals, vulnerability scanning workflow, compliance awareness (GDPR, PCI-DSS).	

Practical List:

1. Study of OWASP Juice Shop / WebGoat vulnerable application
2. Input validation implementation
3. Password hashing using bcrypt or Argon2
4. SQL Injection demonstration and prevention
5. Cross-Site Scripting (XSS) demonstration and prevention
6. CSRF protection implementation
7. Secure session management implementation
8. Security headers implementation
9. Web vulnerability scanning using OWASP ZAP
10. Burp Suite proxy interception and request analysis

Text Book(s):

Reference Book(s):

- Dafydd Stuttard & Marcus Pinto - *The Web Application Hacker's Handbook*
- OWASP Foundation - *OWASP Testing Guide*
- Mark Graff & Kenneth van Wyk - *Secure Coding: Principles and Practices*
- Tanya Janca - *Alice and Bob Learn Application Security*

Continuous Internal Evaluation (CIE) Components:

- Lab Performance & Experiment Execution
- Practical Assignments / Secure Coding Exercises
- Vulnerability Testing Report / Case Study
- Viva-Voce

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	2	–	2	1	–
CO2	1	2	3	–	2	1	–
CO3	1	2	3	–	2	1	–
CO4	1	2	3	–	2	2	1

SHREYARTH UNIVERSITY												
School of Computer Science and Applications												
B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)												
Teaching Scheme W.E.F-2024-25												
B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.) Semester - 1												
					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	I	CSM101-1C	Computer HardwareArchitecture	Major Course-1	3	0	1	4	5	50	50	100
2	I	CSM102-1C	Introduction to Networking	Major Course-2	3	0	1	4	5	50	50	100
3	I	CSE101-1C	C Programming	Minor Course-3	3	0	1	4	5	50	50	100
4	I	MDC102-1C	Mathematics-I	MDC-1	3	1	0	4	4	50	50	100
5	I	AEC101-1C	Basic Electronics	AEC-1	1	0	1	2	3	25	25	50
6	I	SEC101-1C	Communication Skills I	SEC-1	2	0	0	2	2	25	25	50
7	I	IKS101-1C	Indian Knowledge System	IKS-1	2	0	0	2	2	25	25	50
			Total		**17**	**1**	**8**	**22**	**26**	**275**	**275**	**550**
B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.) Semester - 2												
					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	II	CYM103-1C	Basics of Python Programming	Major Course-1	3	0	1	4	5	50	50	100
2	II	CYM104-1C	Wireless Communication	Major Course-2	3	0	1	4	5	50	50	100
3	II	CYE102-1C	Introduction to Web Designing	Minor Course-3	3	0	1	4	5	50	50	100
4	II	MDC110-1C	Digital Electronics	MDC-1	3	1	0	4	4	50	50	100
5	II	AEC106-1C	Operating Systems (Windows & Linux)	AEC-1	1	1	0	2	2	25	25	50
6	II	SEC106-1C	Communication Skills II	SEC-1	2	0	0	2	2	25	25	50
7	II	VAC101-1C	Yoga and Nutrition's	VAC-1	0	1	1	2	3	25	25	50
			Total		**15**	**3**	**8**	**22**	**26**	**275**	**275**	**550**
B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.) Semester - 3												
					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	III	CYM201-2C	Cyber Security - I	Major Course-1	3	0	1	4	5	50	50	100
2	III	CYM202-2C	Advance Python Programming	Major Course-2	3	0	1	4	5	50	50	100
3	III	CYM203-2C	Introduction to JavaScript	MajorCourse-3	3	0	1	4	5	50	50	100

4	III	MDC207-2C	Infomation Security	MDC-1	3	1	0	4	4	50	50	100
5	III	AEC207-2C	Micro Controller & Processor Programming	AEC-1	1	1	0	2	2	25	25	50
6	III	SEC207-2C	Communication Skills III	SEC-1	2	0	0	2	2	25	25	50
7	III	IKS202-2C	Indian Knowledge System	IKS-1	2	0	0	2	2	25	25	50
			Total		**17**	**2**	**6**	**22**	**25**	**275**	**275**	**550**
B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.) Semester - 4												
					Teaching Scheme					**Exam Scheme**		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	IV		Linux Shell Script	Major Course-1	3	0	1	4	5	50	50	100
2	IV		Server Management	Major Course-2	2	0	2	4	6	50	50	100
3	IV		Advance Cyber Security	MajorCourse-3	3	0	1	4	5	50	50	100
4	IV		Project 1	Minor Course-1	1	1	2	4	6	50	50	100
5	IV		RDBMS	MDC-1	3	0	1	4	5	50	50	100
6	IV		Digital Marketing	SEC-1	2	0	0	2	2	25	25	50
			Total		**14**	**1**	**14**	**22**	**29**	**275**	**275**	**550**
B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.) Semester - 5												
					Teaching Scheme					**Exam Scheme**		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	V		VAPT (Vulnerability Assessment & Pen Testing)	Major Course-1	3	0	1	4	5	50	50	100
2	V		Security of Internet of Things (IoT)	Major Course-2	3	0	1	4	5	50	50	100
3	V		Project 2	Project	0	0	4	4	8	50	50	100
4	V		Generative AI & Prompt Engineering	SEC-1	0	1	3	4	7	50	50	100
5	V		Professional Writing & Technical Documentation	MDC-1	2	1	1	4	5	50	50	100
6	V		Cyber Law & Governance	VAC-1	2	0	0	2	2	25	25	50
			Total		**10**	**2**	**20**	**22**	**30**	**275**	**275**	**550**

