Sister Nivedita University

DG 1/2 New Town, Kolkata – 700156
www.snuniv.ac.in

School of Engineering

Department of CS

1. Departmental Vision:

- The Department of Computer Science & Engineering aims to create a promising environment for producing skillful professionals by making students aware of the modern industrial need. The Department will also encourage fundamental and innovative research in the field of Computer Science & Engineering

2. Departmental Mission:

- To provide adequate guidance to students on emerging trends in the field of Computer Science & Engineering.
- To prepare students for flexible career paths with qualitative advancement in computing.
- To impart moral and ethical values, along with interpersonal skills to the students and faculty members for their professional and personal growth.
- To provide various opportunities for students as well as faculty members to excel in every field by its collaboration with international bodies.

3. List of Programs Currently Offered by the Department (Currently restricted to UG programs only, PG will be considered in future)

- **B.Tech in CSE**
  - ***PSO for B. Tech in CSE***
  - ***PEO for B. Tech in CSE***
  - ***PEO-Mission map for B. Tech in CSE***
  - ***PEO-PO map for B. Tech in CSE***
  - ***List of Courses for B. Tech in CSE***
  - ***CO-PO map for B. Tech in CSE***
- **B.Tech in CSBS**
  - ***PSO for B. Tech in CSBS***
  - ***PEO for B. Tech in CSBS***
  - ***PEO-Mission map for B. Tech in CSBS***
  - ***PEO-PO map for B. Tech in CSBS***
  - ***List of Courses for B. Tech in CSBS***
  - ***CO-PO map for B. Tech in CSBS***
- **B.Tech in CSE (Cyber Security)**
  - ***PSO for B. Tech in CSE (Cyber Security)***
  - ***PEO for B. Tech in CSE (Cyber Security)***
  - ***PEO-Mission map for B. Tech in CSE (Cyber Security)***
  - ***PEO-PO map for B. Tech in CSE (Cyber Security)***

4. Program Specific Objectives (PSO)

i. PSO for B. Tech in CSE

PSO 1:
Proficiency in Problem Solving and Algorithmic Thinking: Graduates will demonstrate proficiency in analyzing complex problems, designing efficient algorithms, and implementing solutions using appropriate data structures and algorithms. They will be able to apply computational thinking to solve real-world problems across various domains, including software development, system design, and artificial intelligence.

PSO 2:
Competence in Software Development and Engineering Practices: Graduates will possess the skills and knowledge to develop robust, scalable, and maintainable software systems using modern software engineering principles and practices. They will be proficient in utilizing software development methodologies, version control systems, testing frameworks, and software design patterns to deliver high-quality software solutions.

PSO 3:
Expertise in Emerging Technologies and Innovations: Graduates will exhibit expertise in exploring, evaluating, and integrating emerging technologies and innovations into computer science applications. They will be equipped with the ability to adapt to rapidly evolving technological landscapes and leverage advancements in areas such as cloud computing, Cybersecurity, machine learning, data analytics, and Internet of Things (IoT) to address contemporary challenges and opportunities

ii. PSO for B. Tech in CSBS

- *Document is in process. Yet to be updated*

iii. PSO for B. Tech in CSE (Cyber Security)

- *Document is in process. Yet to be updated*

iv. PSO for B. Tech in CSE (Data Science)

- *Document is in process. Yet to be updated*

v. PSO for B. Tech in CSE (AI/ML)

- *Document is in process. Yet to be updated*

vi. PSO for B. Tech in CSE (IoT)

- *Document is in process. Yet to be updated*

5. Program Educational Objectives (PEO)

i. PEO for B. Tech in CSE

PEO1:
Professional Excellence: Graduates of the B. Tech program in Computer Science and Engineering will demonstrate proficiency in applying fundamental principles, problem-solving skills, and innovative approaches to address real-world challenges in the field of computing. They will exhibit a commitment to lifelong learning and professional development, staying abreast of emerging technologies and evolving industry trends.

PEO2:

Leadership and Collaboration: Graduates will possess effective communication, teamwork, and leadership skills essential for interdisciplinary collaboration and successful project management. They will demonstrate the ability to work collaboratively in diverse teams, adapt to dynamic work environments, and lead initiatives that contribute to the advancement of technology and society.

PEO3:
Ethical and Social Responsibility: Graduates will uphold high ethical standards, integrity, and social responsibility in their professional practices. They will demonstrate awareness of the societal impact of technology and contribute to the ethical and sustainable development of computing solutions. They will engage in community service, promote inclusivity, and consider the broader ethical implications of their work on individuals, organizations, and society at large.

