



SRINIVAS UNIVERSITY

(PRIVATE UNIVERSITY ESTABLISHED BY KARNATAKA STATE ACT NO.42 OF 2013)

City Office: GHS Road, MANGALURU-575001, Karnataka State, INDIA

Phone No.: 0824-2425966, 2444891, 2477866 Fax: 0824-2442766

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SRINIVAS UNIVERSITY

CENTRE FOR DISTANCE

&

ONLINE EDUCATION

PROGRAMME PROJECT REPORT (PPR)

MASTER OF COMPUTER APPLICATION

(MCA Online Programme)


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MANGALORE





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1. ABOUT “SRINIVAS UNIVERSITY”

Srinivas University, Mangaluru, is a Private Research and Skill-focused University established in 2013 under the Karnataka State Act and is part of the A. Shama Rao Foundation, founded in 1988 by eminent Chartered Accountant A. Raghavendra Rao. As the flagship of the Srinivas Group of Institutions, the University builds on a legacy of 37 years of academic excellence.

Accredited with an ‘A’ Grade by NAAC, the University today comprises 12 institutes offering 150+ undergraduate, postgraduate, and research programs in diverse domains including Medical, Engineering, Management, Aviation, Allied Health, Dental, Nursing, Hotel Management, Physiotherapy, Social Work, Education, and more.

With a strong focus on industry-aligned curriculum, innovation in examinations, skill-based education, and global collaborations, Srinivas University is committed to preparing future-ready professionals and leaders who can thrive in a rapidly changing world.

Institutes under Srinivas University

- Institute of Allied Health Sciences
- Institute of Aviation Studies
- Institute of Computer & Information Sciences
- Institute of Education
- Institute of Engineering & Technology
- Institute of Hotel Management & Tourism
- Institute of Management & Commerce
- Institute of Medical Sciences & Research Centre
- Institute of Nursing Sciences
- Institute of Physiotherapy
- Institute of Port, Shipping and Logistics Management
- Yoga Sanskrit Studies & Research Centre

VISION

To be a trendsetting university producing leaders with competence, conscience, and compassion who create a just, sustainable world for future generations.

MISSION



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To provide a transformative learning environment that fosters leadership, creativity, and intellectual growth through uncompromising academic and ethical standards.

Objectives

With an aim to be among one of the top Universities in the world, SRINIVAS UNIVERSITY has set itself the following objectives:

- Promote advanced intellectual abilities and research.
- Establish state-of-the-art educational and training facilities.
- Provide consultancy to industry and public organizations.
- Impart value-based education through national and international collaboration.
- Emphasize multi-disciplinary and trans-disciplinary education.

Core Values

Core Values to be embedded in all stakeholders

- Teamwork and unity among stakeholders.
- Respect for human dignity and harmony.
- Responsibility and accountability.
- Ethics and professional integrity.
- Courtesy and inclusiveness.

2. PREAMBLE

PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires

- i. “**Programme**” means Post-graduate Degree Programme offered under Online Learning (OL).


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- ii. **“Course”** means a Theory/Project work and any other subject that is normally studied in a semester.
- iii. **“Institution”** means **SRINIVAS UNIVERSITY**
- iv. **“Academic Council”** means the Academic Council, which is the apex body on all academic matters of **SRINIVAS UNIVERSITY**
- v. **“Controller of Examinations”** means the Controller of Examinations of **SRINIVAS UNIVERSITY** who is responsible for the conduct of examinations and declaration of results.
 - i. **“Director”** means the Director of the Centre for Distance and Online Education (CDOE), CDOE is a part of **SRINIVAS UNIVERSITY**
 - ii. **“Online Learning”** means a mode of providing flexible learning opportunities by overcoming the separation of teacher and learner using the internet, eLearning materials and full-fledged programme delivery through the internet using technology-assisted mechanism and resources.
 - iii. **“Self-Learning e-Module (SLM) for Online mode”** means a modular unit of course material in e-learning form which is inter alia of course material in e-learning form which is inter alia self-explanatory, self-contained, self-directed at the learner, and amenable to self-evaluation, and enables the learner to acquire the prescribed level of learning in a course of study and includes contents in the form of a combination of the following e-Learning content, namely
 - e-Text Materials
 - Audio Podcasts
 - Video Lectures
 - Audio-Visual interactive material
 - Virtual Classroom Zoom/Team/WebEx/Google Class Room sessions
 - Virtual Simulation labs and



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- Self-Assessment Quizzes or Tests

3. CONTENTS OF PROGRAMME PROJECT REPORT (PPR)

I. Programme's Mission and Objectives:

Mission: At Srinivas University MCA program is to produce highly skilled computer professionals through theoretical coursework and practical training. Its objectives include equipping students with advanced knowledge in software development, database management, and network security, fostering ethical and professional development, encouraging research, and bridging the gap between academia and industry to prepare graduates for diverse roles in the IT sector.

The objectives are as follows;

- **Advanced Technical Proficiency:** Provide a strong foundation in computer science theory and advanced skills in software engineering, programming languages, database management, and network security.
- **Industry Readiness:** Bridge the gap between academia and industry by providing hands-on training, internships, and projects to prepare students for real-world challenges.
- **Professional and Ethical Development:** Foster ethical principles, professionalism, and teamwork, and instill strong human values and social responsibility.
- **Research and Innovation:** Encourage students to engage in research, explore new technologies, and contribute to innovative solutions.
- **Lifelong Learning:** Promote continuous professional development and an appreciation for lifelong learning in the field of computing.
- **Global Competency:** Enable students to work on global projects and understand the needs of the international IT job market.

Program Educational Objectives (PEOs):

Our Graduates shall:

PEO1: To provide opportunities for acquiring in-depth knowledge in the field of IT with Programming/Networking skills and also initiate research for holistic development.


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PEO2: To apply current Tools, Technologies to create Systems for solving industry-oriented problems.

PEO3: Inculcate employability skills like communication, decision-making, teamwork, leadership and professional competence.

PEO4: To instill out-of-the-box, tactical, and analytical thinking and decision-making abilities.

PEO5: To embed strong Human Values and Professional Ethics to exhibit social responsibilities.

Program Outcomes (POs):

- 1. Foundational Knowledge** – Demonstrate foundational knowledge required to understand and solve real-world problems.
- 2. Problem Analysis** – Identify, analyze, and interpret problems using scientific and analytical thinking.
- 3. Design & Development of Solutions** – Apply appropriate tools and techniques to design and develop efficient solutions and decision-support systems.
- 4. Modern Tool Usage** – Select and apply suitable modern tools and resources to solve practical problems.
- 5. Data Interpretation & Analysis** – Analyze information using appropriate analytical methods to derive meaningful insights.
- 6. Communication & Teamwork** – Communicate effectively with peers, professionals, and society, and work effectively as an individual or in diverse teams.
- 7. Professional Ethics & Responsibility** – Recognize and adhere to professional ethics and privacy in practice.
- 8. Indian Knowledge System (IKS)** – Demonstrate awareness and appreciation of the Indian Knowledge System.
- 9. Innovation & Research Orientation** – Apply research-oriented methods such as information collection, experimentation, and interpretation to draw valid conclusions.
- 10. Life-long Learning** – Recognize the need for and engage in independent and lifelong learning to adapt to changing professional requirements.
- 11. Employability & Entrepreneurship** – Acquire professional and industry-relevant skills to pursue careers and develop an entrepreneurial mindset.
- 12. Health, Human Values & Social Responsibility** – Demonstrate awareness of physical and mental well-being, uphold ethical and human values, and contribute responsibly to society and the environment.



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Program Specific Outcomes (PSOs):

- PSO1:** To understand core concepts in programming in JAVA, databases, computer networks, web technologies, cloud computing, data science, machine learning, Spring Boot, and related computer science subjects.
- PSO2:** To gain hands-on experience with tools and applications in programming, databases, web and enterprise application development, cloud platforms, data science, machine learning, system and network administration.
- PSO3:** To design and develop software applications and analyzing the solutions using appropriate methods, tools, and technologies.
- PSO4:** To initiate entrepreneurship among students with ethical practice in the field of IT and to exhibit social responsibilities.

Srinivas University aims to achieve academic excellence by providing multi-faceted education to the students and encouraging them to reach the pinnacle of success. The University has designed a system that would provide rigorous academic training and necessary skills to enable them to excel in their careers

Srinivas University is committed to providing a conducive learning environment that ensures comprehensive development of students and makes them competent, confident, and good citizens. The objective of the Master of Computer Application (MCA) Programme of Srinivas University is to provide high-quality management education to students through advancement of knowledge in all business administration functions and development of professionalism, confidence and creative ability in student managers

II. Relevance of the program with HEI's mission and goals:

The relevance of an “MCA” program in Higher Education Institution's (HEI) mission and goals can be multifaceted, aligning with several key aspects:

- **Specialization in a Niche Field:** If the HEI focuses on providing specialized education in specific industries or fields, offering an MCA course complements this focus. It demonstrates the institution's commitment to catering to industry-specific demands and producing skilled professionals in a niche sector.



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- **Industry Collaboration and Partnerships:** If the HEI emphasizes strong engagement with industry, the MCA program supports this goal by fostering collaborations with IT companies, software firms, and technology organizations. Through internships, guest lectures, industry projects, and training programs, the course helps bridge the gap between academic learning and real-world application. This strengthens the institution's reputation and ensures that students gain practical exposure to current industry practices
- **Career-Oriented Education:** If the institution aims to provide career-focused education, the MCA program directly contributes by equipping students with technical skills, problem-solving abilities, and practical knowledge required in the IT sector. The curriculum is designed to enhance employability and prepare graduates for diverse roles such as software developers, system analysts, data analysts, and IT consultants, thereby supporting the HEI's mission of producing job-ready professionals.
- **Global Perspective and Internationalization:** If the HEI seeks to promote global exposure and international academic standards, the MCA program supports this objective by incorporating globally relevant technologies, programming frameworks, and best practices in computing. The program may also encourage collaborations with international institutions, participation in global conferences, and exposure to worldwide IT trends, helping students develop a broader global outlook.
- **Contribution to Economic Development:** If the institution's mission includes contributing to regional or national economic growth, the MCA program plays a vital role by producing skilled IT professionals who support digital transformation and technological advancement. Graduates contribute to software development, innovation, entrepreneurship, and IT-enabled services, thereby strengthening the technology-driven economy.
- **Sustainability and Ethical Practices:** If the HEI emphasizes responsible and ethical education, the MCA program integrates topics such as ethical computing, data privacy, cybersecurity, and sustainable technology practices. Students are encouraged to develop solutions that are socially responsible and environmentally conscious, aligning with the institution's commitment to sustainable development and ethical professional conduct.

VISION:

To continuously upgrade the quality of our curriculum and pedagogy in order to achieve the status of one of the top-ranking institutions in Online Education in the world.

MISSION:

- To be a source of effective value-based IT talent for the sustained development across industries, so as to bring out graduates with the right skill set for employment
- To emerge as a Centre of Excellence in technical, managerial and leadership in

business based industrial needs.

- To disseminate world-class, cutting-edge education and training that shapes the way organizations operate and businesses are led and managed.
- To produce world-class, socially responsible, creative leaders and entrepreneurs who think on a global scale.
- To endow students with the educational opportunity belonging to different socioeconomic backgrounds.


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III. Nature of prospective target group of learners:

The prospective target group for an MCA through Online mode typically includes Individuals already employed in IT industries, BPO, Tech support, front office seeking career advancement without interrupting their jobs. Online mode allows them to balance work commitments with studies. Recent graduates aspiring to become IT professionals and IT administrators across industries and working professionals who are aiming for their career development.

- Those from diverse geographical locations interested in pursuing a MCA program in from a reputable institution without relocating, offering flexibility in learning.
- Professionals from other industries aspiring to transition, leveraging an MCA program to gain industry-specific knowledge and skills.
- Individuals managing or planning to start their own businesses who seek a comprehensive understanding of the industry's nuances and managerial strategies.
- The Online mode appeals to diverse learners due to its flexibility, allowing students to study at their own pace and convenience. It accommodates various learner profiles, providing access to quality education regardless of geographical constraints or work commitments.

IV. Appropriateness of programme to be conducted in Online mode to acquire specific skills and competence:

An “MCA” conducted through Online mode can be highly appropriate for acquiring specific skills and competence due to several reasons:


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- **Flexibility and Accessibility:** Online mode provides a high level of flexibility for students to learn at their own pace and schedule. Unlike traditional classroom learning, online MCA programmes allow students to access lectures, learning materials, and assignments from anywhere and at any time. This flexibility is particularly beneficial for working professionals who wish to upgrade their technical skills without leaving their jobs. Additionally, students from remote or rural areas who may not have access to reputed institutions can still enroll in quality MCA programmes through online platforms.
- **Industry-Relevant Curriculum:** Many online MCA programmes are designed in collaboration with industry experts and technology professionals. This ensures that the curriculum remains updated with the latest developments in the IT industry, such as artificial intelligence, data science, cloud computing, cybersecurity, and web technologies. Regular updates in course content help students acquire practical knowledge and technical skills that are directly applicable in real-world software development and IT environments.
- **Global Reach and Diversity:** Online education removes geographical barriers, enabling students from different regions and countries to participate in the same programme. This creates a diverse learning environment where students interact with peers from varied cultural and professional backgrounds. Such diversity enhances collaborative learning, exposure to different perspectives, and understanding of global technology trends, which are important competencies in the modern IT industry.
- **Technology Integration:** Since MCA is a technology-oriented programme, online learning platforms naturally integrate digital tools and software development environments into the learning process. Students gain hands-on experience using programming tools, cloud platforms, virtual labs, coding environments, and collaboration platforms. Exposure to such technologies improves students' practical competencies and prepares them for real-world software development and IT operations.
- **Networking Opportunities:** Online programmes often provide multiple opportunities for students to connect with instructors, industry experts, alumni, and fellow students through discussion forums, webinars, virtual workshops, and collaborative projects. These networking opportunities can lead to knowledge sharing, mentorship, internships, and potential career opportunities. Building such professional connections is valuable for students entering the competitive IT job market.
- **Cost-effectiveness:** Online MCA programmes are generally more cost-effective compared to traditional on-campus programmes. Students can save on expenses such as accommodation, travel, and other campus-related costs. Additionally, many online platforms provide access to digital libraries, recorded lectures, and open-source tools at minimal or no cost. This makes higher education more affordable while still maintaining the quality of learning.
- **Adaptability to Industry Changes:** The IT industry evolves rapidly with continuous advancements in technology. Online programmes can quickly adapt to these changes by updating course modules, introducing new tools, and incorporating emerging technologies into the curriculum. This adaptability ensures that students remain aligned with current industry requirements and develop the competencies needed to stay competitive in the technology sector.