SHREYARTH UNIVERSITY

School of Computer Science and Applications

B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)

SYLLABUS

SEMESTER – 5

Shreyarth University

B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)

SEMESTER - 5

SHREYARTH UNIVERSITY, AHMEDABAD											
SEMESTER-V SYLLABUS W.E.F. YEAR 2026-27											
Sr. No.	**Sub. Code**	**Name of the subject**	**Curricular Type**	**CREDIT**	**Teaching Scheme**				**Examination Scheme**		
					Th.	**Tut.**	**Pr.**	**Total (Hr.)**	**CCE**	**SEE**	**Total marks**
1		VAPT (Vulnerability Assessment & Pen Testing)	Major Course-1	4	3	0	1	5	50	50	100
2.		Security of Internet of Things (IoT)	Major Course-2	4	3	0	1	5	50	50	100
3.		Project 2	Project	4	0	0	4	8	50	50	100
4.		Generative AI & Prompt Engineering	SEC-1	4	0	1	3	7	50	50	100
5.		Professional Writing & Technical Documentation	MDC-1	4	2	1	1	5	50	50	100
6.		Cyber Law & Governance	VAC-1	2	2	0	0	2	25	25	50
		TOTAL		**22**	**10**	**2**	**20**	**32**	**275**	**275**	**550**

Course: VAPT (Vulnerability Assessment & Pen Testing)								
Course Code:			**Credit: 4**	**Semester: 5**		**Programme: B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)**		
Teaching Scheme				**Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CCE Theory**	**CCE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	0	**1**	**5**	**9/25**	**9/25**	**18/50**	**-**	**36/100**

Course Objectives

- To understand structured penetration testing methodology and industry-standard security assessment frameworks.
- To develop skills in reconnaissance, attack surface mapping, and vulnerability identification.
- To analyze and exploit common web application vulnerabilities in controlled lab environments.
- To apply penetration testing techniques on vulnerable virtual machines and demonstrate basic privilege escalation and attack simulation.

Course Outcomes (COs)

After successful completion of the course, students will be able to:

CO1: Explain penetration testing lifecycle, vulnerability classification, CVSS scoring, and OWASP Top 10 risks.
CO2: Perform reconnaissance, OSINT, and attack surface mapping using appropriate tools and techniques.
CO3: Identify and exploit common web application vulnerabilities in controlled lab environments.
CO4: Conduct applied penetration testing on vulnerable machines and demonstrate basic privilege escalation techniques.

Course Content:

Module	Topics	Weightage (%)
1	**Penetration Testing Methodology** What is Vulnerability Assessment and Penetration Testing? Types of Penetration Testing, Penetration Testing Lifecycle, identifying scope of testing, defining testing boundaries Information Gathering Techniques, Types of vulnerabilities introduction to CVSS (Common Vulnerability Scoring System), OWASP Top 10 Overview	25
2	**Reconnaissance & Attack Surface Mapping** Reconnaissance Fundamentals, Passive vs active reconnaissance, Open-Source Intelligence (OSINT) Techniques, Google Dorking, Subdomain Enumeration, Attack Surface Mapping, Basic Active Directory Concepts, Advanced Nmap Scanning Techniques	25
3	**Web Application Penetration Testing**	25

	Client-server architecture, Mapping web applications, Identifying entry points, Parameter analysis, Testing workflow, Testing on Vulnerable Web, Applications (Lab), SQL Injection, Cross-Site Scripting (XSS), Authentication & Session Vulnerabilities, CSRF, File Upload Vulnerabilities	
4	**Applied Penetration Testing & Lab Practice** Controlled Exploitation in Lab Environments, Capture-the-Flag (CTF) Methodology: Introduction to CTF competitions, Solving security challenges in lab environments, Vulnerable VM Practice, Basic Privilege Escalation	25

Practical List

Module 1: Penetration Testing Methodology

1. CVSS Scoring Practical
2. VAPT Methodology Case Study

Module 2: Reconnaissance & Attack Surface Mapping

3. Information gathering using OSINT techniques
4. Advanced network scanning and service enumeration
5. Subdomain enumeration and attack surface mapping

Module 3: Web Application Penetration Testing

6. SQL Injection testing in vulnerable lab application
7. Cross-Site Scripting (XSS) demonstration
8. Authentication and session vulnerability testing
9. CSRF attack demonstration in lab environment
10. File upload vulnerability exploitation
11. Burp Suite Practical

Module 4: Applied Penetration Testing & Lab Practice

12. Exploitation of a beginner-level vulnerable virtual machine
13. Basic privilege escalation in controlled VM environment
14. Capture-the-Flag (CTF) challenge participation

Text Books

1. Georgia Weidman, Penetration Testing: A Hands-On Introduction to Hacking, No Starch Press.
2. Dafydd Stuttard and Marcus Pinto, The Web Application Hacker’s Handbook: Finding and Exploiting Security Flaws, Wiley.

Reference Books

1. Jon Erickson, Hacking: The Art of Exploitation, No Starch Press.
2. OWASP Foundation, OWASP Testing Guide, OWASP Foundation.

