

Amrutvahini Sheti and Shikshan Vikas Sanstha's

AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)

Amrutnagar, Ghulewadi, Sangamner – 422608



Curriculum Structure and Syllabus Of

M. Tech. Computer Engineering

w.e.f

S.Y. M. Tech: 2026 – 2027



Approved By:

Senkar

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

R. Ganeshkar

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Amrutvahini College of Engineering, Sangamner
(An Autonomous Institute)
Department of Computer Engineering

**National Education Policy (NEP)-2020 Compliant
Curriculum**



MTech (Computer Engineering)

(With effect from Academic Year 2026-27)

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**S.Y MTech (Computer Engineering)**

Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)			Examination Scheme and Marks					Credits			
			Theory	Tutorial	Practical	CCE*	End-Sem	Term work	Practical	Oral	Theory	Tutorial	Practical	Total
Semester III														
R25-MCO-MOOC/ SWAYAM -601	Program Elective Course	Program open elective courses based on MOOC / SWAYAM Platform. Data Science with Python (MOOC Online Course)	4	-	-	-	50	-	-	-	4	-	-	4
R25-MCO-OJT/II-602	On Job Training/ Internship	On Job Training/ Internship	-	-	8	-	-	100	-	-	-	-	6	6
R25-MCO -RMP-603	Major Core Course	Research Methodology & Publication	4	-	-	50	50	-	-	-	4	-	-	4
R25- MCO -RP I-604	Research Project	Research Project-I	-	-	16	-	-	50	-	-	-	-	8	8
R25-MCO -CTS-605	Civic tech Skills Course	Introduction to Constitution of India	-	-	-	-	-	-	-	-	-	-	-	2
Total			8	-	24	50	100	150	-		8	-	14	24

CCE*: Comprehensive Continuous Evaluation

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**S.Y MTech (Computer Engineering)**

Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)			Examination Scheme and Marks					Credits			
			Theory	Tutorial	Practical	CCE*	End-Sem	Term work	Practical	Oral	Theory	Tutorial	Practical	Total
Semester IV														
R25- MCO - SBRP-606	Technical Seminar	Seminar based on Research Project	-	-	8	-	-	50	-	50	-	-	4	4
R25- MCO -RP II- 607	Research Project	Research Project-II	-	-	24	-	-	150	-	50		-	18	18
R25-MCO-CTS-608	Civic tech Skills Course	Cyber Security												4
Total			-	-	32	-	-	200	-	100	-	-	22	26

CCE*: Comprehensive Continuous Evaluation

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Pro-gram:	S. Y. M. Tech			Semester:	III		
Course:	Data Science with Python (MOOC/SWAYAM Online Course)			Course Code:	R25-MCO-MOOC/SWAYAM-601		
Teaching Scheme(Hrs/week)			Credits	Examination Scheme			
Lecture	Practical	Tutorial		CCE	ESE	TW	PR
04 Hrs/Week	-	-	04	-	50	-	-

Course Content

Course Description and: This course is an online MOOC offered through NPTEL/SWAYAM for S.Y. M.Tech (Computer Engineering) students. It focuses on applying Python programming to real-world data science challenges. The course covers Python fundamentals, data handling with Pandas and NumPy, data visualization, statistical analytics, and introductory machine learning case studies. Students complete the course on the NPTEL/SWAYAM platform and earn a nationally recognized certificate worth 3 credits, with 1 additional credit awarded by an assigned mentor based on monitoring course progress.

Course Relevance: In the era of Big Data, AI, and data-driven decision-making, proficiency in Python-based data science is essential for computer engineers. This MOOC bridges the gap between theoretical knowledge and practical industry skills. It equips students to explore datasets independently, visualize trends, derive insights, and build predictive models. Instruction from premier IIT faculty on the NPTEL/SWAYAM platform ensures quality, and the resulting nationally recognized certificate adds significant value to students academic and professional profiles.

Prerequisite: Basic knowledge of any programming language (C/C++/Java), fundamentals of Mathematics and Statistics, and familiarity with general computer operations. Exposure to data structures and algorithms is desirable. No prior data science experience is required.

Bridge Content: - Introduction to Python syntax, variables, control flow, and functions. Basic NumPy array operations and matrix computations. Overview of probability and descriptive statistics. Concepts of data types, file handling, and data preprocessing fundamentals.

Course Objectives:

- To understand Python programming constructs and apply them to data science workflows.
- To develop skills in data collection, cleaning, and preprocessing using Pandas and NumPy.
- To visualize data effectively using Matplotlib, Seaborn, and other Python libraries.
- To apply statistical methods and exploratory data analysis techniques to real-world datasets.
- To explore introductory machine learning concepts and hands-on case studies using Scikit-learn.

Course Outcomes: After learning the course, students will be able to

CO	Course Outcome	Bloom's Level
CO1	Explain Python programming fundamentals and apply them to data science tasks including data loading, manipulation, and scripting.	2
CO2	Apply data wrangling and preprocessing techniques using Pandas and NumPy to handle real-world datasets effectively.	3
CO3	Construct meaningful data visualizations using Matplotlib and Seaborn to communicate data insights effectively.	4
CO4	Analyze datasets using descriptive statistics, hypothesis testing, and exploratory data analysis (EDA) methods.	3

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



CO5	Apply introductory machine learning algorithms from Scikit-learn to solve classification and regression problems.	3
MOOCs Links and additional reading material:		
1. Data Science Using Python (SWAYAM): https://onlinecourses.swayam2.ac.in/e-learning/preview/ini24_cs02 2. Python for Data Science (NPTEL): https://nptel.ac.in/courses/106106212 3. Data Analytics with Python (NPTEL): https://nptel.ac.in/courses/106107220		

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Program:	S. Y. M. Tech			Semester:	III		
Course:	On Job Training/ Internship			Course Code:	R25-MCO-OJT/II-602		
Teaching Scheme(Hrs/week)			Credits	Examination Scheme			
Lecture	Practical	Tutorial		CCE	ESE	TW	PR
-	08 Hrs	-	06	-	-	100	-
Course Content							

Course Description and:

Internship / On Job Training (IN/OJT) is an experiential learning course designed to provide M.Tech. Computer Engineering students with practical exposure to industry, research, innovation, and entrepreneurship environments. The course enables students to apply advanced theoretical concepts to real-world engineering problems through hands-on training, project execution, product development, research activities, and interdisciplinary collaboration. Students undergo structured training in industries, startups, research laboratories, incubation centers, government organizations, or approved online platforms under the guidance of faculty and industry mentors. The internship focuses on emerging technologies such as Artificial Intelligence, Machine Learning, Data Science, Cloud Computing, Cybersecurity, IoT, DevOps, AR/VR, Intelligent Systems, and Sustainable Computing.