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V. Instructional Design:

Instructional design is the practice of designing, creating and delivering learning materials and programs. It can be applied to both physical and virtual education, including online courses.

ADDIE is a systematic and widely used framework for designing effective instructional programs and learning experiences. The acronym stands for Analysis, Design, Development, Implementation, and Evaluation. Each phase is interrelated and ensures that instruction is learner-centered, goal-oriented, and outcome-based.

Analysis

This is the foundation stage where instructional needs are identified. It involves analyzing learners' characteristics, learning gaps, performance problems, learning environment, and organizational goals. Clear instructional goals and constraints (time, resources, technology) are defined at this stage.

Design

In this phase, the instructional blueprint is created. Learning objectives are framed (often using Bloom's taxonomy), content is sequenced, assessment strategies are planned, and instructional methods and media are selected. The focus is on how learning will occur.

Development

Actual instructional materials are produced in this stage. This includes preparing lesson plans, e-content, presentations, activities, assessments, and learning resources. Content is developed as per the design specifications and reviewed for accuracy and alignment with objectives.

Implementation

The instructional program is delivered to learners. This may involve classroom teaching, online delivery, or blended learning. Facilitators are trained, learners are oriented, and instructional materials are used in real learning settings.

Evaluation

Evaluation determines the effectiveness of the instruction. It includes formative evaluation (ongoing feedback during all phases) and summative evaluation (assessment after implementation). Outcomes are measured against objectives, and findings are used for improvement.

In summary, the ADDIE model provides a structured, iterative approach to instructional design, ensuring quality, consistency, and continuous improvement in teaching–learning processes.



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List of Courses for the MCA Program

FIRST SEMESTER							
Subject Code	Subject	Category of Courses	L-T-P-C	Credit	IA	TEE	Total Marks
OLMCA11	Linux System Administration(T+L)	Core- Major	3-0-2-4	4	30	70	100
OLMCA12	Advanced Java (T+L)	Core- Major	3-0-2-4	4	30	70	100
OLMCA13	Entrepreneurship and Startups	AEC	3-0-0-3	3	30	70	100
OLMCA14	Introduction To Cyber Security and Cyber law(T+L)	Core- Minor	2-0-2-3	3	30	70	100
OLMCA15/16	Big Data Analytics / Ethical Hacking(T+L)	Core- Elective - 1	3-0-2-4	4	30	70	100
OLMCA17/18	Statistics For Data Science / Cloud Architecture(T+L)	Core- Elective - 2	3-0-2-4	4	30	70	100
				22	180	420	600

SECOND SEMESTER							
Subject Code	Subject	Category of Courses	L-T-P-C	Credit	IA	TEE	Total Marks
OLMCA21	Network Management (T+L)	Core- Major	3-0-2-4	4	30	70	100
OLMCA22	Web Development with JavaScript and ReactJS (T+L)	Core- Major	3-0-2-4	4	30	70	100
OLMCA23	Java Based Application Development with Spring Boot (T+L)	Core- Major	3-0-2-4	4	30	70	100
OLMCA24	Data Science and Deep Learning with Pyth	Core- Minor	3-0-0-3	3	30	70	100
OLMCA25/26	Network and Web Application Security / Cyber security and Privacy practices(T+L)	Core- Elective -3	3-0-2-4	4	30	70	100
OLMCA27/28	Cryptography/ BlockChain Technologies	Core- Elective -4	3-0-0-3	3	30	70	100
				22	300	350	600



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THIRD SEMESTER

Subject Code	Subject	Category of Courses	L-T-P-C	Credit	IA	TEE	Total Marks
OLMCA31	Web Application Framework (T+L)	Core- Major	3-0-2-4	4	30	70	100
OLMCA32	Software Testing (T+L)	Core- Major	3-0-2-4	4	30	70	100
OLMCA33	E-commerce development using WordPress and WooCommerce (T+L)	Core Major	3-0-2-4	4	30	70	100
OLMCA34/35	Cloud computing essentials with Kubernetes / Internet of Things (T+L)	Core-Elective -5	3-0-2-4	4	30	70	100
OLMCA36/37	Machine Learning/ Cyber Forensics (T+L)	Core-Elective -6	3-0-2-4	4	30	70	100
				20	150	350	500

FOURTH SEMESTER

Subject Code	Subject	Category of Courses	L-T-P-C	Credit	IA	TEE	Total Marks
OLMCA41	Internship Embedded Project work & Viva Voce (or) Research work,Dissertation & Thesis	Core- Major	0-0-60-20	20	60	140	200
				20	60	140	200

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c. Duration of the Program

The Programme can be completed in a minimum of 2 years, and a maximum of 2+2 years, as per UGC Regulations.

d. Faculty & Support Staff Requirements

Faculty shall be allocated as per the requirements stipulated in the UGC Regulations & Guidelines for OL and Online, as the following Associate Professor / Assistant Professor: 2 nos.

Support Staff also shall be allocated, as per the guidelines, for the first 5000 students shall be always ensured.


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e. Instruction Delivery Mechanisms

Courses are delivered in a “self-study” mode with learning material in the form of SLM’s, (print form / eBook Form) and Self Assessments being available to the students. Additionally, Personal Contact Programs (PCP’s) in classroom lecture mode at campus and online via recorded lecture / virtual classroom sessions to be provided as per a fixed schedule towards the end of each term for the Distance Education.

For online mode both Synchronous and Asynchronous Instructional methodologies will be adopted in compliance with the UGC guidelines.

f. Instruction Media

Program Instruction shall be delivered using Print SLM, eBook/e SLM, as well as a Personal Contact Program that shall be conducted in classroom mode, as well as broadcast using the internet using virtual classroom platform for students unable to attend physically.

g. Student Support Service Systems

Learner Support Service via Web, Chat, Call Support. Access to counsellors at the Department on University campus. Access to Library resources at the University / Department.



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VI.Procedure for admissions, curriculum transaction and evaluation:

ELIGIBILITY FOR ADMISSION

Eligibility for Admission into Online Programmes MCA are as follows:

S.No.	Programme	Admission Requirements
1.	MCA	Students with any Under Graduate Degree from UGC recognised institutions with 10+2+3 (or) 10+2+4 years of study and those appearing for their final examination (subject to passing) in the prescribed pattern are eligible to apply for MCA programme. (Maths in any level)

- For admission into OL programme other than Indian students stated above, foreign students are also eligible to enrol in this programme.
- Admission Eligibility requirements for OL programmes are the same as programme “MCA” – offered in full time regular (conventional) mode under respective Regulations.
- Eligibility conditions for admission such as class obtained, number of attempts in the qualifying examination and physical fitness will be as prescribed by the university from time to time.

A. PROGRAM DELIVERY – METHOD & TOOLS

Study material, in the form of e-books, shall be provided to each student at the beginning of the year.

A Web based Portal which shall allow the student access to the following

- Admission & Enrolment Details
- Fee Details and Online Fee Payment Gateway
- Prospectus, Regulations & Syllabus
- Notifications (Admissions, fees, examinations etc) ☐ Course List, with completion status and scores /results



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- eBook's / e- Print of SLM's.
- Self-Assessment/Practice Tests (unscored)
- Continuous Assessments /Assignments
- Online Classroom Lectures (Recorded or via Virtual Classroom session) as conducted each semester.
- Online Learners forum, for student-to-student interaction.
- Online Copy of the Grade sheet.

B. DURATION AND STRUCTURE OF PROGRAMME

The minimum and the maximum period for completion of programme will be as follows:

Programme (OL)	Min. No. of Years	Max. No. of Years
MCA	2	4

- This programme is designed to include the following components as prescribed in the respective curriculum:
 - a. Core courses
 - b. Elective courses
 - c. Assignments
 - d. Project work
 - e. Internship
 - f. Research work and Dissertation
- The medium of instruction and examination in the above components are only in English.



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- The curriculum and syllabi of the “MCA” –Online programme shall be as per the guidelines of the UGC / AICTE and approved by the Academic Council of this Institution.
- Each academic year shall normally be for one year which is divided into two semesters. The continuous internal assessments and semester-end examinations shall follow the Academic Calendar and Examination Schedule.
- The curriculum and syllabi of Online programmes “MCA” are the same as curriculum and syllabi of programmes MCA offered in full time regular (conventional) mode under respective regulations.
- The structure for framing assessment patterns and monitoring the teaching learning process of Online programmes “MCA” are the same as for programmes MCA offered in full time regular (conventional) mode under respective regulations.
- The curriculum of “MCA” –Online programmes shall follow the minimum prescribed credits required for the award of the degree as specified in the AICTE guidelines for this programme as given below:

Programmes	Minimum Prescribed Credits
MCA	84

The norms for delivery of courses offered through OL mode are as follows:



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UGC guidelines for academic delivery of courses through ODL and OL mode as per NEP 2020

NORMS FOR DELIVERY OF COURSES THROUGH ODL MODE

S.No	Subject credits	SLM Units(Block pattern)	Study hours of Learner(All inclusive- Practical sessions)	Synchronous - PCP-Theory	No.of Assignments	
1	2	6-10 Units	60 hours	6 hours	1	
	4	14-20 Units	120 hours	12 hours	2	
	6	20-28 Units	180 hours	18 hours	3	
	8	30-34 Units	240 hours	24 hours	4	Project work

C. DELIVERY OF ONLINE MATERIALS

As per UGC guidelines, Learning Materials are delivered through LMS (Learning Management System) platform with 4 Quadrant approach. Unit wise CIA (Continuous internal Assessment) is designed as per Blooms Taxonomy assessment recommendations and conducted online using LMS Platform as per the semester requirement of the course.

Quadrant I: e-Tutorial with audio, animation, simulation and video materials

Quadrant II: Lecture notes in the PDF, video demonstrations, interactive chats, web links, open-source simulators, case studies and role-plays will be provided as per the course needs.

Quadrant III: Discussion Forums, Feedback Forums, Helpdesk for Doubts clearing Sessions for every course unit will be coordinated by the coordinator and conducted by the respective faculties.

Quadrant IV: Self-Assessment like MCQ, Quizzes, Assignments, FAQ on course units, Clarification post assessment discussion forums.



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Norms for Delivery of Courses in Online Mode

NORMS FOR DELIVERY OF COURSES THROUGH OL MODE								
S.No	Subject Credits	No.of weeks to cover the syllabus	Interactive sessions(Synchronous & Asynchronous)		Hours of Study Material		Self Study hours including assessments	Total hours of study
			Synchronous (Subject live sessions/webinars/Co unselling)	Asynchronous (Discussion Forums/Mentoring)	AV content	ELM		
1	2	6 weeks	6 hours	12 hours	10 hours	10 hours	22 hours	60 hours
2	4	12 weeks	12 hours	24 hours	20 hours	20 hours	44 hours	120 hours
3	6	14 weeks	14 hours	28 hours	30 hours	30 hours	66 hours	180 hours
4	8	16 weeks	16 hours	32 hours	40 hours	40 hours	88 hours	240 hours

D. ASSESSMENTS AND EXAMINATIONS

- The weightage for different components of assessments for programmes offered through Online mode shall be as under:

a) Formative Assessment (Continuous Internal Assessment) : 30 %.

b) Summative assessment (End Semester Examination) : 70 %

For project work the assessment pattern is as follows:

Review of Project Work		Dissertation & Viva-Voce	
Component	Marks	Component	Marks
First Review	5	Presentation	15
Second Review	10	Content Originality	15
Third Review	15	Study/Model and Analysis	15
		Validity	15
		Findings & Conclusion	15
		Future Scope	10
Total	30		70



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- End Semester Assessment Pattern for Online Learning Mode: The Examinations for online learning mode shall be conducted using the technology-enabled to conduct an online test with all the security arrangements ensuring transparency and credibility of the examinations, or through the Proctored Examination and in conformity with any other norms for such examination as may be laid down by the Commission.
- Appearing for semester-end theory examination for each course is mandatory and a student should secure a minimum of **50% marks for MCA** in each course in semester-end examination for the successful completion of the course.
- The components of continuous assessment for theory and practical courses shall be finalized in the first-class committee meeting.
- For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during the first appearance shall be considered for grading along with the marks scored in the semester-end arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester-end examination to award grades and the internal assessment marks secured during study shall not be considered.


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The procedures followed for awarding marks and fixing grades for Online programmes such “MCA” are the same as for programmes offered in the regular (conventional) mode.

E. PASSING, DECLARATION OF RESULTS AND GRADE SHEET

- All assessments for a course shall be made on an absolute marks’ basis. However, the Class Monitoring Committee without the student members shall meet within 5 days after the End Semester Examination and analyse the performance of students in all assessments of a course and award letter grades. The letter grades and the corresponding grade points for MCA are as follows:

Level	Out standing	Excellent	Very good	Good	Above Average	Average	Poor	Fail
Letter Grade	O	S	A	B	C	D	E	F
Grade Points	10	9	8	7	6	5	4	00
Score (Marks) Range (%)	≥ 90	<90	<80 ≥ 70	<70 ≥ 65	< 65 ≥ 60	< 60 ≥ 55	< 55 ≥ 50	<50



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Marks

Maximum CIA (Continuous Internal Assessment)	30
Maximum TEE (Term End Semester Examinations)	70

- A student who earns a minimum of five grade points, declared to have successfully completed the course. Such a course cannot be repeated by the student for improvement of grade.
- The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and declared by the Controller of Examinations.
- Within one week from the date of declaration of result, a student can apply for revaluation of his / her semester end theory examination answer script for more courses, on payment of prescribed fee to the Controller of Examinations.
- After results are declared, grade report shall be issued to each student, which contains the following details:
 - a. List of courses along with course code enrolled during the semester / arrear courses, if any;
 - b. Marks secured (CIA, TEE & Total);
 - c. Passing Minimum;
 - d. Grade Point Semester Wise Grade Point Average (GPA) of all courses enrolled from first semester onwards, if completed for the semester
 - e. Result
- GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.
- The formula for the conversion of CGPA to the equivalent percentage of marks is as follows:



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Grade Point Average (G.P.A.)

$$= \frac{\text{Sum of multiplication of grade points and the credits of the courses (Total Credit Points)}}{\text{Sum of the credits of the courses (passed) in a semester (No. of Credits)}}$$

* G.P.A. and No. of Credits will not be displayed for Students who have not cleared all the courses.