Continuous Internal Evaluation (CIE) Components

CIE Component	Marks
Practical Examination	15
Assignment	10

CIE Component	Marks
Attendance	05
Total CIE	**30**

CO – PO Mapping

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	2	2
CO2	3	3	3	2	2	2
CO3	3	3	3	2	2	2
CO4	3	3	3	2	3	3

CO–PSO Mapping

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2
CO2	3	3	2	2
CO3	2	3	3	2
CO4	2	3	3	3

Course: Security of Internet of Things (IoT)								
Course Code:			**Credit: 4**	**Semester: 5**		**Programme: B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)**		
Teaching Scheme				**Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CCE Theory**	**CCE Practical**	**SEE Theory**	**SEE Practical**	**Total**
3	0	**1**	**5**	**9/25**	**9/25**	**18/50**	**-**	**36/100**

Course Objectives

- To understand IoT architecture, communication protocols, and attack surfaces.
- To study microcontrollers, microprocessors, sensors, and their role in IoT systems.
- To analyze embedded device security mechanisms and firmware-level protection techniques.
- To evaluate IoT risk management frameworks, privacy challenges, and emerging security models.

Course Outcomes (COs):

After successful completion of the course, students will be able to:

CO1: Explain IoT architecture, communication protocols, and security foundations including OWASP IoT Top 10 risks.

CO2: Analyze IoT hardware platforms including Arduino, ESP32, and Raspberry Pi, and evaluate associated hardware constraints.

CO3: Evaluate embedded system security mechanisms such as secure boot, firmware protection, and resistance to side-channel and physical attacks.

CO4: Assess IoT security risks and recommend mitigation strategies considering privacy, legal issues, Zero Trust principles, and botnet threats such as Mirai.

Course Content:

Module	Topics	Weightage (%)
1	**Fundamentals of IoT & Security Foundations** Introduction to Internet of Things (IoT), IoT Architecture (Perception, Network, Middleware, Application Layers), IoT Data Flow & Attack Surface, IoT Communication Protocol Stack: MQTT, CoAP, AMQP, Zigbee, BLE, OWASP IoT Top 10 Overview	25
2	**Microcontrollers, Microprocessors, Sensors & Actuators** Microcontroller vs Microprocessor, Overview of: Arduino, ESP8266 / ESP32, Raspberry Pi, Sensors & Actuators	25
3	**Device & Embedded System Security**	25

	Hardware-Level Security Concepts, Secure Boot Mechanism, Firmware Analysis Concepts, Secure Firmware Update Mechanisms, Side Channel Attacks, Physical Security Risks, IoT Malware & Reverse Engineering Basics	
4	**IoT Risk Management, Privacy & Emerging Trends** IoT Risk Assessment Methodologies, IoT Security Testing Approaches, Case Study of Mirai Botnet, Privacy Issues in IoT Ecosystems, Legal & Ethical Issues in IoT Security, Zero Trust Architecture in IoT, Future Trends in IoT Security	25

Practical List

Module 1: Fundamentals of IoT & Security Foundations

1. Study of IoT architecture using simulation tools
2. Configuration of MQTT broker and security analysis
3. Packet capture and analysis of IoT traffic

Module 2: Microcontrollers, Microprocessors, Sensors & Actuators

4. Comparative study of Arduino, ESP32, and Raspberry Pi platforms
5. Sensor data acquisition experiment (temperature/PIR sensor)

Module 3: Device & Embedded System Security

6. Demonstration of insecure IoT communication
7. Smart home attack scenario simulation
8. Show difference between signed vs unsigned updates

Module 4: IoT Risk Management, Privacy & Emerging Trends

9. Identify risks in a smart home / IoT system
10. Assign severity (basic CVSS-style thinking)

Text Books

1. Fei Hu, Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, CRC Press.
2. Brian Russell and Drew Van Duren, Practical Internet of Things Security, Packt Publishing.

Reference Books

1. Souvik Pal, IoT Security Issues, CRC Press.
2. Andrew “bunnie” Huang, The Hardware Hacker: Adventures in Making and Breaking Hardware, No Starch Press.

Continuous Internal Evaluation (CIE) Components

CIE Component	**Marks**
Practical Examination	15
Assignment	10
Attendance	05
Total CIE	**30**

CO – PO Mapping

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	1	2
CO2	3	2	3	2	2	2
CO3	3	3	3	2	2	2
CO4	3	3	3	3	3	3

CO – PSO Mapping

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2
CO2	3	3	2	2
CO3	2	3	3	2
CO4	2	3	3	3

Course: Project 2								
Course Code:			**Credit: 4**	**Semester: 5**		**Programme: B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)**		
Teaching Scheme				**Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CCE Theory**	**CCE Practical**	**SEE Theory**	**SEE Practical**	**Total**
0	**0**	**4**	**8**	**18/50**	**-**	**18/50**	**-**	**36/100**

Course Objectives:

- To apply knowledge gained from core and specialization subjects to solve real-world problems.
- To design, implement, and validate a system-based solution.
- To develop research, analytical, and technical documentation skills.
- To enhance teamwork, project management, and professional ethics.

Course Outcomes (COs):

After successful completion of the course, students will be able to:

CO1: Design and implement a project addressing a real-world problem in Cyber Security, IoT, Networking, or related domains.

CO2: Design and implement a system using appropriate tools, technologies, and methodologies.

CO3: Analyze results, evaluate performance, and validate system effectiveness.

CO4: Demonstrate teamwork, professional ethics, and effective technical communication.