The course emphasizes innovation, professional ethics, communication skills, teamwork, project management, research aptitude, and Industry 5.0 practices while preparing students for professional careers, higher research, startups, and lifelong learning.

Course Relevance:

The Internship / On Job Training course is highly relevant in the context of modern engineering education, Industry 5.0 requirements, and Outcome-Based Education (OBE). The course bridges the gap between academic learning and industrial expectations by exposing students to real-time engineering practices, modern development environments, and research methodologies.

The course helps students to:

- Gain industry-oriented practical exposure and hands-on technical skills.
- Understand organizational workflow, professional ethics, and industrial standards.
- Develop innovative solutions using advanced and emerging technologies.
- Improve employability, entrepreneurship, and research capabilities.
- Enhance communication, teamwork, leadership, and project management skills.
- Build professional portfolios, research publications, patents, and startup ideas.
- Address societal and sustainable development challenges using computing technologies.

The course aligns with NEP 2020, AICTE internship policy, NBA accreditation requirements, and the future demands of digital transformation and intelligent systems.

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Prerequisite: Students enrolling for Internship / On Job Training should have:

1. Fundamental knowledge of Computer Engineering subjects and programming concepts.
2. Understanding of software development methodologies, databases, networking, operating systems, and modern computing tools.
3. Basic knowledge of emerging technologies such as AI/ML, Cloud Computing, IoT, Cybersecurity, or Data Analytics.
4. Familiarity with software tools, programming environments, version control systems, and documentation practices.
5. Good communication skills, professional ethics, teamwork attitude, and willingness for self-learning.
6. Completion of prerequisite coursework, mini projects, seminars, or laboratory work as prescribed by the department.

Bridge Content: - Before commencement of the Internship / On Job Training, students shall undergo bridge sessions to enhance their technical, professional, and industry-readiness skills. The bridge content includes

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



advanced programming practices, modern software development tools, GitHub and version control, cloud and AI fundamentals, research methodology, technical documentation, communication skills, teamwork, project management, professional ethics, innovation, entrepreneurship, and Industry 5.0 awareness. These sessions help students adapt effectively to industrial, research, startup, and multidisciplinary working environments.

Course Objectives:

To provide practical exposure to real-world industrial, research, entrepreneurial, and societal problems through experiential learning.

To bridge the gap between academic knowledge and industry expectations using advanced technologies and innovative practices.

To develop technical competency in emerging domains such as Artificial Intelligence, Data Science, Cloud Computing, Cybersecurity, IoT, AR/VR, and Intelligent Systems.

To enhance professional communication, leadership, teamwork, project management, and ethical practices in engineering environments.

To encourage innovation, research aptitude, startup culture, patent development, and product-oriented thinking.

To cultivate self-learning ability, critical thinking, and problem-solving skills required for Industry 5.0.

Course Outcomes: After learning the course, students will be able to

CO	Course Outcome	Bloom's Level
CO1	Analyze and identify real-world engineering problems in industrial or research environments.	4
CO2	Design and develop innovative solutions using modern computing technologies and tools.	6
CO3	Apply advanced technical knowledge in multidisciplinary domains for practical applications.	3
CO4	Demonstrate effective teamwork, leadership, communication, and project management skills.	3
CO5	Prepare professional reports, technical documentation, research Publications, and presentations.	6
CO6	Demonstrate innovation, entrepreneurship, ethical responsibility, and lifelong learning attitude.	5

Course Content

Innovative Internship Components

A) Flexible Internship Modes

Students may opt for any one or combination of the following:

- Industry Internship
- Research Internship
- Startup Internship
- Innovation/Product Development Internship
- Open-Source Contribution Internship
- Entrepreneurship/Incubation Internship
- Social/Community Technology Internship
- Remote Global Internship
- Patent and Prototype Development Internship

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**B) Emerging Technology Domains**

Students may work in areas including but not limited to:

- Artificial Intelligence & Generative AI
- Machine Learning & Deep Learning
- Data Science & Big Data Analytics
- Cloud Computing & DevOps
- Cybersecurity & Digital Forensics
- Blockchain & Web3
- Internet of Things (IoT)
- Edge AI & Intelligent Systems
- Augmented Reality / Virtual Reality
- Robotics & Automation
- Smart Agriculture & Healthcare Systems
- UAV and Drone Technologies
- Sustainable Computing & Green Technologies

Internship Duration and Academic Requirements

- The internship shall be completed in a minimum duration of 8 weeks.
- Students are expected to spend approximately 12 hours per week resulting in around 220–240 total internship hours.
- The internship may be completed through industries, research institutes, government organizations, AICTE/UGC approved platforms, startups, incubation centers, or self-initiated innovation projects approved by the department.
- Students must maintain regular interaction with faculty and industry mentors throughout the internship duration.

Internship Workflow

Phase	Activities
Phase I	Orientation, Mentor Allocation, Problem Identification
Phase II	Literature Survey, Requirement Analysis, Technology Selection
Phase III	Design, Development, Experimentation, and Implementation
Phase IV	Testing, Validation, Deployment, and Optimization
Phase V	Documentation, Presentation, Demonstration, and Evaluation

Suggested Weekly Activities

Week	Activities
Week 1	Organization induction, domain understanding, problem statement definition
Week 2	Literature review, requirement analysis, planning
Week 3	Architecture design and technology stack finalization
Week 4	Prototype or module development
Week 5	Testing, debugging, experimentation

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Week 6	Deployment and optimization
Week 7	Documentation, GitHub portfolio preparation
Week 8	Final report submission, presentation, and viva voce

Mandatory Deliverables

Students shall submit the following:

1. Joining Report
2. Weekly Progress Log / Daily Diary
3. Internship Completion Certificate
4. Technical Internship Report
5. Presentation and Demonstration
6. GitHub Repository / Portfolio Link
7. Industry Mentor Feedback Form

Innovation-Based Deliverables (Any Two)

Students are encouraged to complete any two of the following:

- Research Paper
- Patent Draft
- Product Prototype
- Mobile/Web Application
- Open-Source Contribution
- Startup Business Model
- AI/ML Model Deployment
- Technical Blog or Video Tutorial
- Dataset Preparation
- Cloud Deployment Project

Faculty Supervision

1. Each student/group shall be assigned one internal faculty mentor and one external industry/research mentor.
2. Faculty mentors shall monitor the progress through regular reviews, presentations, and interaction meetings.
3. Industry mentors shall provide technical guidance, performance evaluation, and practical exposure.