Percentage Equivalent of Marks = CGPA X 10

- After successful completion of the programme, the Degree shall be awarded upon fulfilment of curriculum requirements and classification based on CGPA as follows:

Classification	CGPA
First Class with Exemplary	9.0 CGPA and Above (First Attempt within stipulated Time and no break of study)
First Class with Distinction	7.5 CGPA and Above (First Attempt within stipulated Time and no break of study)
First Class	6 CGPA and Below 7.5 CGPA
Second Class	5.0 and Below 6 CGPA

- For the purpose of classification, the CGPA shall be rounded to two decimal places. For the purpose of comparison of the performance of students and ranking, CGPA will be considered up to three decimal places.

F.POWER TO MODIFY THE REGULATION

Srinivas University's Academic Council has the RIGHT and POWER TO MODIFY any of the above regulations from time to time as per the guidelines.


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VII. Requirement of the laboratory support and Library resources:

Students registered in the Online programme and who desire to avail themselves of library facilities will be permitted to make use of the Exclusive Library earmarked for OL programmes in the University and also, they will be permitted to use the main University Library. Additional online resources are also provided via the Learning Management System, with access to library.

Courses that require Laboratory support shall be provided with online virtual lab and lab simulation tools and software, to allow students to practice accordingly.

VIII. Cost estimate of the programme and the provisions:

The Finance Committee will set aside budgetary provisions towards Programme Development, Programme Delivery, and Programme Maintenance. Once the programmes are operational, fee receipts from the program may be used to cover the same, as per the guidance of the Executive Council. The cost estimate is given in Indian Rupees (INR) for launching three online programmes such as “MCA”

CALCULATION FOR FEE FIXATION Master of Computer Application (MCA)

1. Key Assumptions (Baseline Parameters)

Parameter	Value
Total Sanctioned Students Intake	500
60% Admission	300
Total Programme Duration	2 Years (4 Semesters)
Mode of Delivery	Online
Academic Year Intake	Two Times
Faculty Mix	Senior + Mid-level + Visiting

Gross Revenue from Student Fees

$300 \times ₹60,500 = ₹18150000$

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Total Revenue = ₹1.815 Crores

2. Cost Head Classification

To realistically assess break-even, costs are categorized into:

1. Fixed Costs (Independent of student count)
2. Variable Costs (Per student dependent)
3. Fixed Cost Components (Annualized)

3.1 Academic Human Resources

Component	Qty	Annual Cost (₹)
Professors / Associate Professors	4	38,00,000
Assistant Professors	6	34,00,000
Digital Technical Staff	2	10,00,000
Academic Coordinator / HoD Allowance	1	6,00,000
Subtotal – Faculty Cost		₹ 88,00,000

3.2 Infrastructure & Campus Overheads

Component	Annual Cost (₹)
Classrooms (Maintenance, Utilities)	9,00,000
Computer Digital Library (Hardware AMC)	8,00,000
Electricity & Internet Bandwidth	8,00,000
Housekeeping & Security Allocation	6,00,000
Subtotal – Infrastructure	₹ 31,00,000

3.3 Academic Administration & Compliance

Component	Annual Cost (₹)
Examination & Evaluation (Internal + External)	7,00,000
ERP / LMS	4,00,000
Journals and Online Resources	9,00,000
Accreditation & Regulatory Compliance	3,00,000
Subtotal	₹ 23,00,000

Component	Cost per Student (₹)	Total for 300 Students (₹)
Study Materials / E-Resources	2,000	600000
Lab Consumables & software	1800	540000
Student Support Services	1,000	3,00,000
ID Cards, Records, Certifications	1,000	3,00,000
Total Variable Cost	6,700	₹ 1740000

5. Total Cost Summary (Annualized)

Cost Head	Amount (₹)
Fixed Costs	1,42,00,000
Variable Costs	1740000
Total Annual Operating Cost	1,59,40,000

Total Projected fee per student

Total Projected Fee per student in Indian Rupees.

Total Annual Operation Cost/ No. of expected admissions
=1,59,40,000 / 300
= Rs. 53,133

(Fifty-Three Thousand One Hundred Thirty-Three)

Proposed Fee per Student for the course - 60,500/-



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IX. Quality assurance mechanism and expected program outcomes

- a. Review Mechanism for Programme: A systematic review mechanism is essential to maintain the quality and relevance of the MCA programme. The programme is periodically reviewed by an academic committee consisting of subject experts, faculty members, and industry professionals. Feedback is collected from students, alumni, and employers to assess the effectiveness of the curriculum and teaching methodologies. Based on this feedback, necessary revisions are made to update the course structure, introduce emerging technologies, and improve learning outcomes. Regular internal reviews, academic audits, and meetings of the Board of Studies ensure that the programme continues to meet academic standards and industry expectations.
- b. Course Benchmarking: Course benchmarking involves comparing the MCA curriculum with those offered by reputed universities, professional institutions, and industry standards. This process helps ensure that the programme aligns with national and international academic benchmarks in computer science and information technology. Benchmarking also includes reviewing syllabi, course objectives, teaching methods, and evaluation techniques to maintain competitiveness and quality. By aligning the curriculum with industry certifications, emerging technologies, and best academic practices, the programme ensures that students gain relevant technical knowledge and practical skills required in the IT sector.
- c. Mechanism for Monitoring Effectiveness: To ensure the effectiveness of the programme, continuous monitoring mechanisms are implemented. These include regular evaluation of student performance through assignments, projects, quizzes, and examinations. Faculty performance is also assessed through student feedback and peer reviews. Additionally, the institution tracks key performance indicators such as student progression, placement records, research activities, and project outcomes. Learning Management Systems (LMS) and academic analytics may also be used to monitor student engagement and learning progress. The collected data is analyzed to identify areas for improvement and to ensure that the programme successfully achieves its intended learning outcomes.

The CIQA is striving to bring newer initiatives pertaining to research, campus development, ICT adoption in teaching, providing better focus for the research scholars through workshops, coordinating Academic and Administrative Audit of the University, etc. At the end of every academic year, the University conducts assessment of the curriculum / course/ academic programme by students. The assessment focuses on broad areas like

- 1) reasons for selecting courses,
- 2) facilities available in the Departments,
- 3) quality of the syllabus,
- 4) internal assessment evaluation,



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- 5) quality of the teacher in terms of regularity to classes, command over language, encouragement of students in the classes, completion of syllabus and
- 6) rating of the programme and the Department. This feedback contributes to the academic radar prepared by the CIQA.

Towards the Quality Assurance Mechanism for OL Programs, the University shall establish a Centre for Internal Quality Assurance exclusively for programmes in the Online mode and follow the Quality Assurance Guidelines on learning materials in multiple media, human resources, curriculum and pedagogy, as specified in the UGC OL Regulations.

The CIQA will be required to conduct training and capacity building of teaching and administrative staff and counsellors at regular intervals.

The University IQAC's cell shall work closely with the CIQA to develop Feedback mechanisms, to allow for Program and Process Review on a regular basis. 360 Degree feedback, from Students, Faculty, Counsellors and Admin Staff shall be processed, and suggestions and improvements incorporated accordingly.

The Course shall be benchmarked with the Courses conducted in campus, for full time students, to ascertain the quality. Students' learning outcomes as measured in the exams and test shall be compared on a regular basis.

Post completion of a Degree Program, students will be regularly polled / interviewed using email feedback surveys, to measure impact of the program on their professional and academic lives. These indicators shall be used to constantly improve upon the programs and make them at par industry standards and expectations.



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4. ANNEXURE - DETAILED SYLLABI



Program Structure

Sem	Category	Subject Code	Subject	L-T-P-C	Credit
1	Core- Major	OLMCA11	Linux System Administration	3-0-2-4	4
1	Core- Major	OLMCA12	Advanced Java	3-0-2-4	4
1	AEC	OLMCA13	Entrepreneurship and Startups	3-0-0-3	3
1	Core- Minor	OLMCA14	Introduction To Cyber Security and Cyber law	2-0-2-3	3
1	Core- Elective -1	OLMCA15	Big Data Analytics	3-0-2-4	4
1	Core- Elective -1	OLMCA16	Ethical Hacking	3-0-2-4	4
1	Core- Elective -2	OLMCA17	Statistics For Data Science	3-0-2-4	4
1	Core- Elective -2	OLMCA18	Cloud Architecture	3-0-2-4	4

Sem	Category	Subject Code	Subject	L-T-P-C	Credit
2	Core- Major	OLMCA21	Network Management	3-0-2-4	4
2	Core- Major	OLMCA22	Web Development with JavaScript and ReactJS	3-0-2-4	4
2	Core- Major	OLMCA23	Java Based Application Development with Spring Boot	3-0-2-4	4
2	Core- Minor	OLMCA24	Data Science and Deep Learning with Python	3-0-0-3	3
2	Core- Elective -3	OLMCA25	Network and Web Application Security	3-0-2-4	4
2	Core- Elective -3	OLMCA26	Cyber security and Privacy practices	3-0-2-4	4
2	Core- Elective -4	OLMCA27	Cryptography	3-0-0-3	3
2	Core- Elective -4	OLMCA28	BlockChain Technologies	3-0-0-3	3

Sem	Category	Subject Code	Subject	L-T-P-C	Credit
3	Core- Major	OLMCA31	Web Application Framework (T+L)	3-0-2-4	4
3	Core- Major	OLMCA32	Software Testing (T+L)	3-0-2-4	4
3	Core Major	OLMCA33	E-commerce development using WordPress and WooCommerce (T+L)	3-0-2-4	4
3	Core-Elective 5	OLMCA34	Cloud computing essentials with Kubernetes	3-0-2-4	4
3	Core-Elective	OLMCA35	Internet of Things (T+L)	3-0-2-4	4
3	Core-Elective	OLMCA36	Machine Learning	3-0-2-4	4
3	Core-Elective	OLMCA37	Cyber Forensics (T+L)	3-0-2-4	4

Sem	Category	Subject Code	Subject	L-T-P-C	Credit
4	Core- Major	OLMCA41	Internship Embedded Project work & Viva Voce (or) Research work, Dissertation & Thesis	0-0-60-20	20

SEMESTER I

1. OLMCA11 - Linux System Administration

Attribute	Details
Course Code & Name	OLMCA11 - Linux System Administration (Core- Major)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To provide a foundational understanding of the Linux operating system, its architecture, and command-line interface. • To equip students with the skills to install, configure, and maintain Linux systems. • To introduce user and group management techniques to ensure system security. • To develop the ability to manage Linux services and processes. • To enable students to configure networking in Linux.
Course Outcomes	CO1: Compare and contrast various Linux distributions and install and configure different Linux systems. CO2: Gain proficiency in managing file and directory permissions and using command-line tools to control access. CO3: Install Red Hat Linux, configure essential system settings, manage disk partitions and troubleshoot. CO4: Effectively manage users and groups, delegate administrative privileges securely, and configure authentication. CO5: Use yum for package management, manage services with systemd, and ensure system security.
SLM UNITS(block pattern)	Block 1: Introduction to Linux (12 Hrs) Introduction to Linux Distributions, Open Source Software, File Systems, System Directories, Listing File and Directory Attributes, File Management, File Permissions, Absolute vs Relative Paths, Security Implications, Changing File/Directory Permissions and Ownership. Block 2: Installation of Linux (12 Hrs) Installing Red Hat Linux, Basic Disk Structure, Partitioning Tool, Device name allocation, Unix file system and Mount points, Installing GRUB/LILO, Booting the Installation Program, Disk Partitioning, Disk Druid Window, Firewall Configuration, Setting the root password, Authentication, Package group selection. Block 3: User Management (12 Hrs) Management of users and groups, User Private Group, Shadow passwords, Command Line Tools for Managing Users, The process on command useradd, Creating Group Directories, Gaining Privileges (su and sudo commands). Registering the System, subscription-manager commands, Managing Software Repositories. Block 4: Installation and Management of software (12 Hrs) Yum the Red Hat package manager, Checking For and Updating Packages, Updating Security-Related Packages, Preserving Configuration File Changes, Upgrading the System Off-line, Installing/Removing Packages. Managing Services with systemd, working with systemd Targets, Rescue Mode, Emergency Mode, Shutting Down, Suspending, and Hibernating. Block 5: OpenSSH Protocol (12 Hrs) OpenSSH, SSH Protocol, SSH Features, Event Sequence of an SSH Connection, Authentication, Channels, Configuring OpenSSH, Starting an OpenSSH Server, SSH for Remote Connections, Using ssh, scp, and sftp Utilities, X11 Forwarding, Port Forwarding. Web Servers, Apache HTTP Server, Setting Up Virtual Hosts.
Reference Books	• Maxim Svistunov, Stephen Wadeley. Red Hat Enterprise Linux 7 System Administrator's Guide. • Peter Membrey. The Definitive Guide to CentOS.