Project Phases

Phase	Topics	Weightage (%)
1	**Problem Identification & Proposal (Weeks 1–2)** Identification of problem, Literature review of existing solutions, Gap analysis, Definition of objectives and scope, Technology stack selection, Faculty approval	20
2	**System Design & Architecture (Weeks 3-6)** Detailed system architecture, Security architecture (if applicable), Database / Network / IoT topology design, Diagrams / Flowcharts / DFD, Risk assessment & feasibility analysis	20

3	**Implementation & Integration (Weeks 7-12)** Development / Configuration, Integration of modules, Security mechanisms implementation, Data collection or simulation	20
4	**Testing & Documentation (Weeks 13-15)** Perform testing and debugging. Prepare final report with screenshots, results, and findings. Present and demonstrate the project before evaluators.	20
5	**Presentation and Viva (Weeks 16)** Live demonstration of the project to an evaluation panel. Viva voce covering project rationale, methodology, and outcomes.	20

Evaluation Scheme

Component	**Description**	**Assessment Type**	**Marks**
Problem Definition & Literature Review	Topic relevance, objectives, feasibility, planning quality	Internal	10
System Design & Architecture	Flowcharts, DFD/ER diagrams, network/web layout, design clarity	Internal	15
Implementation & Configuration	Functionality, coding/configuration quality, use of tools/technologies, innovation	Internal	15
Testing & Documentation	Test cases, debugging, documentation quality, screenshots	Internal	10
Final Implementation & Final Project Report	Working system, correctness, innovation, completeness, technical documentation	External	20
Presentation & Demonstration	Presentation skills, communication, workflow explanation, teamwork, response to queries	External	10
Viva Voce	Understanding of the project, technical knowledge, individual contribution, future scope	External	10
Total			**100**

CO–PO Mapping

COs / POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	2	2	2	2
CO2	3	3	3	2	2	2
CO3	3	3	3	2	2	2
CO4	2	2	2	2	3	3

CO–PSO Mapping

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2
CO2	3	3	3	2
CO3	2	3	3	2
CO4	2	2	3	3

Course: Generative AI & Prompt Engineering								
Course Code:			**Credit: 4**	**Semester: 5**		**Programme: B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)**		
Teaching Scheme				**Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CCE Theory**	**CCE Practical**	**SEE Theory**	**SEE Practical**	**Total**
0	**1**	**3**	**7**	**-**	**18/50**	**-**	**18/50**	**36/100**

Course Objective:

- To introduce the fundamentals of Generative AI and its role in modern Cyber Security.
- To develop practical skills in prompt engineering for security analysis, automation, and threat intelligence.
- To understand security risks, adversarial use, and ethical concerns of Generative AI systems.
- To enable students to design AI-assisted solutions for cyber security tasks.

Course Outcomes (COs):

After successful completion of the course, students will be able to:

CO1: Explain the working principles of Generative AI models and their applications in Cyber Security.

CO2: Design effective prompts for security analysis, vulnerability assessment, and code review.

CO3: Apply Generative AI tools to automate cyber security tasks such as log analysis and threat reporting.

CO4: Evaluate security risks, ethical concerns, and misuse of Generative AI in cyber domains.

Course Content:

Module	**Topics**	**Weightage (%)**
1	**Prompt Engineering Fundamentals** What is Prompt Engineering? Structure of Effective Prompts, Zero-shot, One-shot, Few-shot Prompting, Role-based Prompting, Chain-of-	25

	Thought Prompting (Basic Concept), Prompt Refinement & Optimization	
2	**Generative AI Tools & Applications** Text Generation & Content Creation, Code Generation & Debugging, Image Generation Concepts, AI for Research & Report Writing, AI for Vulnerability Assessment & Pentesting Support, Building Simple AI-Assisted Workflows	25
3	**Generative AI in Cyber Security** Evolution of Artificial Intelligence & Generative AI Cyber Security, Introduction to Large Language Models (LLMs), Applications of Generative AI in Cyber Security: Threat Intelligence, Malware Analysis Assistance, Security Automation, Limitations of AI in Security	25
4	**Ethics, Governance & Risks of Generative AI** Responsible and Ethical Use of AI in Cyber Security, Bias and Fairness in AI, AI Hallucination & Misinformation, Data Privacy & Security Issues, Copyright & Intellectual Property Concerns, Responsible AI Usage, Future Trends: AI-driven Cyber Defense	25

Practical List

Module 1: Prompt Engineering Fundamentals

1. Designing structured prompts for content generation
2. Few-shot prompting exercise
3. Comparative analysis of different prompts

Module 2: Generative AI Tools & Applications

1. Code generation and debugging using AI tools
2. AI-generated report writing and editing
3. Designing prompts to detect phishing emails
4. Simulated incident response report generation

Module 3: Generative AI in Cyber Security

5. Prompt design for vulnerability explanation
6. Secure code review using AI tools

Module 4: Ethics, Governance & Risks

7. 6. Identifying bias or hallucination in generated outputs
8. Identifying hallucination in AI-generated security output

Text Books

1. Tom Taulli, Generative AI Basics, Apress.

Reference Book

1. James Phoenix and Mike Taylor, Prompt Engineering for Generative AI, O'Reilly Media.

Continuous Internal Evaluation (CIE) Components

CIE Component	**Marks**
Assignment	10
Class Test	10

CIE Component	Marks
Attendance	10
Total CIE	**30**

CO – PO Mapping

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	2	1	1	2
CO2	3	2	2	1	1	2
CO3	3	3	2	1	2	2
CO4	3	3	2	2	2	2

CO–PSO Mapping

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1
CO2	3	3	2	1
CO3	3	3	2	2
CO4	2	2	3	3

Course: Professional Writing & Technical Documentation								
Course Code:			**Credit: 4**	**Semester: 5**		**Programme: B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)**		
Teaching Scheme				**Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CCE Theory**	**CCE Practical**	**SEE Theory**	**SEE Practical**	**Total**
2	**1**	**1**	**4**	**9/25**	**9/25**	**18/50**	**-**	**36/100**

Course Objective

- To develop professional writing skills specific to Cyber Security documentation.
- To train students in preparing vulnerability reports, incident reports, and security documentation.
- To enhance clarity and accuracy in technical communication within security operations.
- To promote ethical and legally compliant documentation practices in cyber security.