Documentation and Reporting

Students shall maintain:

- Daily/Weekly Activity Diary
- Attendance Record
- Work Progress Reports
- Code Repository / Design Documents
- Final Internship Report
- Research/Patent/Innovation Evidence (if applicable)

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**Suggested Learning Platforms and Tools**

- GitHub
- GitLab
- Kaggle
- Hugging Face
- Google Colab
- AWS Academy
- Microsoft Azure
- Docker & Kubernetes
- Jira / Trello / Notion
- IEEE Xplore / Springer / Scopus

Expected Learning Outcomes

At the end of the internship, students shall be able to:

- Gain industry-oriented practical exposure.
- Develop innovative and research-oriented solutions.
- Build professional portfolios and technical competency.
- Improve employability and entrepreneurial skills.
- Demonstrate readiness for Industry 5.0 environments.

CO-PO mapping table:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO8	PO9	PO10	PO11	PSO 01	PSO 02	PSO 03
CO1	3	1	2	2	1	1	—	1	1	3	3	2	1
CO2	3	2	3	3	1	1	1	2	3	3	3	3	2
CO3	3	1	3	3	1	1	—	1	2	3	3	3	2
CO4	1	2	2	1	2	1	3	3	2	2	1	1	3
CO5	1	3	2	1	2	—	1	3	1	1	1	1	2
CO6	2	1	2	1	3	2	2	2	3	3	2	2	3
Avg.	2.2	2	2.3	1.8	1.7	1.2	1.8	2	2	2.5	2.2	2	2.2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**Assessment Pattern**

Component	Marks
Weekly Progress Evaluation	15
Industry Mentor Assessment	20
Technical Implementation / Innovation	20
Internship Report & Documentation	15
Presentation & Demonstration	10
Viva-Voce Examination	10
Portfolio / GitHub / Research Contribution	10

Evaluation Rubrics

Criteria	Weightage
Technical Knowledge and Skills	25%
Innovation and Creativity	20%
Problem Solving Ability	15%
Communication and Teamwork	15%
Documentation and Presentation	15%
Professional Ethics and Discipline	10%

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Pro-gram:	S. Y. M. Tech	Semester:	III
Course:	Research Methodology & Publication	Course Code:	R25-MCO-RMP-603
Teaching Scheme(Hrs/week)		Credits	
Lecture	Practical	Tutorial	Examination Scheme
04	-	-	CCE ESE TW PR
Hrs/Week			50 50 - -
Course Content			

Course Description and:

The Research Methodology & Publication course provides a foundation for conducting rigorous and impactful research in the field of Computer Engineering. It also provides a comprehensive framework for conducting systematic scientific investigations and publishing results. It covers research design, data collection, analysis, and ethical publishing practices, designed to train post-graduate students to execute independent research.

Course Relevance:

In this era of rapid technological advancements, the ability to design, execute, and critically evaluate research is paramount. It will equip students with the necessary tools and knowledge to systematically investigate complex problems, develop innovative solutions, and contribute to the advancement of computer science. This course is foundation and the roadmap for mandatory research thesis, technical paper publications, and R&D roles in industry. It teaches students to systematically approach research problems rather than using trial-and-error methods.

Prerequisite: Basic understanding of algorithm analysis, data structures, and operating systems, Discrete

Mathematics, Probability Theory, and Statistics is crucial for data analysis and modeling. Ability to understand technical papers and write reports.

Bridge Content: - Algorithm design, performance evaluation, experimental, qualitative/quantitative, and simulation-based methodologies.

Course Objectives:

- To understand basic concepts of research and its methodologies
- To define appropriate research problem and parameters
- To acquaint with the tools, techniques, and processes of doing research
- To learn the effective report writing skills and allied documentations
- To become aware of the ethics in research, academic integrity and plagiarism.

Course Outcomes: After learning the course, students will be able to

CO	Course Outcome	Bloom's Level
CO1	Define research and explain its essential characteristics with examples from engineering and science fields	2
CO2	Identify and apply different types of research (basic, applied, qualitative, quantitative, exploratory, descriptive, etc.) to specific problems.	3

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



CO3	Analyze the outcomes of research such as publications, patents, and technological contributions, and understand their societal and industrial impacts.	4
CO4	Apply analysis techniques for effective experimental data analysis and interpretation of results.	3
CO5	Apply the basics of Intellectual Property Rights (IPR) to safeguard innovative research and prevent unethical practices	3
Course Content		
Unit 1	Definition and objectives of Research	12 Hrs.
Definition and objectives of Research, Various Steps in Research process, Developing a research question-Choice of a problem, Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle. Philosophy and validity of research. Various functions that describe characteristics of research such as systematic, valid, verifiable, empirical and critical approach.		
Unit 2	Research Types	12 Hrs.
Pure and applied research. Descriptive and explanatory research. Qualitative and quantitative approaches. Formulating the Research Problem, Literature Review, Surveying, synthesizing, critical analysis, reading materials, reviewing, rethinking, critical evaluation, interpretation, Research Purposes, Developing the objectives, Preparing the research design including sample Design, Sample size.		
Unit 3	Research Outcome	12 Hrs.
Relevance, interest, available data, choice of data, Analysis of data, Generalization and interpretation of analysis, Preparation of the Report on conclusions reached, Testing validity of research outcomes, Suggestions and recommendations, identifying future scope.		
Unit 4	Analysis Techniques	12 Hrs.
Basic principle of Analysis of Variance, ANOVA Technique, Setting up Analysis of Variance Table, short-cut method for oneway ANOVA, Coding method, Two-way ANOVA, ANOVA in Latin-square design, analysis of co-variance (ANCOVA), assumptions in ANCOVA. Academic Ethics: Plagiarism, exposure on anti-plagiarism tools.		
Unit 5	Technical Writing and IPR	12 Hrs.
Academic writing, sources of information, assessment of quality of journals and articles, writing scientific report, structure and component of research report, types of report – technical reports and thesis, SCOPUS Index, citations, search engines beyond google, impact factor, H-Index. IPR: What is IPR? importance of patents, types of IPR, process of patent.		
Textbooks:		
1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers' Distributors. 2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited. 3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd.ed), Singapore, Pearson Education. 4. Neeraj Pandey, Intellectual Property Rights ,1st Edition, PHI 5. Shrivastava, Shenoy& Sharma, Quantitative Techniques for Managerial Decisions, Wiley		
Reference Books:		
1. Goode W J &Hatt P K, Methods in Social Research, McGraw Hill 2. Basic Computer Science and Communication Engineering – R. Rajaram (SCITECH).		