Attribute	Details
	• G. Mourani. Securing and Optimizing Linux: RedHat Edition.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	-	-	1	-	-	2	2	-
CO2	3	2	2	3	-	1	2	-	-	2	2	-
CO3	3	3	3	3	1	-	1	-	-	2	2	-
CO4	3	2	2	3	-	1	3	-	-	2	2	-
CO5	3	2	2	3	-	-	2	-	-	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	-
CO2	2	3	1	1
CO3	2	3	2	-
CO4	2	3	1	2
CO5	2	3	2	1

2. OLMCA12 - Advanced Java

Attribute	Details
Course Code & Name	OLMCA12 - Advanced Java (Core- Major)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To understand how to connect and interact with databases using JDBC API. • To learn to build dynamic web applications using Servlets and handle HTTP requests. • To develop server-side web pages using JSP with session handling. • To implement object-relational mapping and data persistence using Hibernate. • To build modular and secure enterprise applications using the Spring Framework.
Course Outcomes	CO1: Connect Java applications to databases, perform queries, manage transactions, and use advanced features. CO2: Create web applications using servlets, managing client requests, sessions, cookies, and database integration. CO3: Understand JSP technology, create dynamic web pages, handle forms, and utilize built-in and custom tags. CO4: Understand Hibernate configuration, mapping Java objects, querying data, and ensuring

Attribute	Details
	consistency. CO5: Grasp the fundamentals of Spring, dependency injection, AOP, and building secure web applications.
SLM UNITS(block pattern)	Block 1: Java JDBC Concepts (12Hrs) Introduction to JDBC, JDBC Driver types, JDBC database connections, JDBC Statements, PreparedStatement, CallableStatement, ResultSet, JDBC data types, transactions, Batch Processing, Stored Procedure. Block 2: Servlet Aspects (12Hrs) Servlet structure, Life Cycle of a Servlet, Using Tomcat for Servlet Development, The Servlet API Handling Client Request: Form data, HTTP status codes, Handling Cookies, Session tracking, Database Access. Block 3: Overview of JSP (12 Hrs) Overview of JSP Technology, Need of JSP, Advantages of JSP, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, JSP Directives, JSP Action, JSP Implicit Objects, JSP Form Processing, JSP Session and Cookies Handling, JSP Standard Tag Libraries, Custom Tags, Expression Language, Exception Handling. Block 4: Hibernate (12 Hrs) Introduction, Hibernate Configuration, Hibernate Concepts, Hibernate O-R Mapping, Manipulating and Querying, Hibernate Query Language, Criteria Queries, Native SQL, Transaction and Concurrency. Block 5: Spring Framework (12 Hrs) Spring Basics, Spring Container, Spring AOP, Spring Data Access, Spring O-R mapping, Spring Transaction Management, Spring Remoting and Enterprise Services, Spring Web MVC Framework, Securing Spring Application.
Reference Books	• Keogh, J. J2EE: The Complete Reference. Tata McGraw-Hill. • Lindfors, J., & Fleury, M. JMX: Managing J2EE with Java Management Extensions. • Broemmer, D. J2EE Best Practices: Java Design Patterns, Automation, and Performance.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	2	-	-	-	1	2	2	-
CO2	3	3	3	3	1	1	-	-	2	2	3	-
CO3	3	3	3	3	1	1	-	-	2	2	3	-
CO4	3	3	3	3	2	-	-	-	2	2	3	-
CO5	3	3	3	3	2	1	1	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	-
CO2	3	3	3	1
CO3	3	3	3	1


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CO	PSO1	PSO2	PSO3	PSO4
CO4	3	3	3	-
CO5	3	3	3	1

3. OLMCA13 - Entrepreneurship and Startups

Attribute	Details
Course Code & Name	OLMCA13 - Entrepreneurship and Startups (AEC)
Credits	3 Credits
L-T-P-C	3-0-0-3
Course Objectives	- To instill the foundational concepts of entrepreneurship and the entrepreneurial mindset. - To understand the processes of project planning, location analysis, and feasibility. - To learn about project financing, government regulations, and startup ecosystems.
Course Outcomes	CO1: Recall the main concepts in project planning and entrepreneurship. CO2: Understand project factors and the significance of entrepreneurship. CO3: Apply market research and financial analysis in project planning. CO4: Analyze project location decisions and finance sources. CO5: Assess project plans and finance strategies.
SLM UNITS(block pattern)	BLOCK 1: PROJECT CONCEPTION AND LOCATION (11 Hrs) Introduction to Project Management: Nature, Scope, Process Elements, Significance and Emergence of Projects, Project types. Project Planning. Project Location Analysis: Location of Project Site, Working Conditions, Development Plans of Government, Elements and Factors Affecting Location Decisions. BLOCK 2: PROJECT SELECTION AND FEASIBILITY(11 Hrs) Product and Service Selection: Selection of the Product or Service, Market Research, Product Appraisal, Product Design. Selection and Design Considerations: Factors Affecting the Selection Decision, Choice of Technology, Feasibility. Project Impact Analysis: Effects on Environment, Pollution control, Economic Analysis. BLOCK 3: PROJECT FINANCING AND MANAGEMENT (11 Hrs) Sources of Project Finance: Venture Capital, Angel Investors, Institutional financing, Financial Bootstrapping, Cooperative Societies, Raising Capital from Market. Financial Analysis and Repayment: Cost of Capital, Cost Benefit Analysis, Cash flow Analysis. Project Control and Review. BLOCK 4: ENTREPRENEURSHIP DEVELOPMENT (12 Hrs) Fundamentals of Entrepreneurship: Nature and Importance of Entrepreneurship, Entrepreneurial Environment, Entrepreneur vs. Professional Managers. The Entrepreneurial Journey: Development of Women Entrepreneurs. The Entrepreneurial Ecosystem: Role of Government and Financial Institutions, Challenges and Avenues of Entrepreneurial development.
Reference Books	Standard textbooks on Entrepreneurship and Project Management as recommended by the university.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	1	1	1	-	1	2	3	-
CO2	2	2	2	-	1	2	2	-	1	2	3	1
CO3	2	3	2	2	3	1	1	-	2	2	3	1
CO4	2	3	2	1	2	1	1	-	2	2	3	1
CO5	2	3	3	2	2	2	1	-	2	2	3	1
CO6	3	3	3	2	2	2	2	-	3	2	3	1

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	-	-	1	3
CO2	-	-	1	3
CO3	-	-	2	3
CO4	-	-	2	3
CO5	-	-	2	3

4. OLMCA14 - Introduction to Cyber Security and Cyber law

Attribute	Details
Course Code & Name	OLMCA14 - Introduction to Cyber Security and Cyber law (Core- Minor)
Credits	3 Credits
L-T-P-C	2-0-2-3
Course Objectives	• To introduce the foundational concepts of cybersecurity, including the CIA Triad. • To familiarize students with global cybersecurity frameworks (ISO, GDPR, NIST). • To enable learners to assess risks, vulnerabilities, and apply risk management. • To impart knowledge on identity/access management and disaster recovery. • To provide a thorough understanding of cyber law and electronic governance.
Course Outcomes	CO1: Understand and apply the principles of the CIA Triad and concepts of authentication, authorization, and privacy. CO2: Demonstrate knowledge of security frameworks (ISO/IEC 27001, HIPAA, PCI DSS) and apply standards to ensure compliance. CO3: Identify threats and vulnerabilities, conduct risk assessments, and calculate metrics (SLE, ALE) to mitigate risks. CO4: Manage identity life cycles, access control, and develop business continuity and disaster recovery plans. CO5: Understand cyber law, electronic governance, penalties, the Cyber Appellate Tribunal, and intermediary liability.
SLM	Block 1: Introduction to Cyber Security (11 Hrs)

Attribute	Details
UNITS(block pattern)	CIA Triad, Identification, Authentication, Authorization, Accounting, Privacy, Data Classification, Threats, Vulnerability, Risk, Organizational Roles, Security Controls (Preventive, Detective, Corrective, Deterrent, Administrative, Technical). Block 2: Cyber Security Standards & Frameworks (12 Hrs) Security Frameworks, Compliance, ISO/IEC 27000 Series, ISO 27001:2013, COBIT, U.S Privacy Laws, HIPAA, PCI DSS, GLBA, GDPR, NIST. Cyber Jurisprudence, Electronic Governance, Penalties Compensation and Adjudication, The Cyber Appellate Tribunal, Cyber Offences, Exemption from liability of intermediary in certain cases, Examiner of Electronic Evidence Block 3: Security Governance and Risk Management (11 Hrs) Policies & Standards, Security Metrics, Identify Threats & Vulnerabilities, Conducting Risk Assessment, Qualitative and Quantitative Risk Analysis, Exposure Factor, Single Loss Expectancy, Annualized Loss Expectancy, Risk Mitigation, Asset Evaluation. Block 4: Security Domains (11 Hrs) Identity & Access Management, Managing Identity Provisioning Life Cycle, Business Continuity Planning, Business Impact Assessment, Disaster Recovery, Personnel Security, Security Awareness, Physical Security.
Reference Books	• Chapple, M. (ISC)2 CISSP Certified Information Systems Security Professional Official Study Guide. • Cannon, D. L. CISA certified information systems auditor study guide. • Messier, R. CEH v10 Certified Ethical Hacker Study Guide.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	1	3	-	1	2	2	2
CO2	3	2	2	2	1	1	3	-	1	2	2	2
CO3	3	3	3	2	3	1	2	-	2	2	2	1
CO4	3	2	3	2	1	2	3	-	1	2	2	1
CO5	3	2	2	1	1	1	3	-	1	2	2	2

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	3
CO2	2	1	1	3
CO3	2	2	2	2
CO4	2	2	2	3
CO5	1	1	1	3

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Attribute	Details
Course Code & Name	OLMCA15 - Big Data Analytics (Core- Elective -1)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To introduce the fundamental concepts of big data. • To familiarize students with big data technologies and ecosystems. • To enable students to understand the architecture and functioning of distributed computing frameworks. • To cultivate problem-solving skills through practical case studies. • To prepare students for careers in data science and analytics.
Course Outcomes	CO1: Apply normalization techniques to design efficient database schemas and manage database transactions. CO2: Understand and classify various types of data, characteristics of big data, and the analytics flow. CO3: Differentiate between SQL and NoSQL databases, understanding the advantages and industrial applications. CO4: Perform CRUD operations using CQL, manage data with collections, and execute import/export in Apache Cassandra. CO5: Work with MongoDB, utilizing dynamic queries, data storage, replication, and MapReduce operations.
SLM UNITS(block pattern)	Block 1: Database Normalization and Transaction Management (12 Hrs) Introduction to Normalization, Functional Dependencies, Normal Forms (1NF to BCNF). Transaction Processing, ACID properties, serializability, Concurrency Control Techniques (Two-phase locking, timestamp ordering). Block 2: Introduction to Big Data and Analytics (12 Hrs) Classification of Data, Types of analytics, Evolution and Definition of Big Data, Characteristics and Challenges, Domain Specific Examples (Web, Healthcare, IoT). Analytics Flow, Big Data Stack. Block 3: Introduction to NoSQL, Hadoop, and Distributed Data Systems (12 Hrs) NoSQL: Types, Advantages, SQL vs NoSQL. Hadoop: Distributed Computing Challenges, Hadoop Ecosystem, HDFS, YARN, processing data with Hadoop. Block 4: Data Modeling and Management with Apache Cassandra (12 Hrs) Cassandra Features (Gossip, Partitioner, Replication Factor), CQL Data types, Key spaces, CRUD Operations, Collections (Set, List, Map), Time to Live, Import and Export. Block 5: Data Management with MongoDB and MapReduce Framework (12 Hrs) MongoDB: JSON usage, Dynamic Queries, Replication, Sharding, Data types, Query Language. MapReduce: mapper, reducer, combiner, Partitioner, searching, sorting.
Reference Books	• Elmasri, Navathe. Fundamentals of Database Systems. • Seema Acharya. Big Data and Analytics. • Arshdeep Bahga. Big Data Analytics – A Hands-On Approach.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	1	-	1	2	2	-
CO2	3	2	2	2	3	1	-	-	2	2	2	-
CO3	3	2	2	2	2	-	-	-	1	2	2	-

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO4	3	3	3	3	3	1	1	-	2	2	3	-
CO5	3	3	3	3	3	1	1	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	1
CO2	3	1	2	1
CO3	3	1	2	1
CO4	3	3	3	1
CO5	3	3	3	1

6. OLMCA16 - Ethical Hacking

Attribute	Details
Course Code & Name	OLMCA16 - Ethical Hacking (Core- Elective -1)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	- To introduce the fundamental principles of cybersecurity, ethical hacking methodologies, and legal frameworks. - To equip students with practical skills to set up a virtual hacking lab and utilize Linux-based tools. - To provide a comprehensive understanding of vulnerability assessment and penetration testing (VAPT). - To familiarize students with common, high-impact attack vectors and OWASP Top 10.
Course Outcomes	CO1: Differentiate between hacking and ethical hacking, explain the 5-phase methodology, and describe legal boundaries. CO2: Set up a secure virtualization lab and perform active and passive reconnaissance using tools like Nmap. CO3: Conduct vulnerability assessments using automated tools, analyze findings, and structure penetration testing reports. CO4: Identify common web application vulnerabilities (OWASP Top 10) and recognize social engineering attack types. CO5: Analyze post-exploitation techniques, identify common malware threats, and apply network security practices and basic incident response methods to protect information systems
SLM UNITS(block pattern)	BLOCK 1: Core Concepts and Frameworks Core Concepts in Cybersecurity: Hacking vs. Ethical Hacking. Hacking Methodologies: Types of Hackers, Cyber Kill Chain, 5-Phase Process. Legal and Ethical Frameworks: Responsible Disclosure, IT Act 2000, GDPR. BLOCK 2: Lab Setup and Reconnaissance Lab Virtualization: VirtualBox vs VMware, Kali Linux. Linux Fundamentals: Terminal Commands, Users, Permissions. Reconnaissance and Scanning: Footprinting, OSINT, Nmap,

Attribute	Details
	Zenmap. BLOCK 3: Vulnerability Assessment and Penetration Testing Vulnerability Assessment Concepts: Testing vs Penetration Testing, OpenVAS, Nessus, Burp Suite. Vulnerability Analysis: CVSS & CVE, Reporting. Penetration Testing: Types (Black/White/Grey Box), Red Teaming. BLOCK 4: Web Applications and Social Engineering Web Application Fundamentals: HTTP, Cookies, Burp Suite setup. Web Application Vulnerabilities: OWASP Top 10 (Injection, Broken Access Control, SSRF). Social Engineering: Phishing, Vishing, Tailgating. BLOCK 5: Post-Exploitation and Security Defense Post-Exploitation: Privilege Escalation, Maintaining Access, Covering Tracks. Malware Basics: Virus, Worm, Trojan, Ransomware, Spyware. Network Security: Firewalls, IDS, IPS, VPN. Security Practices: Patch Management, Password Policies, Multi-Factor Authentication. Incident Response: Basics of Incident Response and Digital Forensics.
Reference Books	• Gray Hat Hacking: The Ethical Hacker's Handbook. • CEH v10: Certified Ethical Hacker Study Guide.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	1	3	-	1	2	2	1
CO2	3	3	3	3	2	1	2	-	2	2	3	-
CO3	3	3	3	3	3	2	2	-	2	2	3	-
CO4	3	3	2	3	2	1	2	-	2	2	3	-
CO5	3	3	2	3	2	1	2	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	3
CO2	2	3	2	2
CO3	2	3	3	2
CO4	2	3	2	2
CO5	2	3	3	2