Course Outcomes (COs):

After successful completion of the course, students will be able to:

CO1: Prepare structured and professional cyber security documents.
CO2: Draft vulnerability assessment, penetration testing, and incident response reports.
CO3: Apply industry documentation standards and referencing practices in security reports.
CO4: Communicate technical security findings clearly to technical and non-technical audiences.

Course Content:

Module	Topics	Weightage (%)
1	**Fundamentals of Security Documentation** Principles of Technical Writing in Cyber Security, Clarity, Accuracy, and Risk Communication, Writing for Technical vs Management	25

	Audience, Common Documentation Errors in Security Reporting, Ethical and Legal Considerations in Security Documentation	
2	**Vulnerability Assessment & Penetration Testing Reports** Structure of VAPT Reports, Executive Summary Writing Risk Rating (CVSS – Overview), Documenting Vulnerabilities (Description, Impact, Proof of Concept, Remediation), Writing Secure Code Review Reports, Responsible Disclosure Documentation	25
3	**Incident Response & SOC Documentation** Incident Response Report Structure, Writing Incident Timeline and Root Cause Analysis, Log Analysis Documentation, Threat Intelligence Reporting, Digital Evidence Documentation & Chain of Custody, Compliance & Audit Documentation	25
4	**Research & Professional Communication in Cyber Security** Writing Security Research Papers, Writing Security Policies & Procedures, Drafting Security Awareness Materials, Email Communication in Security Operations, Report Presentation & Briefing Skills, Plagiarism & Confidentiality in Security Documentation	25

Practical List:

Module 1: Fundamentals of Security Documentation

1. Creating an executive summary for management
2. Presenting findings to technical & non-technical audience

Module 2: Vulnerability Assessment & Penetration Testing Reports

3. Drafting a complete VAPT report
4. Preparing a vulnerability disclosure report
5. CVSS-based risk rating exercise

Module 3: Incident Response & SOC Documentation

6. Writing an incident response report
7. Drafting SOC alert analysis report

Module 4: Research & Professional Communication

8. Writing a security policy document
9. Presenting findings to technical & non-technical audience

Text Books

1. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice, Oxford University Press.

Reference Books

1. Shirley Taylor, Technical Writing: Process and Product, Pearson Education.
2. Gerald J. Alred, Charles T. Brusaw, and Walter E. Oliu, Handbook of Technical Writing, Bedford/St. Martin's.

Continuous Internal Evaluation (CIE) Components

CIE Component	Marks
Assignment	15

CIE Component	Marks
Class Test	10
Attendance	05
Total CIE	**30**

CO–PO Mapping

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	2	2	3	2
CO2	3	2	2	2	3	2
CO3	3	3	2	2	3	2
CO4	2	2	2	2	3	3

CO–PSO Mapping

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1
CO2	3	3	2	1
CO3	3	3	2	2
CO4	2	3	2	2

Course: Cyber Law & Governance								
Course Code:			**Credit: 2**	**Semester: 5**		**Programme: B.Sc. in Cyber Security, Cloud Computing & Networking (Hons.)**		
Teaching Scheme				**Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CCE Theory**	**CCE Practical**	**SEE Theory**	**SEE Practical**	**Total**
2	**0**	**0**	**2**	**18/50**	**-**	**18/50**	**-**	**36/100**

Course Objective:

- To introduce basic concepts of cyber law and digital governance.
- To understand common cybercrimes and relevant legal provisions.
- To create awareness about privacy, data protection, and ethical issues in cyberspace.
- To understand regulatory frameworks and compliance requirements.

Course Outcomes (COs):

After successful completion of the course, students will be able to:

CO1: Explain the need and importance of cyber laws.
CO2: Identify different types of cybercrimes and related legal actions.
CO3: Understand privacy, data protection, and digital evidence concepts.
CO4: Describe cyber governance policies and ethical responsibilities.

Course Content:

Module	Topics	Weightage (%)
1	**Basics of Cyber Law** Introduction to Cyber Law, Need for Cyber Law, Overview of IT Act, Introduction to the IT Act – 2000, Key objectives of the IT Act,	25

	Important sections of the IT Act related to cyber offenses, digital Signatures & Electronic Records, Evolution of cyber laws globally and in India, Legal recognition of electronic documents	
2	**Cyber Crimes** Definition and characteristics of cybercrimes, Difference between traditional crimes and cybercrimes, Types of Cyber Crimes, Hacking, Phishing, Identity Theft, Cyber Stalking & Online Fraud, Punishments under the IT Act, Legal remedies for victims of cyber crimes	25
3	**Privacy & Data Protection** Concept of Privacy in the digital age, Data Protection Principles, Concept of digital evidence, Types of digital evidence, Cyber Forensics Overview, Role of digital forensics in cybercrime investigations	25
4	**Cyber Governance & Ethics** National Cyber Security Policy (Overview), Objectives of the policy , Role of Government & Regulatory Bodies, Role of CERT-In in incident response, Introduction to Intellectual Property Rights (IPR), Types of intellectual property, Ethical Issues in Digital World	25

Text Book

1. Vivek Sood, Cyber Law Simplified, McGraw Hill Education.

Reference Books

1. Government of India, Information Technology Act, 2000 (with Amendments), Bare Act.
2. Rodney D. Ryder, Guide to Cyber Laws, Wadhwa & Company.