Approved By:

Chairman
 BoS, Computer Engineering
 Amrutvahini College of Engineering, Amrutnagar
 Sangamner-422608

Chairman
 Academic Council
 Amrutvahini College of Engineering, Amrutnagar
 Sangamner-422608



MOOCs Links and additional reading material:

1. https://www.youtube.com/playlist?list=PLm-zueI9b64QGMcfm5Ckv_8W5Z1d3vMBY
2. https://onlinecourses.swayam2.ac.in/cec20_hs17/preview
3. https://onlinecourses.nptel.ac.in/noc23_ge36/preview [NPTEL+1](#)

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Pro-gram:	S. Y. M. Tech			Semester:	III		
Course:	Research Project I			Course Code:	R25-MCO-RP I-604		
Teaching Scheme(Hrs/week)			Credits	Examination Scheme			
Lecture	Practical	Tutorial		CCE	ESE	TW	PR
-	16 Hrs/Week	-	08	-	-	50	-
Course Content							

Course Description and:

•The master's degree culminates in a research project of the student's own design. This project is documented by a final research report or dissertation. The student's work is guided by an academic supervisor.

- It also is supported by a variety of key skill programs. Students are expected to construct a research project that includes original research, deliberate and well considered methodological choices, and shows relevance to significant conversations within the discipline.
- The dissertation should represent the very best research and analysis a student can produce.

Course Relevance:

This course is highly relevant for developing advanced research, analytical, and problem-solving skills. It enables students to design and execute independent research projects while applying appropriate methodologies and academic practices. Through the dissertation and research activities, students gain experience in critical thinking, data analysis, technical writing, and scholarly communication.

Prerequisite: Students should possess fundamental knowledge related to their undergraduate discipline along with basic research and analytical skills. Familiarity with literature review, report writing, data analysis, and research methodologies is desirable. Basic understanding of academic writing tools, statistical techniques, and software relevant to the field of study may be beneficial. In addition, students should be capable of independent learning, critical thinking, and problem-solving, as the course involves designing and executing a supervised research project culminating in a dissertation or final research report.

Bridge Content: - Revision of fundamental concepts related to research methodology, academic writing, literature survey, data collection, and data analysis techniques. Basic understanding of statistical methods, problem identification, hypothesis formulation, and report preparation is revisited. Students are also introduced to research tools, referencing techniques, ethical research practices, and software or programming platforms relevant to their field of study for analysis, documentation, and presentation purposes.

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Course Objectives:

Upon successful completion of this course, students will be able to:

- 1. demonstrate an ability to plan a research project, such as is required in a research proposal prior to the launch of their work
- 2. demonstrate an ability to comply with ethical, safety, and documentation processes appropriate to their project
- 3. demonstrate expert knowledge in the subject of their research project, such as through a integrated literature survey
- 4. demonstrate expert knowledge in the research methods appropriate to generating reliable data for their research questions
- 5. demonstrate the ability to manage projects and to make constructive use of expertise associated with their project, while working as an independent learner
- 6. demonstrate an ability to relate their original data to existing literature, or to create a novel

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



synthesis of existing materials

- 7. demonstrate an ability to assemble their findings into a substantial piece of writing that presents a clear thesis and a cohesive, evidence-based argument
- 8. demonstrate an ability to balance description, analysis, and synthesis within their project report
- 9. demonstrate an ability to reflect on the strengths and weaknesses of their research and methodology, with constructive advice on how they might improve their efforts in future work

Course Outcomes: After learning the course, students will be able to

CO	Course Outcome	Bloom's Level
CO1	Apply research methodologies and domain knowledge to undertake independent research and solve discipline-specific Problems.	3
CO2	Plan and manage a research project by preparing proposals, selecting methods, and conducting systematic investigation.	3
CO3	Analyze research findings and relate them with existing literature to develop evidence-based conclusions and scholarly writing.	3
CO4	Evaluate research outcomes, methodologies, and ethical practices to improve the quality and effectiveness of future work.	3

Course Content

Phase 1 Informal conversations

Students are strongly encouraged to discuss possible project ideas with tutors, fellow students, and other research professionals. All research projects begin with open-ended conversations and scoping exercises. These should be non-committal.

Phase 2 Identify topic

The first formal step in the module involves identifying a preliminary project title and writing an abstract of no more than 100 words. This requires submitting a completed registration form. Writing an abstract for a research proposal or for completed research work is an important transferable skill. Students who do not submit a completed registration form will be assigned a project. The project title is understood to be provisional. Supervisors will be assigned to students after the project title/ abstract forms have been submitted. Supervision: A supervisor is required. The main responsibilities of the supervisor are to assist the student with project management and to advise the student on criteria for assessment. You can expect your supervisor to read and comment on a full draft of your research proposal and of your project. It is a good idea to discuss a time line for your project with your supervisor, and to establish a definite timetable. Some key points in our advice to students on compliance:

1. Allow at least two weeks between submitting an ethics application and the date of your first data collection
2. Your supervisor must approve (and sign!) your ethics application before you submit it at departmental level
3. After your protocols have been approved, append a copy of your ethical approval certificate to the dissertation and project proposal.

Phase 3 Project proposal

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



The proposal should reflect a student's best effort. At the same time, we recognize research often raises new questions. Some redefinitions of topics and titles is common later in the research process. Students should keep their supervisors up to date on these developments, and they can expect a reasonable amount of adaptation.