Attribute	Details
Course Code & Name	OLMCA17 - Statistics for Data Science (Core- Elective -2)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To develop an understanding of statistical concepts, central tendency, dispersion, and data visualization. • To introduce principles of probability distributions and the Central Limit Theorem. • To equip skills for constructing and interpreting confidence intervals. • To perform hypothesis testing for means and make data-driven decisions. • To apply linear regression analysis techniques for predictive modelling.
Course Outcomes	CO1: Analyze and summarize data using mean, median, variance, and visualizations. CO2: Explain probability distributions and apply the Central Limit Theorem. CO3: Calculate and interpret confidence intervals for population parameters. CO4: Conduct hypothesis tests for means with known and unknown variances. CO5: Perform simple and multiple linear regression analyses and interpret models.
SLM UNITS(block pattern)	Block 1: Introduction to Statistics (12 Hrs) Population vs sample, Types of data, Visualization techniques, Frequency distribution, histogram, scatter plot, Mean, median, mode, Skewness, Variance, standard deviation, Covariance, Correlation coefficient. Block 2: Probability Distributions and Sampling Theory (12 Hrs) Normal Distribution, Standard Normal Distribution, Central limit theorem, Standard error, Estimators and estimates. Block 3: Statistical Estimation and Sampling Inference (12 Hrs) Definition of confidence intervals, calculating with known variance, z-score, Student's T Distribution, unknown variance, t-score, Margin of error, two means independent/dependent samples. Block 4: Hypothesis Testing and Statistical Decision-Making (12 Hrs) Null vs Alternative, rejection region and significance level, Type I vs Type II error, Test for mean (variance known/unknown), p-value, dependent/independent samples. Block 5: Regression Analysis and Model Interpretation (12 Hrs) Regression fundamentals, Correlation vs causation, linear regression model, R-squared, multiple linear regression, Adjusted R-squared, F-statistic, Assumptions of linear regression.
Reference Books	• Banker, R. D. Maximum likelihood, consistency and data envelopment analysis. • Cielen, D. Introducing data science: big data, machine learning, and more. • Blum, A. Foundations of data science.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	1	-	-	2	2	2	-
CO2	3	3	2	2	3	-	-	-	1	2	2	-
CO3	3	3	2	2	3	-	-	-	2	2	2	-
CO4	3	3	2	2	3	-	-	-	2	2	2	-
CO5	3	3	3	3	3	-	-	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-
CO2	3	1	1	-
CO3	3	2	2	-
CO4	3	2	2	-
CO5	3	3	3	-

8. OLMCA18 - Cloud Architecture

Attribute	Details
Course Code & Name	OLMCA18 - Cloud Architecture (Core- Elective -2)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To establish a strong foundation in cloud architecture principles, service models, and the AWS Well-Architected Framework. • To provide understanding of designing scalable compute, storage, and secure network solutions. • To introduce advanced cloud-native patterns like microservices, API gateways, and DevOps. • To develop strategic capabilities in architecting for security, reliability, cost management, and cloud migration.
Course Outcomes	CO1: Compare cloud service and deployment models, and evaluate architectural designs using the Well-Architected Framework. CO2: Design secure, scalable, and cost-effective solutions for compute, storage, database, and networking. CO3: Analyze the trade-offs between monolithic and microservice architectures and design serverless applications. CO4: Develop a comprehensive strategy for cloud migration, governance, security, and disaster recovery. CO5: Analyze cloud monitoring and optimization techniques and evaluate emerging cloud technologies for efficient and secure cloud architecture.
SLM UNITS(block pattern)	BLOCK 1: FOUNDATIONS OF CLOUD ARCHITECTURE (12 Hrs) From Traditional to Cloud Architecture, Cloud Service & Deployment Models (IaaS, PaaS, SaaS). The AWS Well-Architected Framework: Operational Excellence, Security, Reliability, Performance Efficiency, Cost Optimization. BLOCK 2: ARCHITECTING CORE CLOUD INFRASTRUCTURE (12 Hrs) Designing Compute Solutions: VMs, Containers, Serverless. Storage Architecture: Object, Block, File storage. Database Architecture: Relational, NoSQL, Data Warehouses. Designing Network and Connectivity: VPC/VNet Design, Network Security, Hybrid Cloud Architecture. BLOCK 3: DESIGNING CLOUD-NATIVE APPLICATIONS (12 Hrs) Monolith vs. Microservices, API Gateways, Service discovery. Event-Driven and Serverless Architecture. DevOps and Infrastructure as Code (IaC): CI/CD pipelines, Terraform, CloudFormation, Deployment Strategy Design. BLOCK 4: SECURITY, GOVERNANCE, AND MIGRATION (12 Hrs)

Attribute	Details
	Architecting for Security and Compliance: IAM, Data Protection, KMS. Architecting for Reliability and Cost: High Availability, Disaster Recovery Strategies. Cloud Migration and Governance: Cloud Adoption Framework, Migration 6 R's, Governance Model. BLOCK 5: CLOUD MONITORING, OPTIMIZATION AND EMERGING TRENDS (12 Hrs) Monitoring and Logging: Cloud Monitoring Tools, Logging and Alerting. Performance and Cost Optimization: Auto Scaling, Load Balancing, Cost Management. Cloud Security Monitoring: Threat Detection, Security Auditing. Emerging Cloud Technologies: Edge Computing, AI/ML in Cloud, Multi-Cloud and Hybrid Strategies.
Reference Books	Standard textbooks on Cloud Architecture, AWS, and GCP best practices as recommended.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	-	1	-	1	2	2	-
CO2	3	3	3	3	2	1	2	-	2	2	3	-
CO3	3	3	3	3	2	1	1	-	2	2	3	-
CO4	3	3	3	3	2	2	3	-	2	2	3	-
CO5	3	3	3	3	2	2	3	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1
CO2	3	3	3	1
CO3	3	3	3	1
CO4	3	3	3	2
CO5	3	3	3	2

SEMESTER II

9. OLMCA21 - Network Management

Attribute	Details
Course Code & Name	OLMCA21 - Network Management (Core- Major)
Credits	4 Credits

Attribute	Details
L-T-P-C	3-0-2-4
Course Objectives	• Understand and Analyze Layered Models like ISO, TCP/IP. • Understand and Analyze various Network Components. • Understand and Analyze IOS commands and configure CISCO Devices. • Understand various options for a Network Management.
Course Outcomes	CO1: Understand the OSI model and networking devices like repeaters, switches, and bridges. CO2: Configure and manage Virtual LANs (VLANs) and control network traffic. CO3: Use Cisco router commands to configure and troubleshoot routers. CO4: Configure and manage network switches, VLANs, and security features. CO5: Understand and manage router components, including configuration and password recovery.
SLM UNITS (block pattern)	Block 1: Internetworking - Models, Devices and Protocols (12 Hrs) Layered Approaches, OSI Reference Model, Connection-Oriented vs Connection-Less Communication. Devices: Repeaters, Switches, Bridges. Ethernet Networking, Data Encapsulation, Cisco Three-Layer Hierarchical Model, Cabling Cisco Devices. Block 2: Virtual Local Area Network (VLAN) (12 Hrs) Broadcast Control, Security, Static VLANs, Dynamic VLANs, Identifying VLANs, Frame Tagging, Inter-Switch Link (ISL) Protocol, Trunking, Routing between VLANs, VLAN Trunk Protocol (VTP). Block 3: IOS Management Commands (12 Hrs) Cisco Router User Interface, IOS, Connecting to a Cisco Router, Setup Mode, Command-Line Interface, Overview of Router Modes, Setting Passwords, Encrypting Passwords, Router Interfaces, Configuring IP Addresses. Block 4: Managing a Switch (12 Hrs) Connecting to the Console Port, Switch Startup, Configure network device security features, SSH, Configuring Switch Interfaces, Setting IP Information, Configure Port Security, Configure ACLs to filter network traffic. Block 5: Managing a Router (12 Hrs) Cisco Router Components, Router Boot Sequence, Managing Configuration Registers, Recovering Passwords, Viewing and Changing the Configuration, Backing Up and Restoring the Cisco IOS, Erasing the Configuration.
Reference Books	• Network Management Study Material compiled by Prof. Subrahmanya Bhat. • Todd Lammle. CCNA Routing and Switching Study Guide. • Wendell Odom. CCNA Routing and Switching 200-120 Official Cert Guide Library.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	2	2	-
CO2	3	3	3	3	1	1	1	-	-	2	3	-
CO3	3	3	3	3	1	-	1	-	1	2	3	-
CO4	3	3	3	3	1	-	2	-	1	2	3	-
CO5	3	3	3	3	1	-	2	-	1	2	3	-

CO-PSO Mapping Matrix

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CO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1
CO2	3	3	3	1
CO3	3	3	3	1
CO4	3	3	3	2
CO5	3	3	3	2

10. OLMCA22 - Web Development with JavaScript and ReactJS

Attribute	Details
Course Code & Name	OLMCA22 - Web Development with JavaScript and ReactJS (Core- Major)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To introduce modern web development using JavaScript and ReactJS. • To provide hands-on experience with core JS fundamentals and advanced concepts. • To build interactive user interfaces using ReactJS components. • To train in state management, routing, and API integration. • To develop proficiency in deploying and testing full-stack apps.
Course Outcomes	CO1: Understand the basics of JavaScript, including syntax, data types, functions, and arrays. CO2: Apply advanced JavaScript concepts like OOP, asynchronous programming, and DOM manipulation. CO3: Implement common data structures and algorithms in JavaScript. CO4: Create and manage ReactJS components, handle events, and use React hooks. CO5: Build full-stack applications, manage state using Redux/Context API, and test with Jest.
SLM UNITS(block pattern)	Block 1: Introduction to JavaScript and Basics (12 Hrs) History, Setting Up Environment, Syntax, Variables, Operators, Control Flow, Loops, Functions, Arrow Functions, Scope, Arrays, Objects. Block 2: Advanced JavaScript Concepts (12 Hrs) OOP in JS, Prototypes, Classes, Promises, async/await, DOM Manipulation, Event Handling, ES6 Features (Destructuring, Spread, Rest), Blocks. Block 3: JavaScript Data Structures and Algorithms (12 Hrs) Arrays, Stacks, Queues, Linked Lists, Trees, Hash Tables, Sorting Algorithms (Bubble, Merge, Quick), Searching Algorithms, Big O Notation. Block 4: Introduction to ReactJS (12 Hrs) Overview, JSX, Functional vs Class Components, State and Props, Event Handling, Component Lifecycle, Hooks (useState, useEffect). Block 5: Advanced ReactJS Concepts and Building Applications (12 Hrs) React Router, Context API, Redux, Forms and Validation, Integrating Backend APIs, Testing with Jest and React Testing Library.
Reference Books	• David Flanagan. JavaScript: The Definitive Guide. • Marijn Haverbeke. Eloquent JavaScript: A Modern Introduction to Programming.

Attribute	Details
	• Alex Banks and Eve. Learning React: Modern Patterns for Developing React Apps.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	2	2	-
CO2	3	3	3	3	1	-	-	-	1	2	3	-
CO3	3	3	3	2	2	-	-	-	1	2	3	-
CO4	3	3	3	3	1	1	-	-	2	2	3	-
CO5	3	3	3	3	2	2	1	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-
CO2	3	3	3	-
CO3	3	2	3	-
CO4	3	3	3	-
CO5	3	3	3	1

11. OLMCA23 - Java Based Application Development with Spring Boot

Attribute	Details
Course Code & Name	OLMCA23 - Java Based Application Development with Spring Boot (Core- Major)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To understand the basics of Spring Boot, architecture, and project setup. • To build simple applications using REST APIs, JSON handling, and Spring Data JPA. • To implement advanced Spring Boot features like security and actuator. • To design and consume RESTful APIs with JSON processing. • To test, package, and deploy Spring Boot applications.
Course Outcomes	CO1: Understand the fundamentals of Spring Boot, architecture, and project setup. CO2: Develop Spring Boot applications, create REST APIs, handle JSON, and use Spring Data JPA. CO3: Implement security, actuator for monitoring, and command-line applications. CO4: Design and consume RESTful APIs, process JSON, and integrate with Thymeleaf. CO5: Test, deploy, and package Spring Boot applications, including unit testing and deployment.

