VELS

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI
ACCREDITED BY NAAC WITH 'A' GRADE
Marching Beyond 30 Years Successfully
INSTITUTION WITH UGC 12B STATUS

B.Tech

Computer Science and Engineering

SPE[Software Product Engineering]

Curriculum and Syllabus
Regulation 2023
(Based on Choice Based Credit System)

Effective from the Academic Year
2023-2024

Department of Computer Science and Engineering
School of Engineering

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES (VISTAS)

VISION

To develop a knowledge hub for Computer Science Engineers and Technocrats in application of their competence for the betterment of the Individual, Industry and Society.

MISSION

M1: To nurture the students to be industry ready by providing a strong conceptual foundation and by enhancing their employability and entrepreneurial skills.

M2: To provide holistic growth by conducting relevant enrichment programs, which includes curricular, co-curricular, extra-curricular and extension activities.

M3: To inculcate innovation and creativity through practically viable Internships and project works.

M4: To create a research oriented mind-set and focus in fulfilling growing demands of the society through mentoring and lifelong learning.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Apply comprehensive technical knowledge in computer science and engineering, including software development, algorithms, and system design, to innovate and solve complex problems in a rapidly evolving technological landscape.

PEO2: Become highly employable, with the ability to excel in global tech industries, demonstrating proficiency in the latest technologies and readiness to tackle advanced technical challenges.

PEO3: Engage in lifelong learning, exhibit leadership, and leverage technical and managerial skills for societal benefit, contributing significantly to technological advancements and sustainability.

PROGRAMME OUTCOMES (POs)

PO 1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Develop and integrate software solutions leveraging advanced knowledge in areas such as web development, mobile applications, artificial intelligence, data analytics and other technology areas to address real-world problems and meet industry needs.

PSO2: Achieve this through sufficient industry exposure during the course of the program, enabling seamless integration of theoretical knowledge with real-world applications.

COMPETENCIES AND PERFORMANCE INDICATORS			
PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.			
1.1	Demonstrate competence in mathematical modelling	1.1.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems
		1.1.2	Apply the concepts of probability, statistics and queuing theory in modelling of computer-based system, data and network protocols.
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply theory and principles of computer science and engineering to solve an engineering problem
PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Evaluate problem statements and identifies objectives
		2.1.2	Identify processes/modules/algorithms of a computer-based system and parameters to solve a problem
		2.1.3	Identify mathematical algorithmic knowledge that applies to a given problem
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Reframe the computer-based system into interconnected subsystems
		2.2.2	Identify functionalities and computing resources.
		2.2.3	Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions
		2.2.4	Compare and contrast alternative solution/methods to select the best methods

		2.2.5	Compare and contrast alternative solution processes to select the best process.
2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Able to apply computer engineering principles to formulate modules of a system with required applicability and performance.
		2.3.2	Identify design constraints for required performance criteria.
2.4	Demonstrate an ability to execute a solution process and analyze results	2.4.1	Applies engineering mathematics to implement the solution.
		2.4.2	Analyze and interpret the results using contemporary tools.
		2.4.3	Identify the limitations of the solution and sources/causes.
		2.4.4	Arrive at conclusions with respect to the objectives.
PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.			
3.1	Demonstrate an ability to define a complex/ open-ended problem in engineering terms	3.1.1	Able to define a precise problem statement with objectives and scope
		3.1.2	Able to identify and document system requirements from stake- holders
		3.1.3	Able to review state-of-the-art literature to synthesize system requirements.
		3.1.4	Able to choose appropriate quality attributes as defined by ISO/IEC/IEEE standard
		3.1.5	Explore and synthesize system requirements from larger social and professional
		3.1.6	Able to develop software requirement specifications (SRS).
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Able to explore design alternatives.
		3.2.2	Able to produce a variety of potential design solutions suited to meet functional requirements.
		3.2.3	Identify suitable non-functional requirements for evaluation of alternate design solutions.

3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Able to perform systematic evaluation of the degree to which several design concepts meet the criteria.
		3.3.2	Consult with domain experts and stakeholders to select candidate engineering
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Able to refine architecture design into a detailed design within the existing constraints.
		3.4.2	Able to implement and integrate the modules.
		3.4.3	Able to verify the functionalities and validate the design.
PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem for purposes of investigation, its scope and importance
		4.1.2	Able to choose appropriate procedure/algorithm, dataset and test cases.
		4.1.3	Able to choose appropriate hardware/software tools to conduct the experiment.
4.2	Demonstrate an ability to design experiments to solve open-ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives
4.3	Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyze data
		4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations
		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions
PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.			