Phase 4 Term-1 research

Students are expected to commit substantial time during the term to their research project. Supervisions The principal form of academic input for the research project normally comes through discussions with the designated supervisor. The majority of these meetings should be face-to-face, either in person or via video- or audio-conferencing technology. Students are expected to respect these periods of absence and plan their needs accordingly. One distinction is crucial: (1) when staff are on leave, they are off work (i.e., not expected to maintain contact with their supervisees or to undertake their duties); however, (2) when staff are working remotely, they are at work (i.e., expected to maintain contact and to be available for normal duties). A student's supervisor is not the only person who may advise on projects and writing. Others include peers and subject experts.

Phase 5 Submit project report

The project report with the specific due date must be submitted to Department.

Textbooks:

1. John W. Creswell and J. David Creswell, Research Design, 6th Edition, [SAGE Publications](#), 2023.
2. C. R. Kothari and Gaurav Garg, Research Methodology: Methods and Techniques, 4th Edition, [New Age International Publishers](#), 2019.
3. Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, The Craft of Research, 4th Edition, [University of Chicago Press](#), 2016.

Reference Books:

1. Michael Quinn Patton, Qualitative Research and Evaluation Methods, 4th Edition, [SAGE Publications](#), 2015.
2. Uma Sekaran and Roger Bougie, Research Methods for Business, 8th Edition, [Wiley](#), 2020.
3. William M. K. Trochim and James P. Donnelly, Research Methods Knowledge Base, 3rd Edition, [Cengage Learning](#), 2006.

MOOCs Links and additional reading material:

1. Research Methodology (NPTEL) — <https://nptel.ac.in/courses/127106227>
2. Academic and Research Writing (SWAYAM) — <https://onlinecourses.swayam2.ac.in>
3. Introduction to Research Methods (Coursera) — <https://www.coursera.org/learn/research-methods>

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Pro-gram:	S. Y. M. Tech			Semes-ter:	III		
Course:	Introduction to Constitution of India			Course Code:	R25-MCO-CTS-605		
Teaching Scheme(Hrs/week)			Credits	Examination Scheme			
Lecture	Practical	Tuto-rial		CCE	ESE	TW	PR
-	-	-	02	-	-	-	-
Course Content							

Course Description:

This course provides a comprehensive study of the Indian Constitution, its historical evolution, philosophical foundations, and practical application in governance. Learners will explore the making of the Constitution, the role of the Constituent Assembly, and the guiding principles enshrined in the Preamble. The course emphasizes key constitutional provisions such as Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties, along with the structure of the Union and State governments, the judiciary, and the federal system. Special focus is given to Article 21A and the Right to Education, highlighting its impact on social justice and nation-building. Through case studies, debates, and interactive assignments, students will critically analyze constitutional amendments, landmark Supreme Court judgments, and contemporary challenges in Indian democracy. The course nurtures civic awareness, constitutional literacy, and the ability to apply constitutional principles to real-world governance issues.

Course Relevance:

The inclusion of the Indian Constitution in a PG technical curriculum is highly significant for developing well-rounded professionals. While technical expertise is essential, engineers, technologists, and researchers also need a strong understanding of constitutional values, governance structures, and civic responsibilities. This course thus bridges technical expertise with constitutional literacy, ensuring that graduates are not only skilled professionals but also responsible citizens contributing to India's democratic and developmental journey.

Prerequisite:**Bridge Content: -**

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**Course Objectives:**

- To understand the basic foundation and the basic law for the governance of our nation, the history and the different types of Constitutions.
- To understanding the importance and the different aspects of the Constitution.
- To know and understand the different rights enshrined in the Constitution and understand the rights and duties of the government
- To know the different aspects of the Union and the State Executive.

Course Outcomes: After learning the course, students will be able to -

CO	Course Outcome	Bloom's Level
CO1	Synthesize the evolution of Indian Constitution. (Indian Constitution is the product of global constitutional wisdom and indigenous innovation, blending tested principles from other nations with provisions uniquely designed for India's pluralistic society.)	3
CO2	Interpret the scheme of Fundamental Rights and Duties in the Indian Constitution	3
CO3	Analyze the directive principles of state policy, and examine composition, powers, and functions of the organs of governance in India's Parliamentary system,	4
CO4	Analyze emerging constitutional issues such as the Right to Privacy, Information Technology law, and challenges posed by cyberbully and digitization.	4

Course Content

1	Meaning of the constitution law and constitutionalism.
	• Historical perspective of the Constitution of India. • History of Making of the Indian Constitution: History, Drafting Committee. (Composition & Working) • Preamble and basic structure • Salient features and characteristics of the Constitution of India.
2	The fundamental rights and duties
	• Right to Equality Article 14, • Right to certain Freedom under Article 19, • Right to Life and Personal Liberty under Article 21. • Right to Education Article 21A • Right against Exploitation, Article 23 & 24 • Right to Freedom of Religion, Article 25 to 28 • Cultural and Educational Rights, Article 29 & 30 • Right to Constitutional Remedies, Article 32 • Fundamental Duties. Article 51A
3	The Directive Principles of State Policy

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



	• Its importance and implementation. • The scheme of the Fundamental Duties and its legal status. • Federal structure and distribution of legislative and financial powers between the Union and States. • Organs of Governance: Parliament Composition, • Qualifications and Disqualifications, • Powers and Functions, □ Executive, • The constitutional -powers and status of the President of India and Governor • Council of Ministers,
4	Judiciary and Constitution and Emerging issues
	• Judiciary, • Appointment and Transfer of Judges, • Qualifications, Powers and Functions • Right to privacy Article 21. • Information Technology law (IT Act 2000) 1. Section 66: Computer-related offences (hacking, identity theft). 2. Section 66E: Punishment for violation of privacy. 3. Section 67 & 67A: Punishment for publishing obscene or sexually explicit material online. 4. Section 69 & 69A: Government powers to intercept, monitor, and block online content. • Cyber bullying and Impulsive growth of social networking and digitization
Textbooks:	
1. The Constitution of India, 1950 (Bare Act), Government Publication. 2. D. D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.	
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015. 4. Constitutional Law of India by Prof. G S Pande (revised by Dr. Kuldeep Kour) University Book House pvt. ltd, Jaipur. 50th edition or recent edition 2023	
Reference Books:	
1. Granville, A. (1996), The Indian Constitution: Cornerstone of Nation, Oxford: Clarendon Press. 2. Sharma, Brij Kishore, Introduction to the Constitution of India, Prentice Hall of India, New Delhi 3. Kashyap, S.C. (1995), Our Constitution, New Delhi: National Book Trust, India	
MOOCs Links and additional reading material:	
1. https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg151 2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_lw10 3. https://onlinecourses.swayam2.ac.in/e-learning/preview/cec24_hs31	