Continuous Internal Evaluation (CIE) Components

CIE Component	**Marks**
Class Test	10
Assignment	10
Attendance	10
Total CIE	**30**

CO – PO Mapping

COs / POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	1	2	2	1	2
CO2	3	1	2	2	1	2
CO3	2	2	2	2	1	2
CO4	2	2	2	2	2	2

CO – PSO Mapping

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2	2
CO2	3	3	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO3	2	3	2	2
CO4	2	3	3	3

SHREYARTH UNIVERSITY

School of Computer Science and Applications

Teaching Scheme W.E.F-2023-24

B.Sc Animation, Gaming & Vfx

B.Sc Animation, Gaming & Vfx Semester -1

					Teaching Scheme					Exam Scheme		
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	I	ANM101-1C	Drawing for Animation & Design	Major Course 1	0	1	3	4	7	50	50	100
2	I	ANM102-1C	Story & Storyboard	Major Course	0	1	3	4	7	50	50	100
3	I	ANE101-1C	Industrial Environmental	Minor Course1	4	0	0	4	4	50	50	100
4	I	MDC103-1C	Fundamentals to Animation, Game Design &VFX	MDC-1	0	2	2	4	6	50	50	100
5	I	AEC102-1C	Communication Skills	AEC-1	1	0	1	2	3	25	25	50
6	I	SEC102-1C	Fundamentals of Computer	SEC-1	0	0	2	2	4	25	25	50
7	I	IKS101-1C	Indian Knowledge System	IKS-1	2	0	0	2	2	25	25	50
Total					**7**	**4**	**11**	**22**	**33**	**275**	**275**	**550**

B.Sc Animation, Gaming & Vfx Semester -2

Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	II	ANM103-1C	Graphic & Illustration	Major Course-III	0	2	2	4	6	50	50	100
2	II	ANM104-1C	Experimental Animation Project	Major Course-IV	0	2	2	4	6	50	50	100
3	II	ANE102-1C	2d Animation	Minor Course-II	0	2	2	4	6	50	50	100
4	II	MDC106-1C	Visual Design	MDC-II	0	2	2	4	6	50	50	100
5	II	AEC104-1C	Photostory	AEC-II	0	0	2	2	4	25	25	50
6	II	SEC104-1C	Basics of Video Editing	SEC-1I	0	0	2	2	4	25	25	50
7	II	VAC101-1C	Yoga & Nutrition	VAC-I	0	0	2	2	4	25	25	50
					0	**8**	**14**	**22**	**36**	**275**	**275**	**550**

B.Sc Animation, Gaming & Vfx Semester - 3

Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	III	ANM201-2C	Art of Game Design	Major Course-V	0	2	2	4	6	50	50	100
2	III	MDC202-2C	3d Asset Creation	Major Course-VI	0	2	2	4	6	50	50	100
3	III	ANM203-2C	Basic of 3d Animation	Major Course-VII	0	2	2	4	6	50	50	100
4	III	MDC202-2C	Motion Design	MDC-III	0	2	2	4	6	50	50	100
5	III	AEC203-2C	Basics of Rigging	AEC-III	0	0	2	2	4	25	25	50
6	III	SEC202-2C	Digital Fx & Manipulation Techniques	SEC-1II	0	0	2	2	4	25	25	50
7	III	IKS201-2C	Indian Knowledge System II	IKS-II	0	0	2	2	4	25	25	50

					0	**8**	**14**	**22**	**36**	**275**	**275**	**550**
B.Sc Animation, Gaming & Vfx Semester -4												
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	IV	ANM204-2C	Game Level Design-I	Major Course-VIII	0	2	2	4	6	50	50	100
2	IV	ANM205-2C	Animacting-I	Major Course-IX	0	2	2	4	6	50	50	100
3	IV	ANM206-2C	Animation /Game Level Film Project	Major Course-X	0	2	2	4	6	50	50	100
4	IV	MDC206-2C	Lighting & Compositing-I	Minor course-III	0	2	2	4	6	50	50	100
5	IV	SEC206-2C	3D Rigging-II	SEC-IV	0	0	2	2	2	25	25	50
6	IV	AEC206-2C	Particle Fx & Dynamics	AEC-IV	0	0	2	2	2	25	25	50
7	IV	VAC202-2C	Environmental Studies	VAC-2	0	1	1	2	3	25	25	50
Total					**0**	**9**	**13**	**22**	**31**	**275**	**275**	**550**
B.Sc Animation, Gaming & Vfx Semester -5												
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	V	ANM301-3C	Anatomy & Digital Sculpting-I	Major Course-XI	0	2	2	4	6	50	50	100
2	V	ANM302-3C	Tracking & Matchmove	Major Course-XII	0	2	2	4	6	50	50	100
3	V	ANM303-3C	VFX Production Elements	Major Course-XIII	0	0	2	2	4	25	25	50
4	V	ANE302-3C	Digital Hair & Fur Groom	Minor Course-V	0	2	2	4	6	50	50	100
5	V	ANE301-3C	Rotoscopy/Paint	Minor Course-VI	0	2	2	4	6	50	50	100
6	V	SEC303-3C	Cloth & Fabric Study	SEC-V	0	2	2	4	6	50	50	100
Total					**0**	**10**	**12**	**22**	**34**	**275**	**275**	**550**
B.Sc Animation, Gaming & Vfx Semester -6												
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	VI		Lighting & Compositing-II	Major Course-XIV	0	2	2	4	6	50	50	100
2	VI		AR/VR Art	Major Course-XV	0	2	2	4	6	50	50	100
3	VI		Portfolio Development-I	Major Course-XVI	0	2	2	4	6	50	50	100
4	VI		Film Editing & Sound	AEC-V	0	0	2	2	4	25	25	50
5	VI		Comic Illustration	Minor Course-VII	0	2	2	4	6	50	50	100
6	VI		Animation/VFX/Game Internship & Jury	INTERNSHIP IN MAJOR COURSE	0	2	2	4	6	50	50	100
Total					**0**	**10**	**12**	**22**	**34**	**275**	**275**	**550**
B.Sc Animation, Gaming & Vfx Semester -7												
Sr. No	**Semester**	**Course Code**	**Course Name**	**Curricular Components**	**Lecture**	**Tutorial**	**Practical**	**Credit**	**Contact Hours**	**CCE**	**SEE**	**Total**
1	VII		Graphhic & Illustration -II	Major Course-XVII	0	2	2	4	6	50	50	100
2	VII		UI-UX Design	Major Course-XVIII	0	2	2	4	6	50	50	100
3	VII		Portfolio Development-II	Major Course-XIX	0	2	2	4	6	50	50	100