Attribute	Details
SLM UNITS (block pattern)	Block 1: Introduction to Spring Boot (12 Hrs) Features, Architecture, Spring Initializer, Creating a Project, Components, Database Configuration, Spring Boot View (Thymeleaf). Block 2: Developing Applications with Spring Boot (12 Hrs) Building REST APIs (GET, POST), Handling JSON, Working with Databases (H2/MySQL), Using Spring Data JPA, Basic Validation and Error Handling, Configuration. Block 3: Advanced Topics in Spring Boot Development (12 Hrs) Spring Boot Security Basics, Actuator (Health, Metrics), Working with Templates and Views (Thymeleaf), Command-Line Applications using @CommandLineRunner. Block 4: REST API Development and Integration in Spring Boot (12 Hrs) RESTful Web Services, Consuming APIs using RestTemplate, JSON Processing, Integration with Front-End. Block 5: Spring Boot Application Testing and Deployment Strategies (12 Hrs) Testing (JUnit, Mockito), Integration Tests, Building and Packaging (JAR/WAR), Deployment to Local Server, Cloud Deployment (Heroku, AWS), Logging and Monitoring.
Reference Books	• Mark Heckler. Spring Boot: Up and Running. • Craig Walls. Spring Boot in Action. • John Carnell. Spring Microservices in Action.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	-	-	-	-	-	2	2	-
CO2	3	3	3	3	2	-	-	-	1	2	3	-
CO3	3	3	3	3	1	1	2	-	1	2	3	-
CO4	3	3	3	3	2	1	-	-	1	2	3	-
CO5	3	3	3	3	2	1	1	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	-
CO2	3	3	3	-
CO3	3	3	3	1
CO4	3	3	3	-
CO5	3	3	3	1

Attribute	Details
Course Code & Name	OLMCA24 - Data Science and Deep Learning with Python (Core- Minor)
Credits	3 Credits
L-T-P-C	3-0-0-3
Course Objectives	• To understand core Python programming concepts and structures. • To apply advanced Python features like OOP, file handling. • To gain proficiency in data analysis using NumPy and Pandas. • To develop effective visualizations using Seaborn, Plotly, Tableau. • To comprehend and implement deep learning models using TensorFlow or PyTorch.
Course Outcomes	CO1: Understand Python fundamentals, syntax, data types, and control structures. CO2: Apply advanced Python concepts, including functions, OOP, and file handling. CO3: Analyze and preprocess data using Numpy, Pandas, and Matplotlib for EDA. CO4: Use advanced data visualization tools like Seaborn, Plotly, Tableau, and Power BI. CO5: Understand the fundamentals of deep learning, neural networks, CNNs, RNNs, and framework implementation.
SLM UNITS(block pattern)	Block 1: Python Fundamentals (11 Hrs) Setting up Environment, Basic Syntax, Operators, Strings, Data Structures (Lists, Tuples, Sets, Dictionaries), Conditional Statements, Loops. Block 2: Advanced Python Concepts and Applications (11 Hrs) Functions, Lambda, Exception and Error Handling, OOP (Classes, inheritance, polymorphism), Generators, Blocks, Date and Time Handling, Regex, File Handling. Block 3: Data Mining Fundamentals and Core Data Analysis Tools (12 Hrs) Data Mining basics, Challenges, Data Quality, Preprocessing, Numpy Basics, Pandas Basics, EDA using Pandas and Numpy, Matplotlib, Web Scraping, Seaborn, Plotly, Database Access using Python, Data Visualization with Tableau and Power BI. Block 4: Deep Learning (11 Hrs) Introduction to Deep Learning, Basics of Neural Networks (Neurons, Weights, Biases, Activation Functions), Feedforward Neural Networks (FNNs), CNNs, RNNs, Introduction to TensorFlow/PyTorch.
Reference Books	• Al Sweigart. Automate the Boring Stuff with Python. • Jiawei Han. Data Mining: Concepts and Techniques. • Ian Goodfellow. Deep Learning.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	2	2	-
CO2	3	3	3	3	1	-	-	-	1	2	2	-
CO3	3	3	3	3	3	-	-	-	2	2	3	-
CO4	3	2	3	3	3	1	-	-	1	2	3	-
CO5	3	3	3	3	3	1	1	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-
CO2	3	3	3	-
CO3	3	3	3	-
CO4	2	3	3	1
CO5	3	3	3	1

13. OLMCA25 - Network and Web Application Security

Attribute	Details
Course Code & Name	OLMCA25 - Network and Web Application Security (Core- Elective -3)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To establish a strong foundation in core network security principles. • To familiarize students with the architecture of Firewalls, IDS/IPS, and VPNs. • To provide a comprehensive understanding of network attack methodologies. • To introduce the most critical web application vulnerabilities (OWASP Top 10).
Course Outcomes	CO1: Explain the core concepts of Confidentiality, Integrity, Availability, encryption, hashing, and digital signatures. CO2: Differentiate between firewalls and IDS/IPS, and analyze security mechanisms of WPA3 and SSL/TLS. CO3: Demonstrate ability to use tools like Nmap and Wireshark to identify network-layer vulnerabilities. CO4: Identify and describe common web attacks (SQL Injection, XSS) and explain defensive measures. CO5: Analyze security monitoring techniques and apply basic incident response and security management practices to protect network and web applications.
SLM UNITS(block pattern)	BLOCK 1: NETWORK SECURITY FOUNDATIONS (12 Hrs) Security Principles (CIA Triad, AAA Model, Threat Modeling). Core Network Defense (Firewalls, IDS vs IPS, VPNs). Fundamentals of Network Cryptography (Symmetric/Asymmetric Encryption, Hashing, PKI, SSL/TLS). BLOCK 2: NETWORK ATTACKS AND WIRELESS SECURITY (12 Hrs) Reconnaissance and Scanning (Whois, Port Scanning, OS Fingerprinting, Nmap). Network-Layer Attacks (IP Spoofing, ARP Poisoning, Packet Sniffing, DoS/DDoS). Wireless Network Security (WPA3, Rogue APs, Evil Twin, Aircrack-ng). BLOCK 3: WEB APPLICATION SECURITY AND OWASP TOP 10 (PART 1) (12 Hrs) Web Application Architecture and HTTP (Cookies, Sessions). Injection and Data Flaws (SQL Injection, Command Injection, Cryptographic Failures). Authentication and Authorization Flaws (Broken Authentication, IDOR). BLOCK 4: WEB APPLICATION SECURITY AND OWASP TOP 10 (PART 2) (12 Hrs) Cross-Site Vulnerabilities (XSS, CSRF, SSRF). Misconfiguration and Component Flaws. Web

Attribute	Details
	Penetration Testing and Secure SDLC (Burp Suite, OWASP ZAP, CSP, WAF). BLOCK 5: SECURITY MONITORING AND INCIDENT RESPONSE (12 Hrs) Security Monitoring: Log Analysis, SIEM, Security Auditing. Incident Response: Incident Handling Process, Containment and Recovery. Security Management: Risk Assessment, Security Policies and Compliance. Emerging Trends: Zero Trust Security, Cloud and IoT Security Basics.
Reference Books	Standard textbooks on Network Security and Web Application Security as recommended by the university.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	2	-	-	2	2	-
CO2	3	3	3	3	1	-	2	-	1	2	2	-
CO3	3	3	3	3	2	-	2	-	1	2	3	-
CO4	3	3	3	3	2	1	3	-	2	2	3	-
CO5	3	3	3	3	2	1	3	-	2	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	2
CO2	3	2	3	2
CO3	3	3	3	2
CO4	3	3	3	3
CO5	3	3	3	3

14. OLMCA26 - Cyber security and Privacy practices

Attribute	Details
Course Code & Name	OLMCA26 - Cyber security and Privacy practices (Core- Elective -3)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	- To introduce students to fundamental concepts of cyber security and basic protection mechanisms. - To provide hands-on experience with secure browsing and password management.

Attribute	Details
	- To explore privacy-focused technologies (Tor, Proxy). - To build practical skills in setting up secure email communication. - To train students in cryptographic tools for email encryption.
Course Outcomes	CO1: Learn how to secure computers and data against online threats. CO2: Understand how to browse safely and protect privacy online. CO3: Safely manage and encrypt email communications. CO4: Learn how to create and manage secure passwords. CO5: Gain skills in encrypting emails and using public key encryption.
SLM UNITS(block pattern)	Block 1: Fundamentals of Cyber Security and Device Protection (12 Hrs) Security Basics, Undirected and Directed Threats, End-To-End Encryption, Anti-Virus Software, External Data (USB) threats, Portable Apps. Block 2: Password Management and Secure Browsing (12 Hrs) Password Complexity, Using Keeppassx, Encrypting Passwords. Safe Browsing, Firefox Extensions (Https Everywhere, Adblock Plus, Noscript). Block 3: Privacy and Anonymity Technologies (12 Hrs) Proxy Settings, Foxyproxy. Tor Browser Bundle, Installing and Using Tor for anonymous browsing. Block 4: Email Threats and Secure Email Client Configuration (12 Hrs) E-Mail Safety, Viruses and Spam. Using Thunderbird, Secure Connections (SSL/TLS), DKIM, SPF, DMARC. Block 5: Email Encryption Using PGP and Key Management (12 Hrs) Mail Encryption, Key-Pairs, Installing PGP/GPG, Enigmail, Creating PGP Keys, Encrypting Attachments, Public Key Servers, Revocation Certificates.
Reference Books	- Nina Godbole. Cyber Security Understanding Cyber Crimes. - Mike Shema. Anti-Hacker Tool Kit.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	2	-	-	2	2	1
CO2	2	2	2	3	-	-	3	-	-	2	2	1
CO3	2	2	3	3	-	1	3	-	1	2	2	-
CO4	2	2	2	3	-	-	2	-	-	2	2	-
CO5	3	3	3	3	-	1	3	-	1	2	3	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	3
CO2	2	3	1	3
CO3	2	3	2	3
CO4	1	3	1	2

CO	PSO1	PSO2	PSO3	PSO4
CO5	2	3	2	3

15. OLMCA27 - Cryptography

Attribute	Details
Course Code & Name	OLMCA27 - Cryptography (Core- Elective -4)
Credits	3 Credits
L-T-P-C	3-0-0-3
Course Objectives	• Understand the basics and history of cryptography. • Learn different encryption and decryption techniques. • Explore symmetric and asymmetric key methods. • Study key generation, distribution, and management. • Apply cryptography in real-world security systems.
Course Outcomes	CO1: Learn the basics of cryptography, including encryption and decryption techniques. CO2: Understand how symmetric and asymmetric encryption methods work. CO3: Grasp the concepts of PKI, including managing cryptographic keys and certificates. CO4: Explore how cryptography is used to secure data transmission over networks. CO5: Learn about hashing algorithms and digital signature techniques.
SLM UNITS(block pattern)	Block 1: Cryptography and its History (11 Hrs) Cipher Text, Encryption, Decryption, Caesar Cipher, Substitution Cipher, Transposition Ciphers, Block Ciphers, Cryptographic Keys, Symmetric/Asymmetric Cryptography. Block 2: Symmetric Keys (12 Hrs) Symmetric Algorithms, Data Encryption Standard (DES), Electronic Code Book Mode, Cipher Block Chaining Mode, Cipher Feedback Mode, Triple DES, IDEA, Advanced Encryption Standard (AES), RSA, El Gamal, Hashing, SHA, MD2, MD4, MD5, Digital Signatures, HMAC, Digital Signature Standard. Block 3: Public Key Infrastructure (11 Hrs) PKI, Creation and Distribution of Symmetric Keys, Asymmetric Key Management, Diffie-Hellman, Key Escrow, Certificates, Certificate Authorities, OCSP. Block 4: Trusted Platform Block (11 Hrs) Trusted Platform Block, PGP, S/MIME, SSL, TLS, HTTPS, Steganography, Digital Rights Management, Cryptographic Attacks.
Reference Books	• Gisin, N. et al. Quantum cryptography. • Delfs, H. Introduction to cryptography. • Salomaa, A. Public-key cryptography.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	1	-	-	2	1	-
CO2	3	3	2	2	1	-	2	-	-	2	2	-

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C03	3	3	3	2	1	-	2	-	-	2	2	-
C04	3	3	3	3	2	1	3	-	1	2	3	-
C05	3	3	3	3	2	-	3	-	1	2	2	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
C01	3	1	1	1
C02	3	2	2	1
C03	3	2	2	2
C04	3	3	3	3
C05	3	2	3	2



16. OLMCA28 - BlockChain Technologies

Attribute	Details
Course Code & Name	OLMCA28 - BlockChain Technologies (Core- Elective -4)
Credits	3 Credits
L-T-P-C	3-0-0-3
Course Objectives	• To introduce the fundamental concepts of blockchain, its history, and Bitcoin. • To provide a deep understanding of cryptographic foundations and consensus mechanisms. • To equip students with practical skills for developing smart contracts using Solidity. • To explore the blockchain ecosystem, DApps, use cases, and Web3.
Course Outcomes	CO1: Explain the core principles of blockchain, including decentralization, hashing, and Merkle trees. CO2: Compare and contrast different consensus protocols (PoW vs PoS). CO3: Develop, compile, and deploy a basic smart contract on Ethereum using Solidity. CO4: Analyze security vulnerabilities of blockchain and evaluate applications in various sectors. CO5: Evaluate blockchain security challenges and emerging trends such as regulation, Layer 2 solutions, CBDCs, and Web3 technologies.
SLM UNITS(block pattern)	BLOCK 1: Introduction and Key Concepts (11 Hrs) Introduction to Blockchain and Cryptocurrency: Overview, history, Bitcoin basics. Key Concepts of Blockchain: Decentralization, mining, hashing, digital signatures, consensus mechanism. BLOCK 2: Cryptography and Consensus (11 Hrs) Cryptographic Foundations: Public key cryptography, hash functions, Merkle trees. Consensus Protocols: Proof-of-Work, Proof-of-Stake, DPoS, Byzantine fault tolerance. Ethereum and Smart Contracts: Ethereum overview, EVM, gas fees. BLOCK 3: Smart Contracts and Applications (12 Hrs) Developing Smart Contracts: Introduction to Solidity, writing and deploying smart contracts. Decentralized Applications: DApps, permissioned vs permissionless. Blockchain Platforms and Use Cases: Bitcoin, Ethereum, Hyperledger, supply chain, DeFi, NFTs. BLOCK 4: Security and Future Trends (11 Hrs) Security and Challenges: Blockchain scalability, attacks (51%, Sybil), interoperability. Future Trends: Regulation and compliance, Layer 2 solutions, CBDC, Web3.
Reference Books	• Standard textbooks on Blockchain Technologies, Ethereum, and Smart Contracts as recommended.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	-	1	-	1	2	2	-
CO2	3	3	2	2	2	-	1	-	1	2	2	-
CO3	3	3	3	3	2	1	2	-	2	2	3	-
CO4	3	3	3	2	2	1	3	-	2	2	3	-
CO5	3	3	3	2	2	1	3	-	2	2	3	-

CO	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1
CO2	3	1	2	1
CO3	3	3	3	2
CO4	3	2	3	3
CO5	3	2	3	3