Approved By:

Chairman
 BoS, Computer Engineering
 Amrutvahini College of Engineering, Amrutnagar
 Sangamner-422608

Chairman
 Academic Council
 Amrutvahini College of Engineering, Amrutnagar
 Sangamner-422608



Program:	S. Y. M. Tech				Semester:	IV	
Course:	Seminar based on Research Project				Course Code:	R25-MCO-SBRP-606	
Teaching Scheme(Hrs/week)			Credits	Examination Scheme			
Lecture	Practical	Tutorial		CCE	ESE	TW	OR
-	08 Hrs/Week	-	04	-	-	50	50
Course Content							

Course Description:

The seminar aims to enhance students' research, presentation, and critical thinking skills, preparing them for advanced academic pursuits and professional careers. Technical Seminars will provide students with the opportunity and support to improve their self-study skills using modern information technologies and apply new knowledge and skills in practice, including in new areas.

Course Objectives: Upon successful completion of this course, students will be able to:

- Deepen Technical Knowledge: To enable students to explore a specialized topic within Computer Engineering beyond the regular curriculum, fostering in-depth understanding.
- Develop Research Skills: To provide practical experience in identifying, acquiring, evaluating, and synthesizing information from various technical sources (research papers, standards, technical reports).
- Enhance Communication Skills: To cultivate effective oral and visual presentation skills, enabling students to articulate complex technical concepts clearly and concisely to a knowledgeable audience.
- Foster Critical Thinking: To encourage students to critically analyze existing research, identify challenges, propose solutions, and engage in constructive discussions.
- Promote Independent Learning: To encourage self-directed learning and the ability to stay updated with emerging technologies and research trends.
- Prepare for Thesis/Dissertation: To serve as a foundational step for the Master's thesis/dissertation, allowing students to explore potential research areas.

Course Outcomes: After successful completion of the course, learner will be able to:

CO1 : Formulate the goals and objectives of scientific research;

CO2 : Search, evaluate and analyze information about the achievements of science and technology in the target area and beyond;

CO3 : Interpret data from different fields of science and technology;

CO4 : Build the logic of reasoning and statements;

CO5 : Create, design and edit text documents in accordance with the requirements of the organization or publisher;

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Guidelines for Seminar

- Responsibility of the students:

- The Seminar should be carried out individually by each student.
- A student should identify the area or topics in recent trends and developments in consultation with the guide.
- A student should report to his/her respective guide regularly (at least once in a week) and report the progress of the seminar work.
- A student should follow the timelines and deadlines and inform the supervisor in case of any difficulty/delay.
- Students should maintain the record of all the meetings, remarks given by guide/reviewers and progress of the work in the diary. The diary must be presented during each review presentation to the reviewers.
- A student should conduct the research ethically, adhere to the academic integrity standards, and cite sources whenever using any existing results
- A student should incorporate constructive feedback to improve the quality and rigor of the research work towards seminar.

- For final examination, students should complete the Seminar Report in all aspects including formatting and citation.
- Each student should prepare the report, get it approved by his/her guide and submit the duly signed copy within the deadline.
- A student should invest time and effort in preparing for seminar presentations and the oral presentation of the seminar.

- Topic Selection

- Relevance: Topics must be directly related to Computer Engineering, encompassing current research trends, emerging technologies, advanced concepts, or interdisciplinary applications.
- Scope: The topic should be sufficiently focused to allow for in-depth exploration within the seminar timeframe, yet broad enough to demonstrate a comprehensive understanding. Avoid overly narrow or excessively broad topics.
- Novelty (Desired): While not strictly a research paper, students are encouraged to explore topics that have recent advancements, open problems, or areas where their unique insights can be presented. Avoid merely summarizing introductory textbook material.
- Guide / Supervisor Approval: Each student must select a seminar topic in consultation with and obtain approval from an assigned faculty supervisor. The supervisor will guide the student in refining the topic and identifying relevant resources.
- Examples of Broad Areas: Artificial Intelligence/Machine Learning, Data Science & Big Data, Cybersecurity, Cloud Computing, Internet of Things (IoT), Computer Networks, Software Engineering, High-Performance Computing, Embedded Systems, Computer Vision, Natural Language Processing, Blockchain, Quantum Computing.

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**• Seminar Structure and Deliverable :**

The technical seminar typically involves the following stages and deliverable

- Topic Proposal (2-3 weeks after topic approval)
- A concise document (1-2 pages) outlining:
 - * Proposed Seminar Title
 - * Brief Description/Abstract of the Topic
 - * Motivation and Relevance to Computer Engineering
 - * Preliminary List of Key References (at least 5-7 reputable sources)
 - * Tentative Scope and Outline of the Presentation
 - * Submission: To the faculty supervisor for approval.
 - * Literature Review and Research (Ongoing): Sources: Students must primarily rely on peer-reviewed academic sources (IEEE Xplore, ACM Digital Library, SpringerLink, arXiv, Google Scholar), reputable conference proceedings, and established industry standards. Wikipedia and unverified blogs are generally not acceptable as primary sources.
 - * Critical Analysis: Beyond mere summarization, students are expected to critically analyze the literature, identifying different approaches, their advantages/disadvantages, open issues, and potential future directions.
 - * Note-Taking & Organization: Maintain systematic notes and organize research material effectively

• Seminar Report (Due 2-3 weeks before presentation):

- A written report (typically 20-25 pages, excluding references and appendices) detailing the seminar content.
- Format: Follow a professional academic paper format (e.g., IEEE transaction style).
- Sections:
 - * Abstract: A concise summary of the seminar topic and key findings.
 - * Introduction: Background, motivation, problem statement (if applicable), and outline of the report.
 - * Literature Review/Background: Detailed discussion of relevant concepts, theories, and existing work.
 - * Core Content: In-depth exploration of the chosen topic, presenting different methodologies, architectures,

algorithms, or challenges as relevant.