4	VII		Advanced Digital Texturing & Shading	Minor Course-VIII	0	2	2	4	6	50	50	100
5	VII		Research project & Methodology	OJT IN MAJOR COURSE	0	0	6	6	12	75	75	150
Total					**0**	**8**	**14**	**22**	**36**	**275**	**275**	**550**

B.Sc Animation, Gaming & Vfx Semester -8

Sr. No	Semester	Course Code	Course Name	Curricular Components	Lecture	Tutorial	Practical	Credit	Contact Hours	CCE	SEE	Total
1	VIII		Game Level Design-II/ Animacting -II	Major Course-XX	0	2	2	4	6	50	50	100
2	VIII		Digital Film Making	Major Course-XXI	0	2	2	4	6	50	50	100
3	VIII		Portfolio Development-III	Major Course-XXII	0	2	2	4	6	50	50	100
4	VIII		Anatomy Study & Digital Sculpting-II	Minor Course-IX	0	2	2	4	6	50	50	100
5	VIII		Research project Dissertation & Jury	RP IN MAJOR COURSE	0	0	6	6	12	75	75	150
Total					**0**	**8**	**14**	**22**	**36**	**275**	**275**	**550**

B.Sc. Animation,VFX&Gaming
Batch 2023-2027

SEVENTH SEMESTER

Effective from the AcademicYear2023-24

Programme Outcomes Definition (Animation, VFX & Game Design)

1. **PO1 – Artistic, Technical & Computational Knowledge**
   Apply principles of art, design, mathematics, and computing along with animation, VFX, and game development fundamentals to create effective visual and interactive solutions.
2. **PO2 – Problem Analysis & Creative Solution Design**
   Identify, analyze, and solve animation, VFX, and game design problems by developing creative concepts, storytelling approaches, and technically feasible solutions.
3. **PO3 – Modern Tools, Technology & Production Pipeline**
   Utilize industry-standard software, tools, and emerging technologies while understanding and applying complete production pipelines in animation, VFX, and game development.
4. **PO4 – Research, Ethics & Societal Impact**
   Conduct research, understand cultural and societal contexts, and apply ethical principles while evaluating the impact of animation, VFX, and gaming content on society and industry.
5. **PO5 – Communication, Teamwork & Project Management**
   Communicate effectively through visual, verbal, and written means, collaborate in multidisciplinary teams, and apply project management practices in creative production environments.
6. **PO6 – Lifelong Learning, Innovation & Adaptability**
   Demonstrate continuous learning, adapt to evolving technologies and industry trends, and foster innovation and entrepreneurial thinking in animation, VFX, and game design.

Course: Advanced Digital Texturing & Shading								
Course Code: Insert here			**Credit: 4**	**Semester: VII**			**Programme: BSc Animation**	
Teaching Scheme				**Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**ESE Theory**	**ESE Practical**	**Total**
0	**2**	**2**	**6**	**0 / 0**	**18 / 50**	**0/0**	**18 / 50**	**36 / 100**

Course Objectives:

- Understand production workflows
- Apply industry tools
- Develop production assets
- Integrate assets into pipeline

Course Outcomes (COs):

CO1. Apply production tools
CO2. Analyze workflows
CO3. Create production assets
CO4. Evaluate production quality

Course Content:

Module	Topics	Weightage (%)
1	**PBR Fundamentals:** • PBR theory • Texture maps (Albedo, Roughness, Normal, Metalness) • UV mapping optimization	25
2	**Advanced Texturing**: • Substance Painter workflow • Procedural texturing • Smart materials and masks	25
3	**Advanced Shading**: • Shader networks in Maya/Blender • Node-based shading • Skin, metal, glass shaders	25
4	**Production Pipeline Integration**: • Export workflows • Rendering optimization • Game engine integration	25

Practical List (If applicable):

1. Create realistic prop textures — Unit I
2. Character skin shading — Unit II
3. Hard surface texturing — Unit III
4. Environment material creation — Unit IV
5. Final production asset — Unit V

Text Book(s):

1. PBR Guide – Allegorithmic

Reference Book(s):