PEO4:
Global Perspective and Societal Impact: Graduates will recognize the global context of computing and its impact on society, economy, and environment. They will engage in lifelong learning to address societal challenges and contribute to sustainable development through the application of computing technologies in areas such as healthcare, education, Cybersecurity, environmental conservation, and social justice.

ii. PEO for B. Tech in CSBS

- *Document is in process. Yet to be updated*

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iv. PEO for B. Tech in CSE (Data Science)

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v. PEO for B. Tech in CSE (AI/ML)

- *Document is in process. Yet to be updated*

vi. PEO for B. Tech in CSE (IoT)

- *Document is in process. Yet to be updated*

6. PEO-Departmental Mission Mapping

i. PEO-Mission map for B. Tech in CSE

	Mission 1	Mission 2	Mission 3	Mission 4
PEO1	3	2	1	2
PEO2	2	2	1	2
PEO3	1	1	3	2
PEO4	1	1	2	3

Highly Correlated: 3
Moderately Correlated: 2
Slightly Correlated: 1
Not Correlated: 0

ii. PEO-Mission map for B. Tech in CSBS

- *Document is in process. Yet to be updated*

iii. PEO-Mission map for B. Tech in CSE (Cyber Security)

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iv. PEO-Mission map for B. Tech in CSE (Data Science)

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v. PEO-Mission map for B. Tech in CSE (AI/ML)

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vi. PEO-Mission map for B. Tech in CSE (IoT)

- *Document is in process. Yet to be updated*

7. Program Outcome (POs)

***PO1*. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

***PO2.* Problem analysis:** Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural and engineering sciences.

***PO3.* Design/Development of solutions:** Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety and the cultural societal and environmental considerations.

***PO4.* Conduct investigations of complex problems:** Use research based knowledge including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

***PO5.* 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.

***PO6.* The engineer and society:** Apply reasoning informed by the contextual knowledge to access societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

***PO7.* 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.

***PO8.* Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

***PO9.* Individual and team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

***PO10.* Communications:** Communicate effectively with the engineering community and with the society at large. Be able to comprehend and write effective reports documentation. Make effective presentations and give and receive clear instructions.

***PO11.* Project management and finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

***PO12.* Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

8. PEO-PO Mapping

i. PEO-PO map for B. Tech in CSE

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	2	3	2	2	2	0	0	0	0	0	0	1

PEO2	2	1	1	2	1	1	0	2	3	2	2	1
PEO3	0	2	0	0	0	2	2	2	1	2	2	1
PEO4	0	0	0	0	0	3	2	0	0	0	0	1

Highly Correlated: 3
Moderately Correlated: 2
Slightly Correlated: 1
Not Correlated: 0

ii. PEO-PO map for B. Tech in CSBS

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iii. PEO-PO map for B. Tech in CSE (Cyber Security)

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vi. PEO-PO map for B. Tech in CSE (IoT)

- *Document is in process. Yet to be updated*

9. List of Courses with COs

i. List of Courses for B. Tech in CSE

SL. No	Semester	Course Name	Course Code	Course Outcome (CO)
1	1			CO1: Understand the fundamentals of Propositional Logic

		Discrete Mathematics		CO2: Identify truth tables and logical operators to analyze problems.
				CO3: Understand the fundamental theorems of Group theory.
				CO4: Understand the fundamental concepts in graph theory.
				CO5: Apply the knowledge of Boolean algebra in switching circuits.
				CO6: Use Max-flow Min-cut theorem, Ford and Fulkerson algorithm to design complex engineering problems.
2	1	Fundamentals of Computer Science & Problem Solving		CO1: To be able to develop an algorithm for solving a problem.
				CO2: To be able to explain the utility of operators in C.
				CO3: To be able to make use of control statements for solving the related problems.
				CO4: To be able to utilize the concept of user defined functions for breaking a problem into sub problems.
				CO5: To be able to solve different problems using pointers and arrays.
				CO6: To be able to make use of structures for constructing a complex data type which is more meaningful and relevant?
3	1	Digital Electronics		CO1: Explaining the number systems and Boolean function simplification methods
				CO2: Design and simulation of combinational logic circuits
				CO3: Design and simulation of sequential logic circuits
				CO4: Construct combinational circuits using memory and PLDs