- * Analysis/Discussion: Critical evaluation of the presented material, comparing different approaches, discussing implications, and identifying gaps.
- * Future Trends/Conclusion: Summarization of key takeaways, potential future directions, and concluding remarks.
- * References: A comprehensive list of all cited sources, properly formatted.
- * Appendices (Optional): Supplementary material if necessary.

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**• Oral Presentation :**

- Duration: Typically 25-30 minutes for presentation, followed by 10-15 minutes for Q&A.
- Audience: Faculty members, peers, and potentially other interested individuals.
- Content: The presentation should effectively convey the key aspects of the seminar topic. It should not simply be a reading of the report.
- Visual Aids: High-quality presentation slides (e.g., PowerPoint, Google Slides, LaTeX Beamer) are mandatory. Slides should be clear, concise, visually appealing, and support the oral delivery. Avoid excessive text on slides.
- Delivery: Clear articulation, confident posture, good eye contact, and appropriate pace. Practice the presentation thoroughly.
- Q&A Session: Be prepared to answer questions from the audience on all aspects of the seminar topic. Demonstrate a strong understanding and ability to defend your perspectives.

• Evaluation Criteria :

The technical seminar will be evaluated based on the following criteria:

- Topic Selection and Scope (10%): Relevance, timeliness, and appropriate depth of the chosen topic. Clarity and focus of the topic proposal.
- Literature Review and Research (25%): Breadth and depth of literature surveyed. Quality and credibility of sources used. Critical analysis and synthesis of information.
- Seminar Report/Paper (30%): Clarity, organization, and logical flow of content. Technical accuracy and depth of discussion. Adherence to academic writing standards (grammar, spelling, formatting, referencing). Originality in synthesis and critical insights. Absence of plagiarism.
- Oral Presentation (35%): Content: Clarity, completeness, and accuracy of the presented material. Organization: Logical flow, effective use of time. Visual Aids: Quality, clarity, and effectiveness of slides. Delivery: Confidence, clarity of speech, enthusiasm, engagement with the audience. Q&A: Ability to answer questions accurately, comprehensively, and confidently

Textbooks:

1. "Engineering Communication" by Charles W. Knisely & Karin I. Knisely
2. "Technical Communication: Principles and Practice" by Meenakshi Raman & Sangeeta Sharma
3. "The Craft of Scientific Presentations" by Michael Alley

MOOCs Links and additional reading material:

1. <https://nptel.ac.in/courses/109/106/109106180/>
2. <https://www.udemy.com/course/technical-writing/> 3.
3. <https://www.edx.org/course/writing-in-the-sciences>

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Program:	S. Y. M. Tech			Semester:	IV		
Course:	Research Project II			Course Code:	R25-MCO-RP II-607		
Teaching Scheme(Hrs/week)			Credits	Examination Scheme			
Lecture	Practical	Tutorial		CCE	ESE	TW	OR
-	24 Hrs/Week	-	18	-	-	150	50
Course Content							

Course Description :

- The master's degree culminates in a research project of the student's own design. This project is documented by a final research report or dissertation. The student's work is guided by an academic supervisor.
- It also is supported by a variety of key skill programs. Students are expected to construct a research project that includes original research, deliberate and well considered methodological choices, and shows relevance to significant conversations within the discipline.
- The dissertation should represent the very best research and analysis a student can produce

Course Relevance:

This course provides students with an opportunity to apply advanced knowledge and research skills to solve real-world and discipline-specific problems through independent investigation. It enhances critical thinking, analytical ability, research methodology, technical writing, and project management skills.

Prerequisite: Students should possess advanced understanding of their undergraduate discipline along with prior experience in research methodology, literature review, technical writing, and analytical techniques acquired during earlier project work. Familiarity with data analysis tools, statistical methods, research ethics, and software relevant to the field of study is essential.

Bridge Content: - Revision of advanced research methodology, literature review techniques, research ethics, data interpretation, and scholarly writing practices. Concepts related to hypothesis validation, experimental design, result analysis, and dissertation structuring are reinforced.

Students are further exposed to advanced analytical tools, referencing and citation standards, publication practices, presentation techniques, and software platforms relevant to research implementation, documentation, and dissemination of findings.

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

**Course Objectives:**

Upon successful completion of this course, students will be able to:

- Demonstrate an ability to plan a research project, such as is required in a research proposal prior to the launch of their work
- Demonstrate an ability to comply with ethical, safety, and documentation processes appropriate to their project
- Demonstrate expert knowledge in the subject of their research project, such as through a integrated literature survey
- Demonstrate expert knowledge in the research methods appropriate to generating reliable data for their research questions
- Demonstrate the ability to manage projects and to make constructive use of expertise associated with their project, while working as an independent learner
- Demonstrate an ability to relate their original data to existing literature, or to create a novel synthesis of existing materials
- Demonstrate an ability to assemble their findings into a substantial piece of writing that presents a clear thesis and a cohesive, evidence-based argument
- Demonstrate an ability to balance description, analysis, and synthesis within their project report
- Demonstrate an ability to reflect on the strengths and weaknesses of their research and methodology, with constructive advice on how they might improve their efforts in future work

Course Outcomes: After learning the course, students will be able to

CO	Course Outcome	Bloom's Level
CO1	CONDUCT independent and original research by applying advanced research methodologies and analytical techniques.	3
CO2	PLAN , MANAGE , and EXECUTE a complex research project within defined timelines using appropriate research methods and tools.	4
CO3	ANALYZE and SYNTHESIZE research findings with existing scholarly literature to develop evidence-based conclusions and technical writing.	4
CO4	PREPARE and PRESENT a well-structured dissertation demonstrating ethical practices, critical evaluation, and professional documentation standards.	5

Course Content

Phase	Literature Review and Problem Identification
1	
Students are expected to conduct an extensive literature survey, identify research gaps, finalize the problem statement, and define research objectives in consultation with the supervisor.	
Phase 2	Research Planning and Methodology

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Students prepare a detailed research plan including methodology, tools, data collection techniques, timeline, and expected outcomes. Ethical and documentation requirements are also discussed.

Phase 3	Implementation and Data Analysis
----------------	---

Students carry out experimental work, simulations, surveys, or analytical studies related to the project and perform systematic data analysis using appropriate techniques and tools.

Phase 4	Dissertation Writing and Review
----------------	--

Students compile research findings, analysis, methodology, and conclusions into a structured dissertation. Regular reviews and discussions with the supervisor are conducted for improvement.