1. PBR Guide – Wes McDermott (Official Substance / Industry Standard)

Continuous Internal Evaluation (CIE) Components:
CIE Practical (20 Mid +30 internal evaluation)

1. Practical Assignment 10 marks
2. Attendance/lab Discipline/Classwork 10 marks
3. Surprise Test 10 marks

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	1	3	–
CO2	3	3	2	2	3	–
CO3	3	3	3	2	3	1
CO4	3	3	2	3	3	1

Course: Graphic & Illustration-II

Course Code: Insert here			Credit: 4	Semester: VII			Programme: BSc Animation	
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Practical	Contact Hours	CIE Theory	CIE Practical	ESE Theory	ESE Practical	Total
0	2	2	6	0 / 0	18 / 50	0/0	18 / 50	36 / 100

Course Objectives:

- Understand production workflows
- Apply industry tools
- Develop production assets
- Integrate assets into pipeline

Course Outcomes (COs):

CO1. Apply production tools
CO2. Analyze workflows
CO3. Create production assets
CO4. Evaluate production quality

Course Content:

Module	Topics	Weightage (%)
1	**Advanced Drawing:** • Anatomy • Perspective • Gesture drawing	25
2	**Digital Illustration:** • Photoshop illustration • Brushes and techniques	25
3	**Visual Storytelling:** • Character illustration • Scene illustration	25
4	**Professional Workflow:** • Portfolio creation • Client work simulation	25

Practical List (If applicable):

1. Character illustration Unit I

2. Environment illustration Unit II
3. Concept art Unit II
4. Story illustration Unit III
5. Final production asset Unit IV

Text Book(s):

1. Interactive Computer Graphics

Reference Book(s):

1. Computer Graphics Principles and Practice – Foley & Van Dam
2. Fundamentals of Computer Graphics – Steve Marschner

Continuous Internal Evaluation (CIE) Components:

CIE Practical (20 Mid +30 internal evaluation)

1. Practical Assignment 10 marks
2. Attendance/lab Discipline/Classwork 10 marks
3. Surprise Test 10 marks

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	1	3	–
CO2	3	3	3	2	2	–
CO3	3	3	3	2	3	1
CO4	3	3	2	3	2	1

Course: AI for VFX

Course Code: Insert here			Credit: 4	Semester: VII			Programme: BSc Animation	
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Practical	Contact Hours	CIE Theory	CIE Practical	ESE Theory	ESE Practical	Total
0	2	2	6	0 / 0	18 / 50	0/0	18 / 50	36 / 100

Course Objectives:

- Understand production workflows
- Apply industry tools
- Develop production assets
- Integrate assets into pipeline

Course Outcomes (COs):

CO1. Apply production tools
CO2. Analyze workflows
CO3. Create production assets
CO4. Evaluate production quality

Course Content:

Module	Topics	Weightage (%)
1	**AI Fundamentals**: • AI concepts • Machine learning for design, animation & Vfx basics	25
2	**AI Image Generation:** • Stable Diffusion • ComfyUI workflows	25
3	**AI Video & VFX:** • AI rotoscoping • AI compositing	25
4	**Production Integration:** • Pipeline integration • Automation	25

Practical List (If applicable):

1. AI image generation Unit I
2. AI compositing Unit II

3. AI video generation Unit III
4. AI VFX shot creation Unit IV

Text Book(s):

1. Practical Machine Learning for Computer Vision Dive into Deep Learning
2. Machine Learning for Computer Vision
3. Digital Compositing
4. AI in Digital Visual Effects

Reference Book(s):

1. Comfy wikipedia
2. Artificial Intelligence in Digital Visual Effects

Continuous Internal Evaluation (CIE) Components:

CIE Practical (20 Mid +30 internal evaluation)

1. Practical Assignment 10 marks
2. Attendance/lab Discipline/Classwork 10 marks
3. Surprise Test 10 marks

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	–	2	3	–
CO2	2	3	2	2	3	1
CO3	3	2	3	2	3	2
CO4	2	2	2	3	3	2

Course: Portfolio Development-II			
Course Code: Insert here	**Credit: 4**	**Semester: VII**	**Programme: BSc Animation**

Teaching Scheme				Evaluation Scheme				
Lecture	**Tutorial**	**Practical**	**Contact Hours**	**CIE Theory**	**CIE Practical**	**ESE Theory**	**ESE Practical**	**Total**
0	**2**	**2**	**6**	**0 / 0**	**18 / 50**	**0/0**	**18 / 50**	**36 / 100**

Course Objectives:

- Understand production workflows
- Apply industry tools
- Develop production assets
- Integrate assets into pipeline

Course Outcomes (COs):

CO1. Apply production tools
CO2. Analyze workflows
CO3. Create production assets
CO4. Evaluate production quality

Course Content:

Module	Topics	Weightage (%)
1	Portfolio Planning	25
2	Asset Creation	25
3	Demo Reel Creation	25
4	Presentation	25

Practical List (If applicable):

1. Demo reel Unit I Unit II
2. Website Creation Unit III

Text Book(s):

Reference Book(s):

1. Portfolio Management

Continuous Internal Evaluation (CIE) Components:

CIE Practical (20 Mid +30 internal evaluation)

1. Practical Assignment 10 marks
2. Attendance/lab Discipline/Classwork 10 marks

3. Surprise Test 10 marks

Mapping with Programme Outcomes (POs):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	–	2	3	–
CO2	2	3	2	2	3	1
CO3	3	2	3	2	3	2
CO4	2	2	2	3	3	2