SEMESTER III

17. OLMCA31 - Web Application Framework

Attribute	Details
Course Code & Name	OLMCA31 - WEB APPLICATION FRAMEWORK (Core- Major)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• Set up and use the Node.js development environment, including installation and working with tools like NetBeans IDE. • To understand and use basic Node.js concepts and Blocks, and manage packages with Node Package Manager (NPM). • Build and debug Node.js applications, handle HTTP requests, work with files, manage events, and connect to databases. • Develop secure and scalable web applications using Express.js and RESTful APIs with routing, middleware, file handling, and authentication.
Course Outcomes	CO1: To set up and configure the Node.js development environment, including installation, working in REPL, and using the Node.js console and NetBeans IDE. CO2: To understand and apply basic Node.js concepts, such as primitive types, object literals, functions, buffers, and accessing the global scope. CO3: To effectively use Node.js Blocks, including core, local, and third-party Blocks, and create custom Blocks to enhance application functionality. CO4: To utilize the Node Package Manager (NPM) for installing, updating, and managing project dependencies both locally and globally. CO5: Develop web applications and RESTful APIs using the Express framework in Node.js and implement basic authentication and security mechanisms.
SLM UNITS(block pattern)	Block 1: Introduction to Node.js (12 Hrs) Features and advantages of Node JS, Traditional Web Server Model, Node.js Process Model, Asynchronous programming with Node.js, Types of applications that can be developed using Node.js. Setup Development Environment: Install Node.js on Windows, working in REPL, Node JS Console, Creating a Node File with JavaScript, Accessing a Node.js File Through the Command Line Interface, Using Node.js in Net-Beans IDE. Block 2: Node.js Blocks and Package Manager (12 Hrs) Node.JS Basics: Primitive Types, Object Literal, Functions, Buffer, Access Global Scope. Node.JS Blocks: Block, Block Types: Core Blocks, Local Blocks, Third Party Blocks, Block

Attribute	Details
	Exports. Using Blocks in a Node.js File, Using the Built in HTTP, URL, Query String Block, Creating a Custom Block. Node Package Manager: NPM, Installing Packages Locally, Adding dependency in package.json, Installing packages globally, Updating packages. Block 3: Web servers and Debugging applications (12 Hrs) Creating Web Server: Handling HTTP requests, Sending requests. File System: Reading, Writing a File, Writing a file asynchronously, Opening a file, deleting a file, Other IO Operations: Append, Rename, Truncate. File System Block with URL Block Create, Read, Remove a Directory. Debugging Node JS Application: Core Node.js debugger, Node Inspector, Built-in debugger in IDEs. Block 4: Events and Database Connectivity (12 Hrs) Events: EventEmitter class, Methods and Events of EventEmitter Class, returning event emitter, Extend EventEmitter Class, Passing Arguments and 'this' to listeners, Asynchronous and Synchronous call, handle Events only Once, Error Events. Database Connectivity: Connection string, Configuring, Working with insert, select command, Updating records, Deleting records, Drop tables, Ordered Result Set. Block 5: Express, Node.js and Restful API (12 Hrs) Express and Node JS: Introduction to Express Framework, Express Server Request-Response Routes, Route Parameters, Multiple Route Callback/Handler Functions, Methods of Response Object, Chaining Route Handlers, Send Static Files, Accept User Input, File Upload with Express, Manage Cookies, Send file as a response, Templates and Express. RestFul API: What is REST, Install PostMan, Get all articles, Post a new article, Delete request, Make a specific Get request, put operation on a specific record, patch request, deleting a specific record. Authentication and Security: Introduction, register and login, encryption, cookies and session.
Reference Books	• David Herron, Node.js Web Development, 7th Edition, Packt Publishing. • Brad Dayley & Brendan Dayley, Node.js, MongoDB and Angular Web Development, 2nd Edition. • Dhruti Shah, Node.JS Guidebook, BPB Publications. • Basarat Ali Syed, Beginning Node.js, A press.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	-	3	1	-	-	-	2	2
CO2	3	3	3	3	2	3	2	-	-	-	2	3
CO3	3	3	2	2	-	3	1	-	-	-	2	2
CO4	3	3	3	3	2	3	2	-	-	-	2	2
CO5	3	3	3	3	2	3	2	-	-	-	2	2

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-
CO2	3	2	2	-
CO3	2	2	1	-

CO	PSO1	PSO2	PSO3	PSO4
CO4	3	2	2	-
CO5	3	2	2	-

18. OLMCA32 - Software Testing

Attribute	Details
Course Code & Name	OLMCA32 - SOFTWARE TESTING (Core- Major)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To understand the fundamentals of software quality, key quality factors, and the components of Software Quality Assurance (SQA) systems. • To explore how quality assurance activities are integrated throughout the software project lifecycle, including various testing and review strategies. • To implement software testing techniques, design effective test cases, and analyze the role of automation tools and CASE tools. • To examine the infrastructure components that support software quality, such as documentation, training, certification, and corrective measures. • To apply software quality metrics, understand the cost of quality, and explore the basics of automated testing using Selenium WebDriver.
Course Outcomes	CO1: To understand the challenges of software quality and the role of management in ensuring software quality assurance (SQA). CO2: To identify and implement pre-project software quality components, including contract review and development of quality plans. CO3: To integrate quality activities throughout the project life cycle, utilizing various testing strategies such as Black Box and White Box testing. CO4: To execute the software testing process effectively, including test case design, automated testing, and ensuring the quality of external contributions. CO5: To apply software quality infrastructure components, including staff training, corrective actions, and documentation control, and understand the impact of CASE tools.
SLM UNITS (block pattern)	BLOCK 1: Foundations of Software Quality and Assurance (12 Hrs) Introduction to software Quality and Assurance: The software quality challenge, Software quality, Software quality factors, Management and its role in software quality assurance. Components of SQA: The components of the software quality assurance system – overview. Pre-project Software Quality Components: Contract review, Development and quality plans. BLOCK 2: SQA Integration and Testing Strategies (12 Hrs) SQA Components in the Project Life Cycle and Strategies: Integrating quality activities in the project lifecycle, Reviews, Software testing– strategies, BlackBox Testing and WhiteBox Testing. BLOCK 3: Test Implementation and Automation Tools (12 Hrs) Software Testing –Implementation: The Testing Process, Test Case Design, Automated Testing, Testing Life Cycle, Software Quality Implementation, Assuring the quality of software maintenance components, Assuring the quality of external Participants’ contributions, CASE tools and their effect on software Quality. BLOCK 4: Software Quality Infrastructure and Support Systems (12 Hrs) Software Quality Infrastructure Components: Procedures and work instructions, Staff training and certification, Corrective and preventive actions, Documentation control. BLOCK 5: Software Quality Metrics and Automation with Selenium (12 Hrs)

Attribute	Details
	Software Quality Metrics: Software Quality metrics, Cost of Quality. Introduction to Selenium, Selenium WebDriver, Selenium WebDriver Architecture, Selenium Test Life Cycle.
Reference Books	• Kshirsagar Naik and Priyadarshi Tripathy, Software Testing & Quality Assurance- Theory and Practice, Wiley Student edition. • William E. Perry, Effective Methods for Software Testing, WILEY, 3rd Edition. • Alan C. Gillies, Software Quality: Theory and Management, International Thomson Computer Press. • M G Limaye, Software Testing, Tata McGraw-Hill Education.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	-	1	-	-	-	2	2
CO2	2	2	3	3	3	-	2	-	-	1	2	3
CO3	2	3	3	3	3	1	2	-	-	1	3	3
CO4	2	3	3	3	3	1	3	-	-	2	3	3
CO5	2	3	3	2	3	-	2	-	-	1	3	3

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	2	-	1	3
CO2	3	-	1	3
CO3	3	1	2	3
CO4	3	1	2	3
CO5	3	-	2	3

19. OLMCA33 - E-Commerce Development using WordPress and WooCommerce

Attribute	Details
Course Code & Name	OLMCA33 - E-COMMERCE DEVELOPMENT USING WORDPRESS AND WOOCOMMERCE (Core Major)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To provide a comprehensive understanding of E-Commerce frameworks. • To familiarize students with the technological infrastructure. • To introduce the fundamentals of Content Management Systems (CMS). • To provide practical exposure to content creation, media management, and SEO optimization. • To encourage students to create dynamic and interactive websites.

Attribute	Details
Course Outcomes	CO1: Demonstrate the development of an E-Commerce website design and implementation. CO2: Demonstrate the WordPress dashboard design and general settings. CO3: Design and implement the enhanced web application and Security system in WordPress Software. CO4: Illustrate the use of the WooCommerce application to optimize the shopping experience. CO5: Demonstrate the WooCommerce application in the sales process and reporting process used to E-Commerce.
SLM UNITS (block pattern)	BLOCK 1: Introduction to E-Commerce and CRM Systems (12Hrs) Introduction to E-commerce: Electronic commerce of definitions and concepts– E-commerce Application - E-commerce vs E-business, advantages and disadvantages of E-commerce, Types of E-commerce in real world, Different E-commerce Platform, E-commerce: Business Models and Concepts, Security in E-commerce, Electronic Marketplaces, CRM: meaning, types of CRM, benefits and limitations of CRM, issues in CRM implementation, classifications of CRM applications, one-to-one marketing. BLOCK 2: WordPress Fundamentals: Settings, Posts, Media & Categories (12 Hrs) Introduction to WordPress software: Features – Advantages and Disadvantages – System requirements for WordPress – Dashboard – General Setting - Writing Settings – Discussion Settings - Categories: Add categories, edit categories, delete categories, arrange categories. Post: Add post, edit post, delete post, Preview post, publish post. Media: Media library, add media, insert media, Edit media. BLOCK 3: WordPress Pages, Plugins, User Roles & Site Security (12 Hrs) WordPress Pages: Add page, publish page, edit page, delete page. Tags: Add Tags, Edit Tags, Delete Tags. Links: Add link, delete link. Comments: Add comments, edit comments, Moderate comments. Plugins - User Roles – Appearance – Performance and Security: Backup the databases and files – Changing the database table prefix- Caching- Compression – Garbage collection – Security logins – SSL and SEO. BLOCK 4: Introduction to WooCommerce: Features, Setup, and Configuration (12 Hrs) WooCommerce: WooCommerce - advantages and disadvantages - Pros and Cons – Features – Setting up WooCommerce – Products settings tab – Tax settings tab – Checkout setting tab - Shipping settings tab – Accounts settings tab – Email settings tab – Setting up product categories - General data – Inventory data – Shipping data – Advanced data. BLOCK 5: Advanced Product and Order Management in WooCommerce (12 Hrs) Product Management in WooCommerce: Simple Products - Grouped Products - External/Affiliate Products - Variable Products – Virtual and Downloadable Products - Payment methods – Shipping methods – Shipping classes – WooCommerce themes – Sales orders – Sales reports – Customer reports – Stock reports – Tax reports.
Reference Books	• Efraim Turban, Judy Whiteside, David King. Introduction to Electronic Commerce and Social Commerce. Springer. • Tris Hussey. WordPress Absolute Beginner's Guide. Que Publishing. • Stephanie Leary. WordPress for Web Developers. A Press Publishing. • Robbert Ravens Bergen. Building ECommerce Solutions with WooCommerce. PACKT.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	3	1	2	-	-	-	2	2
CO2	3	3	2	1	-	1	2	-	-	-	2	2
CO3	3	2	1	-	-	2	2	-	-	-	2	1
CO4	2	3	3	3	3	2	3	-	-	1	3	3

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO5	2	2	2	2	3	1	2	-	-	1	3	3

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1
CO2	1	-	1	-
CO3	1	2	1	-
CO4	2	1	2	1
CO5	2	1	2	1

20. OLMCA34 - Cloud Computing Essentials with Kubernetes

Attribute	Details
Course Code & Name	OLMCA34 - CLOUD COMPUTING ESSENTIALS WITH KUBERNETES (Core- Elective -5)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To explain fundamental concepts, architecture, and global infrastructure of cloud computing using AWS as a foundational platform. • To demonstrate the configuration and management of cloud-based resources such as compute, storage, databases, and IAM services in AWS. • To illustrate the deployment and integration of applications using Google Cloud Platform (GCP) services including compute, storage, and networking. • To implement container orchestration, service exposure, and scaling strategies using Kubernetes in cloud-native environments. • To evaluate cloud architecture designs, monitor usage, and estimate service costs using AWS account management, billing tools, and best practices.
Course Outcomes	CO1: To understand and navigate the AWS Management Console, enabling the identification and utilization of core AWS services and their global infrastructure. CO2: To effectively implement and manage AWS Identity and Access Management (IAM) policies, roles, and security best practices. CO3: To deploy, manage, and scale applications using AWS compute services like EC2 and Lambda, and implement appropriate storage solutions such as EBS, EFS, and S3. CO4: To comprehend and utilize Google Cloud Platform's core services, including compute, storage, networking, and database offerings. CO5: To deploy, update, and scale containerized applications using Kubernetes, understanding its architecture and core concepts like pods, services, and volumes.
SLM UNITS(block pattern)	Block 1: Cloud Computing Concepts and AWS Fundamentals ((12 Hrs) Introduction to Developing on AWS and Global Infrastructure: Introduction to cloud computing, Advantages of the cloud, Introduction to AWS, moving to the AWS Cloud, AWS Global Infrastructure, AWS Services, and Service category, AWS management console click-through, and AWS Architecture. Block 2: IAM, Compute Services, and AWS Storage Tools ((12 Hrs)