Phase 5	Project Presentation and Final Submission
----------------	--

Students present their research work through seminars, demonstrations, or viva voce and submit the final dissertation/report as per departmental guidelines.

Textbooks:

1. John W. Creswell and J. David Creswell, Research Design, 6th Edition, [SAGE Publications](#), 2023.
2. C. R. Kothari and Gaurav Garg, Research Methodology: Methods and Techniques, 4th Edition, [New Age International Publishers](#), 2019.
3. Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams, The Craft of Research, 4th Edition, [University of Chicago Press](#), 2016.

Reference Books:

1. Ranjit Kumar, *Research Methodology: A Step-by-Step Guide for Beginners*, 5th Edition, SAGE Publications, 2019.
2. Mark Saunders, Philip Lewis, and Adrian Thornhill, *Research Methods for Business Students*, 8th Edition, Pearson Education, 2019.
3. Alan Bryman, *Social Research Methods*, 5th Edition, Oxford University Press, 2016.

MOOCs Links and additional reading material:

1. Research Methodology (NPTEL) — <https://nptel.ac.in/courses/127106227>
2. Academic and Research Writing (SWAYAM) — <https://onlinecourses.swayam2.ac.in>
3. Introduction to Research Methods (Coursera) — <https://www.coursera.org/learn/research-methods>
4. How to Write and Publish a Scientific Paper (Coursera) — <https://www.coursera.org/learn/how-to-write-a-scientific-paper>
5. Research Ethics and Research Integrity (NPTEL) — <https://nptel.ac.in/courses/109105176>

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



Amrutvahini College of Engineering, Sangamner – 422608

Rev. No:00 , Date:25 /08 /2025

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



SS

Program:	S. Y. M. Tech			Semester:	IV		
Course:	Cyber Security			Course Code:	R25-MCO-CTS-608		
Teaching Scheme(Hrs/week)			Credits	Examination Scheme			
Lecture	Practical	Tutorial		CCE	ESE	TW	PR
-	-	-	04	-	-	-	-
Course Content							
Course Description : The Cyber Security course in Mechanical Design Engineering program is a mandatory foundational module designed to safeguard modern industrial systems and product designs against digital threats. It bridges the gap between mechanical hardware and digital architecture by teaching engineers how to secure smart factories, automation tools, and cloud-connected systems. Students learn crucial defensive concepts, including threat landscapes, cryptographic frameworks (like encryption and digital signatures), and endpoint device security. The syllabus highlights engineering risk assessment, training students to evaluate and mitigate vulnerabilities in software-hardware ecosystems. Ultimately, it prepares postgraduates to design secure, resilient engineering systems compliant with global data protection standards							
Course Relevance: This course is highly relevant as modern mechanical engineering relies heavily on interconnected digital technologies like IoT, smart factories (Industry 4.0), and automated design networks. It equips design engineers with the essential skills to identify digital vulnerabilities, protect intellectual property (IP) from cyber theft, and build secure, tamper-proof hardware-software systems.							
Course Objectives: Identify Vulnerabilities: Train engineers to recognize security risks, threats, and architectural flaws in interconnected hardware-software systems. Protect Intellectual Property: Equip students with the knowledge of cryptography and cyber laws to safeguard proprietary engineering designs and sensitive corporate data. Implement Resilient Systems: Teach structural risk assessment methodologies to design and deploy secure, tamper-proof automation networks ready for Industry 4.0.							
Course Outcomes: After learning the course, students will be able to							
CO	Course Outcome					Bloom’s Level	
CO1	ANALYZE AND IDENTIFY security vulnerabilities within interconnected engineering systems, smart factories, and digital design networks.					3	
CO2	IMPLEMENT fundamental cryptographic techniques, such as encryption and digital signatures, to ensure data integrity and secure communication.					3	
CO3	DESIGN robust risk-mitigation strategies to protect proprietary					3	

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

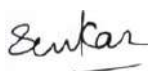
Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608



	engineering blueprints and intellectual property from cyber threats..	
CO4	NAVIGATE Indian and global cyber laws (like the IT Act 2000) to maintain regulatory compliance during digital product development.	3
Course Content <i>Note: This is self-paced course to be completed on NPTEL/MOOC/SPPU ECLM PORTAL 4 Credits will be awarded on successful completion of course with certification.</i>		
Unit 1	Fundamentals of Cyber Security	CO Mapped: CO 1
Introduction to cybercrimes, individual vs. property crimes, cyber terrorism, and information asset identification		
Unit 2	System and Device Security	CO Mapped: CO 2
Securing endpoints, cloud computing security risks, and identifying vulnerabilities in hardware/software design ecosystems		
Unit 3	Cryptography & Technical Countermeasures	CO Mapped: CO 3
Basics of Symmetric & Asymmetric key cryptography (DES, AES, RSA), hash functions, digital signatures, and secure protocol extensions.		
Unit 4	Engineering Risk Assessment	CO Mapped: CO 4
Risk identification, quantitative vs. qualitative risk control strategies, and data protection frameworks		
Reference Books:		
1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunit Belapure (Wiley India) 2. Monali R. Borade and Sachin P. Godse (Technical Publications)		
MOOCs Links and additional reading material:		
1. https://onlinecourses.nptel.ac.in/noc26_cs57/preview 2. https://eclm.unipune.ac.in/topics.aspx		

CO-PO mapping table:

Approved By:


Chairman
 BoS, Computer Engineering
 Amrutvahini College of Engineering, Amrutnagar
 Sangamner-422608


Chairman
 Academic Council
 Amrutvahini College of Engineering, Amrutnagar
 Sangamner-422608



Amrutvahini College of Engineering, Sangamner-422608 Rev. No:00, Date:25/08/2025

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PS O	PS O	PS O
CO	3	-	2	2	2	-	-	2	2	-	-	2	2	2
CO	3	-	3	2	2	-	-	2	2	-	-	2	2	2
CO	2	-	3	2	2	-	-	2	2	-	-	2	2	2
CO	3	-	2	2	2	-	-	2	2	-	-	2	2	2
Avg	3	-	2.6	2	2.2	-	-	2	2	-	-	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Approved By:

Chairman
BoS, Computer Engineering
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608

Chairman
Academic Council
Amrutvahini College of Engineering, Amrutnagar
Sangamner-422608