5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2	Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.
		5.2.2	Demonstrate proficiency in using discipline-specific tools
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations and validate tools, techniques and resources
		5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.
PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
6.1	Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at the global, regional and local level
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public
PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.			
7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1	Identify risks/impacts in the life-cycle of an engineering product or activity

		7.1.2	Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability
7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development
		7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline
PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives
8.2	Demonstrate an ability to apply the Code of Ethics	8.2.1	Identify tenets of the ASME professional code of ethics
		8.2.2	Examine and apply moral & ethical principles to known case studies
PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
		9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
9.2	Demonstrate effective individual and team operations--communication, problem solving, conflict resolution and leadership skills	9.2.1	Demonstrate effective communication, problem-solving, conflict resolution and leadership skills
		9.2.2	Treat other team members respectfully
		9.2.3	Listen to other members
		9.2.4	Maintain composure in difficult situations
9.3	Demonstrate success in a team-based project	9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions			
10.1	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical information
		10.1.2	Produce clear, well-constructed, and well-supported written engineering documents
		10.1.3	Create flow in a document or presentation - a logical progression of ideas so that the main point is clear
10.2	Demonstrate competence in listening, speaking, and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others
		10.2.2	Deliver effective oral presentations to technical and non-technical audiences
10.3	Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations
		10.3.2	Use a variety of media effectively to convey a message in a document or a presentation
PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.			
11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Describe various economic and financial costs/benefits of an engineering activity
		11.1.2	Analyze different forms of financial statements to evaluate the financial status of an engineering project
11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations.
11.3	Demonstrate an ability to plan/manage an engineering	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.

	activity within time and budget constraints	11.3.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget.
PO 12: Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.			
12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for the requirement for continuing professional development
		12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
12.2	Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current
		12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field
12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information
		12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.
PSO 1: Develop and integrate software solutions leveraging advanced knowledge in areas such as web development, mobile applications, artificial intelligence, data analytics and other technology areas to address real-world problems and meet industry needs.			
13.1	Ability to analyze requirements and design software solutions tailored to meet specific needs.	13.1.1	Demonstrate an ability to identify problem statements and analyze user requirements.
		13.1.2	Investigate and translate them into functional software designs.
13.2	Knowledge of industry-standard tools and technologies used in software development.	13.2.1	Utilization of industry-standard tools and technologies to optimize software development processes.
		13.2.2	Engagement in continuous learning and professional development activities to stay abreast of advancements in the field
		13.2.3	Proficiency in programming languages and frameworks evidenced by successful implementation of software solutions.

PSO 2: Achieve this through sufficient industry exposure during the course of the program, enabling seamless integration of theoretical knowledge with real-world applications.			
14.1	Ability to apply theoretical knowledge to real-world scenarios in industry settings.	14.1.1	Successful completion of industry internships.
		14.1.2	Completing projects demonstrating application of theoretical concepts to practical situations.
14.2	Ability to understand industry best practices and standards relevant to software development.	14.2.1	Incorporation of industry best practices and standards into project workflows and deliverables.
		14.2.2	Resolution of complex problems encountered during internships or projects, leading to successful outcomes.

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
SCHOOL OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

The Panel members for Board of studies meeting are listed below

S. No	Name of the Board Member	Designation	Institute / Industry
Internal Members			
1	**Dr. K. Kalaivani**	Associate Professor & Head	Vels Institute of Science, Technology & Advanced Studies (VISTAS)
2	**Dr. S. Arun**	Director, IQAC	Vels Institute of Science, Technology & Advanced Studies (VISTAS)
3	**Dr. R. Anandan**	Professor	Vels Institute of Science, Technology & Advanced Studies (VISTAS)
4	**Dr. N. Kumar**	Professor	Vels Institute of Science, Technology & Advanced Studies (VISTAS)
5	**Dr. A. Rajesh**	Associate Professor	Vels Institute of Science, Technology & Advanced Studies (VISTAS)
6	**Dr. A. Packialatha**	Associate Professor	Vels Institute of Science, Technology & Advanced Studies (VISTAS)
7	**Dr. K. Ulagapriya**	Associate Professor	Vels Institute of Science, Technology & Advanced Studies (VISTAS)
External Expert Members			
1	**Dr. Asnath Victy Phamila Y**	Associate Professor	School of Computer Science and Engineering Vellore Institute of Technology - VIT Chennai

2	**Mr. Santhosh Gopynadhan**	Vice President	Optum Global Solutions (India) Private Limited, Chennai
Student Member			
1	**Mr. Pavan Srivatsav**	Project Associate Cognizant Technology Solutions, Chennai	Cognizant Technology Solutions, Chennai