Attribute	Details
	Identity and Access Management & Security: IAM Introduction, IAM Users & Groups, IAM Policies, AWS Access Key, CLI & SDK, IAM Roles, Security Tools, Shared Responsibility Model for IAM. Root user privileges, Secrets Manager Overview. Compute, Storage, Database, Analytics & Deployment: Compute: EC2 Basics, EC2 Instance Types, Security Groups, SSH, Serverless & AWS Lambda Overview. Storage: EBS Overview, AMI Overview, EBS Snapshot, EFS, AWS S3 Overview. Database & Analytics: RDS & Aurora Overview, DynamoDB, Redshift. Load Balance & Auto Scaling. Block 3: Cloud Application Development on GCP ((12 Hrs) Google Cloud Platform (GCP): Introduction to GCP: History, unique features. Understanding GCP Architecture: Core components including compute, storage, networking, and database services. GCP Compute Services: Google Compute Engine, Google Kubernetes Engine, App Engine, Cloud Functions. GCP Storage and Database Services: Google Cloud Storage, Cloud SQL, Bigtable. GCP Networking Services: VPC, Cloud Load Balancing, Cloud CDN. Block 4: Kubernetes for Container Management ((12 Hrs) Kubernetes: Introduction to Kubernetes, automating deployment, scaling, and management of containerized applications. Understanding Kubernetes Architecture: Master and node components, pods, services, and volumes. Deploying Applications with Kubernetes. Working with Kubernetes Services. State Persistence in Kubernetes: Volumes and Persistent Volume Claims. Block 5: Cloud Cost Management and Architecture Best Practices ((12 Hrs) Account Management, Billing and Architecting: Organizations Overview, Billing: Pricing Models, Compute Optimizer, Billing and Costing Tools, Estimating Costs in the Cloud, Saving Plans Tracking and Monitoring Costs in the Cloud. AWS Architecting: AWS Well-Architected Frameworks, 6-Pillars.
Reference Books	• Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Cloud computing: Principles and Paradigms, John Wiley & Sons. • Michael Miller, Cloud Computing: Web-Based Applications That change the way You Work and Collaborate Online, Pearson Education. • Kumar Saurabh, Cloud Computing, Wiley Pub.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	2	2	1	1	2	1	2	2
CO2	2	3	2	-	2	3	2	1	2	2	3	3
CO3	2	2	2	-	2	3	2	1	2	2	2	2
CO4	2	3	3	2	3	3	3	1	2	2	3	3
CO5	2	3	3	2	3	3	3	1	2	2	3	3

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1
CO2	1	2	1	1
CO3	1	2	1	1
CO4	2	3	2	1

CO	PSO1	PSO2	PSO3	PSO4
CO5	2	3	2	1

21. OLMCA35 - Internet of Things

Attribute	Details
Course Code & Name	OLMCA35 - INTERNET OF THINGS (Core- Elective -5)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	• To introduce the fundamental concepts, architecture, and building blocks of the Internet of Things (IoT). • To understand IoT communication models, networking protocols, and enabling technologies. • To provide knowledge of sensors, actuators, IoT hardware platforms, and interfacing techniques. • To develop skills in designing, building, and deploying IoT applications for real-world problems. • To make students aware of IoT security, privacy issues, and future research directions in the IoT ecosystem.
Course Outcomes	CO1: To understand the fundamentals of IoT, including its genesis, impact, and the convergence of IT and IoT, and to identify the challenges and drivers behind IoT network architecture and design. CO2: To recognize and work with various smart objects, sensors, actuators, and sensor networks, and understand the criteria for connecting smart objects using different IoT access technologies. CO3: To comprehend the role of IP as the network layer for IoT, optimize IP for IoT applications, and understand various application protocols and transport methods used in IoT. CO4: To gain hands-on experience with IoT physical devices such as Arduino UNO, including software installation, programming fundamentals, and practical applications. CO5: To develop skills in using Raspberry Pi for IoT applications, including hardware configuration, programming with Python, and implementing a wireless temperature monitoring system, and understand the architecture and security aspects of smart cities.
SLM UNITS (block pattern)	Block 1: Introduction to IoT ((12 Hrs) What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack Block 2: Smart Objects ((12 Hrs) Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies. Block 3: IoT Software and Data Processing ((12 Hrs) IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods. Block 4: IoT Application Development ((12 Hrs) Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.

Attribute	Details
	Block 5: Security, Privacy, and Future Trends ((12 Hrs) IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.
Reference Books	1 Ashton, K. (2009). That ‘internet of things’ thing. RFID journal, 22(7), 97-114. 2 Da Xu, L., He, W., & Li, S. (2014). Internet of things in industries: A survey. IEEE Transactions on industrial informatics, 10(4), 2233-2243. 3 Ray, P. P. (2018). A survey on Internet of Things architectures. Journal of King Saud University-Computer and Information Sciences, 30(3), 291-319. 4. Atzori, L., Iera, A., & Morabito, G. (2010). The internet of things: A survey. Computer networks

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	2	2	1	1	2	1	2	2
CO2	2	3	2	-	2	3	2	1	2	2	3	3
CO3	2	2	2	-	2	3	2	1	2	2	2	2
CO4	2	3	3	2	3	3	3	1	2	2	3	3
CO5	2	3	3	2	3	3	3	1	2	2	3	3

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1
CO2	1	2	1	1
CO3	1	2	1	1
CO4	2	3	2	1
CO5	2	3	2	1

22. OLMCA36 - Machine Learning

Attribute	Details
Course Code & Name	OLMCA36 - MACHINE LEARNING (Core- Elective -6)
Credits	4 Credits

Attribute	Details
L-T-P-C	3-0-2-4
Course Objectives	- To introduce the theoretical foundations and practical techniques of machine learning. - To enable students to use modern machine learning tools for data analysis and modeling. - To train students in evaluating, selecting, and optimizing machine learning models. - To provide exposure to both supervised and unsupervised learning paradigms. - To explore neural networks and deep learning as advanced ML approaches.
Course Outcomes	CO1: To learn the basics of machine learning, its types, and how it compares to human learning, along with practical tools and applications. CO2: To understand and perform key machine learning tasks like data pre-processing, model selection, training, evaluation, and improving model performance. CO3: To become skilled in feature engineering techniques and understand the significance of Bayesian methods in concept learning. CO4: To master supervised learning methods such as classification and regression, including common algorithms and their practical applications. CO5: To gain proficiency in neural network architectures, learning mechanisms like backpropagation, and foundational deep learning concepts for solving complex real-world problems.
SLM UNITS (block pattern)	Block 1: Introduction to Machine Learning (12 Hrs) Human learning versus machine learning, types of machine learning, applications of machine learning, tools for machine learning, Machine Learning Activities, Data structures for machine learning, Data Pre-processing, selecting a model, training a model, model representation and interpretability, evaluating performance of a model, improving performance of a model. Block 2: Feature Engineering & Bayesian Learning (12 Hrs) Feature Engineering, Bayesian Concept Learning: Introduction to feature engineering, feature transformation, feature subset selection, Importance of Bayesian methods, Bayes' theorem, concept learning through Bayes' theorem, Bayesian Belief Network. Block 3: Supervised Learning (12 Hrs) Supervised Learning – Classification, Regression: Example of supervised learning, classification model, classification learning steps, common classification algorithms, example of regression, common regression algorithms. Block 4: Unsupervised Learning (12 Hrs) Unsupervised Learning – Clustering, pattern finding using association rules: Unsupervised learning versus supervised learning, applications of unsupervised learning, clustering and its types, Apriori algorithm for association rule learning. Block 5: Neural Networks & Deep Learning (12 Hrs) Neural Network: Understanding the biological neuron, exploring artificial neuron, types of activation functions, early implementation of artificial neural network, architectures of neural network, learning process in artificial neural network, backpropagation, Overview of Deep Learning.
Reference Books	- Alpaydin, E. (2021). Machine Learning. MIT Press. - Mohri, M., Rostamizadeh, A., & Talwalkar, A. (2018). Foundations of Machine Learning. MIT Press. - Jordan, M. I., & Mitchell, T. M. (2015). Machine Learning: Trends, Perspectives, and Prospects. Science.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	1	1	1	2	2
CO2	3	2	-	-	-	1	1	1	2	2	2	2

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3	3	2	-	-	1	1	1	1	2	2	2	2
CO4	3	2	1	-	1	1	1	2	2	2	2	2
CO5	3	2	1	-	1	1	1	1	2	2	2	2

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	2
CO2	-	-	1	2
CO3	-	-	1	2
CO4	-	-	1	2
CO5	1	-	1	3

23. OLMCA37 - Cyber Forensics

Attribute	Details
Course Code & Name	OLMCA37 - CYBER FORENSICS (Core- Elective -6)
Credits	4 Credits
L-T-P-C	3-0-2-4
Course Objectives	● Introduce students to the world of cybercrimes and digital evidence. ● Teach the fundamentals of computer and network forensics. ● Explain how to identify, collect, preserve, and analyze digital evidence. ● Provide knowledge of legal and ethical issues in cyber forensics.
Course Outcomes	CO1: To understand different cybercrimes and why computer forensics is important in solving them. CO2: To learn how to investigate cybercrimes step-by-step and collect evidence properly. CO3: To know how to respond to cyber incidents effectively and understand the roles of incident response teams. CO4: To study real cases of cybercrimes and learn from them. CO5: To be able to conduct computer forensic investigations and write clear reports that follow legal rules.
SLM UNITS (block pattern)	Block 1: Introduction to Digital Forensics (12 Hrs) Computer Crime, Different Types of Cyber Crimes, Roles of a Computer in a Crime, The Computer Forensic Objective, Importance of Computer Forensics, The Computer Forensics Specialist, Law enforcement, Categories of Computer Forensics, Corporate Categories of Computer Forensics, Theft of Trade Secrets, Employee Malfeasance, External Breach, Internal Breach Block 2: Methodology of Computer Forensics (12 Hrs) Hard Disks and File Systems, Computer Forensic Life Cycle - Defining a Process, Identification, Collection, Preservation & Analysis. Chain of Custody, validating – Integrity Check using Hashing, Proper Evidence Handling, Gathering of Evidence, Completeness of Investigation, Legal

Attribute	Details
	Compliance, Report Writing, Operating System Forensics, Mobile Forensics. Block 3: Evidence Retrieval (12 Hrs) Computer memory, SSD, Linux and Mac file system, Incident Response Procedures and Frameworks, First Responder Procedure, Importance of Chain of Custody, Windows Recycle Bin Analysis, Windows Event Log Analysis, Volatile and non-volatile data, Investigating Web Attacks, Email Crimes Block 4: Incident Response (12 Hrs) Introduction to incident management, Incident management - NIST SP 800- 61 perspectives, Stages in Incident management, Initial preparation required for incident response, Need for incident response team, CERT (Computer Emergency Response Team), CSIRT (Computer Security Incident Response Team), Roles and responsibilities of Incident response team Block 5: Case Studies (12 Hrs) Mr. Arun Jatley vs. Network Solutions Private, A. Shankar vs State Rep, Gouresh Mehra vs The State Rep (Harassment by email), Rajiv Dinesh Gadkari v. Nilangi Rajiv Gadkari, (Uploading vulgar photographs), Indiabulls Securities Ltd vs. Amulya Ratan Dhar, Abhinav Gupta vs. JCB India Limited and Ors, All Kerala Online Lottery Dealers vs. State of Kerala.
Reference Books	1. Brinson, A., Robinson, A., & Rogers, M. (2006). A cyber forensics ontology: Creating a new approach to studying cyber forensics. digital investigation, 3, 37-43. 2. Greenfield, R. S. (2002). Cyber forensics: a field manual for collecting, examining, and preserving evidence of computer crimes. Auerbach Publications. 3. Baggili, I., & Breitingner, F. (2015, March). Data sources for advancing cyber forensics: what the social world has to offer. In 2015 AAAI Spring Symposium Series.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	1	1	1	2	2
CO2	3	2	-	-	-	1	1	1	2	2	2	2
CO3	3	2	-	-	1	1	1	1	2	2	2	2
CO4	3	2	1	-	1	1	1	2	2	2	2	2
CO5	3	2	1	-	1	1	1	1	2	2	2	2

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	2
CO2	-	-	1	2
CO3	-	-	1	2
CO4	-	-	1	2
CO5	1	-	1	3

SEMESTER IV

24. OLMCA41 - Internship Embedded Project work & Viva Voce (or) Research work, Dissertation & Thesis

Attribute	Details
Course Code & Name	OLMCA41 - INTERNSHIP EMBEDDED PROJECT WORK & VIVA VOCE (OR) RESEARCH WORK, DISSERTATION & THESIS (Core- Major)
Credits	20 Credits
L-T-P-C	0-0-60-20
Course Objectives	• To provide hands-on industry experience or in-depth academic research opportunities. • To allow students to apply theoretical knowledge to practical, real-world problems. • To develop professional documentation, presentation, and software engineering skills.
Course Outcomes	CO1: Understand the importance of effective communication skills, both verbal and written, and apply them in professional environments for clear and concise interactions. CO2: Analyze and develop problem-solving strategies to address real-world workplace challenges, demonstrating critical thinking and decision-making abilities. CO3: Apply teamwork and collaboration techniques, effectively contributing to group efforts while understanding the dynamics of professional relationships and roles. CO4: Develop leadership qualities, including decision-making and motivating teams, to handle professional responsibilities and drive organizational success. CO5: Demonstrate effective time management, organizational, and self-motivation skills, ensuring productivity and meeting deadlines in a professional environment.
SLM UNITS(block pattern)	FORMAT OF PROJECT SYNOPSIS The project proposal should contain: Title, Introduction and objectives, Project Category, Tools/Platform/Hardware and Software Requirements, Analysis (DFDs, ER Diagrams/Class Diagrams, Database Design). A complete structure including: Number of Blocks and their description, Data Structures, Process logic, Testing process, Reports generation. Details on Industry/Client Defined vs User Defined Project, Limitations, Future scope, and enhancements. THE PROJECT REPORT The project report shall contain: Introduction, Objectives, Tools/Environment used. Requirement Analysis Document (including SRS, E-R diagrams, Data Flow Diagrams, Data dictionary). Design Document (System & Detailed - Modularization details, Data integrity, Procedural design, User interface design). Program code (well indented, complete error handling). Testing (Test case designs for BLOCK, Integration, and System testing; Reports of testing outcomes). Input and Output Screens, Limitations, Future scope, and Bibliography. EVALUATION SCHEME Report Evaluation (120 marks): Innovativeness and utility (20), Related studies/Adequacy (20), Project plan & implementation (Analysis - 15, Design - 15, Implementation - 20, Testing - 15), Other mandatory documents (15). Viva-Voce (80 marks): Live Demonstration/Software execution/Dry runs (40), Question and Answer/Soft Skills (40).
Reference Books	• Subject-specific technical documentation and organizational manuals as applicable to the student's project domain.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	-	-	1	-	2	-
CO2	2	3	3	-	-	-	-	-	-	-	-	-

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3	-	-	-	-	-	3	-	-	-	2	-	-
CO4	-	-	-	-	-	2	-	-	-	-	3	-
CO5	-	-	-	-	-	-	-	-	-	3	2	-

CO-PSO Mapping Matrix

CO	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	3
CO2	2	2	3	-
CO3	-	-	-	3
CO4	-	-	-	3
CO5	-	2	2	-