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND

ADVANCED STUDIES SCHOOL

OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CREDIT DISTRIBUTION

B.Tech CSE (Software Product Engineering)										
Credits Per Semester										
S. No	**Course Category**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total Credits**
1	HSC	7	3	3	3	6	6	6	-	34
2	BSC	10	3	3	3	-	-	-	-	19
3	ESC	8	12	-	-	-	-	-	-	20
4	PCC	-	-	16	15	18	8	8	-	55
5	PEC	-	-	-	-	-	6	8	-	24
6	OEC	-	-	-	-	-	-	-	4	4
7	Project	-	-	-	-	-	-	-	14	14
8	MC	-	-	-	-	-	-	-	-	-
	TOTAL	**25**	**18**	**22**	**21**	**24**	**20**	**22**	**18**	**170**

HSC	Humanities and Social Science Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
MC	Mandatory Courses

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES (VISTAS)

(MINIMUM CREDITS TO BE EARNED: 170)

B.Tech CSE(SPE) REGULATION (2023 - 2024)								
Category	**Course Title**	**Lecture**	**Tutorial**	**Practical**	**Credits**	**CA**	**SEE**	**Total**
SEMESTER I								
ESC	Front-end web development	3	-	2	4	40	60	100
HSC	Critical thinking	4	-	-	4	40	60	100
BSC	Discrete Mathematics	3	1	-	4	40	60	100
HSC	Professional skills for the workplace	3	-	-	3	40	60	100
BSC	The Breadth of computer science I	3	-	-	3	40	60	100
ESC	Problem solving using programming	3	-	2	4	40	60	100
BSC	Design for developers	3	-	-	3	40	60	100
MC	Student Induction Program	2	-	-	-	-	-	-
MC	Universal Human Values	2	-	-	-	-	-	100
		19	4	8	25			
SEMESTER II								
HSC	Learning how to learn	3	-	-	3	40	60	100
BSC	The Breadth of computer science II	3	-	-	3	40	60	100
ESC	Back-end Web Development	3	-	1	4	40	60	100
ESC	Databases	3	-	1	4	40	60	100
ESC	Full Stack Web Development	3	-	1	4	40	60	100
MC	Constitution of India	2	-	-	-	-	-	100
		12	2	12	18			
SEMESTER III								
HSC	Economics, Politics and Rural Society Development	3	-	-	3	40	60	100
BSC	Mathematical thinking	2	1	-	3	40	60	100
PCC	Database Management Systems	3	-	-	3	40	60	100
PCC	Database Management Systems Lab	-	-	2	1	40	60	100
PCC	Object Oriented Programming	3	-	-	3	40	60	100
PCC	Object Oriented Programming - Lab	-	-	2	1	40	60	100
PCC	Software Product Engineering - I	-	-	16	8	40	60	100
MC	Basic Life Skills	2	-	-	-	-	-	100
		13	1	20	22			
SEMESTER IV								
HSC	Understanding human languages	3	-	-	3	40	60	100
BSC	Principles of Science	3	-	-	3	40	60	100
PCC	Operating Systems	3	-	-	3	40	60	100
PCC	Data Structure and Algorithms	3	-	-	3	40	60	100

PCC	Data Structure and Algorithms - Lab	-	-	2	1	40	60	100
PCC	Software Product Engineering - II	-	-	16	8	40	60	100
MC	Gender Sensitivity Related Course	2	-	-	-	-	-	100
		14	-	18	21			
SEMESTER V								
HSC	English communication skills	3	-	-	3	40	60	100
HSC	Tools and techniques for creative thinking	3	-	-	3	40	60	100
PCC	Computer Organization & Architecture	3	-	-	3	40	60	100
PCC	Formal Language & Automata Theory	3	-	-	3	40	60	100
PCC	Design & Analysis of Algorithms	3	-	-	3	40	60	100
PCC	Design & Analysis of Algorithms - Lab	-	-	2	1	40	60	100
MC	Environmental science and Engineering	2	-	-	-	-	-	100
PCC	Software Product Engineering - III	-	-	16	8	40	60	100
		16	1	18	24			
SEMESTER VI								
HSC	Discovering Self	3	-	-	3	40	60	100
HSC	Fundamentals of Business Management	3	-	-	3	40	60	100
PEC	Professional Elective course - I	3	-	-	3	40	60	100
PEC	Professional Elective course - II	3	-	-	3	40	60	100
PCC	Software Product Engineering - IV	-	-	16	8	40	60	100
		11	1	16	20			
SEMESTER VII								
HSC	Introduction to philosophy	3	-	-	3	40	60	100
OEC	Open elective I	3	-	-	3	40	60	100
PEC	Professional Elective course - III	3	-	2	4	40	60	100
PEC	Professional Elective course - IV	3	-	2	4	40	60	100
PCC	Software Product Engineering - V	-	-	16	8	40	60	100
		12	-	20	22			
SEMESTER VIII								
OEC	Open elective II	4	-	0	4	40	60	100
Project	Project	-	-	28	14	40	60	100
		4	-	28	18			