				CO5: Demonstrate the working principles of ADC and DACs
				CO6: Discuss about the logic families
4	1	Probability and Statistics		CO1: Build knowledge about basic statistical methods and representations of data
				CO2: Explain the concept of frequency distributions and their graphical presentations.
				CO3: Make use of the knowledge about the measures of central tendency, measures of absolute and relative dispersion, moments, measures of skewness and kurtosis, measures of moments.
				CO4: Apply the concepts of scatter diagram, simple correlation, rank correlation, simple linear regression and curve fitting
				CO5: Apply the concepts of basic probability, concepts of conditional probability, Bayes' theorem and independent events, the fundamental knowledge of one dimensional discrete random variables and their related properties.
				CO6: Build the fundamental knowledge of one dimensional continuous random variables and their related properties.
5	2	Linear Algebra		CO1: Understand the fundamentals of matrix algebra.
				CO2: Describe properties of linear systems using vectors and solve systems of linear equations and interpret their results.
				CO3: Identify vector spaces and subspaces.
				CO4: Identify Linear Transform.
				CO5: Construct the matrix representation of a linear transform
				CO6: Apply the knowledge of Eigenvalue, Eigenvector, Singular value decomposition and Principal component analysis to solve

				problems in Image Processing and Machine Learning.
6	2	Programming and data Structures		CO1: To be able to classify linear and non-linear data structure.
				CO2: To be able to solve different problems using Arrays.
				CO3: To be able to make use of linked list for various operations on polynomials, sparse matrix etc.
				CO4: To be able to utilize the knowledge of Stack, Queues in solving real life problem.
				CO5: To be able to apply the knowledge of several binary trees in problem solving.
				CO6: To be able to identify of the most appropriate searching or sorting algorithm for enhancing the efficiency (i.e. reduce the run-time) or for better memory utilization.
7	2	Computer Organization		CO1: Understand the structure, function and characteristics of computer systems and understand the design of the various functional units and components of computers.
				CO2: Design the arithmetic and Logic unit and understand the floating and fixed point number representation
				CO3: Analyze the performance of ripple carry adder and carry look ahead adder and understand the multiplication and division algorithm
				CO4: Identify the elements of control unit and design of control unit
				CO5: Explain the function of each element of a memory hierarchy.
				CO6: Understand the input output subsystem and analyze the role of interrupts in process state transition.
8	2	Signal and Systems		CO1: Describe the basic mathematical operations on signals and systems

				CO2: Convert the Analog signal into discrete time signal using sampling theorem
				CO3: Explain the properties of Fourier series and transformations
				CO4: Discuss the properties of Laplace and Z transformation
				CO5: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
				CO6: Compute the response of the LTI system for random inputs
9	3	Algorithm-I		CO1: To be able to utilize various asymptotic notations to compute the complexity of different algorithms.
				CO2: To be able to choose the suitable standard algorithm design techniques such as divide & conquer, greedy, dynamic programming, backtracking in solving problems.
				CO3: To be able to compare the complexity of various sorting algorithm.
				CO4: To be able to make use of various graph algorithms for solving problems, i.e. finding shortest path, minimum spanning tree etc.
				CO5: To be able to select the appropriate algorithm strategy for several optimization problems.
				CO6: To be able to utilize various algorithm strategies like Branch & Bound, LCS for solving real life problems.
10	3	Computer Architecture		CO1: Understand the concepts of pipelining and parallel processing.
				CO2: Applying arithmetic and instruction pipeline and evaluating the problems of pipeline hazards.
				CO3: Applying the interleaved memory organization concept and concurrent and simultaneous memory access and analysis the cache coherence problem.
				CO4: Understand the principles of instruction-level parallelism and compare various processor architectures, including

				superscalar, super-pipelined, and VLIW, to enhance computational performance.
				CO5: Analyzing different multiprocessor architectures, understand synchronization and memory consistency issues, and evaluate interconnection networks and cluster computing.
				CO6: Understand the concepts of non-von Neumann architectures non von Neumann architectures such as data flow computers, reduction computer architectures, and systolic architectures, and their applications in parallel processing.
11	3	Formal Language and Automata Theory		CO1: To be able to Understand the fundamental concepts of Finite State Machines and Model
				CO2: To be able to Understand the fundamental concepts of Formal Languages and Automata.
				CO3: To be able to apply the pumping lemma, closure properties to problems.
				CO4: To be able to Understand the fundamental concepts of Context free grammars.
				CO5: To be able to Understand the fundamental concepts of Pushdown Automata.
				CO6: To be able to Understand the fundamental concepts of Turing machine and Linear Bounded Automata.
12	3	Object Oriented Programming through C++		CO1: To be able to describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data, and objects.
				CO2: To be able to apply dynamic memory management techniques using pointers, constructors, destructors, etc
				CO3: To be able to apply the concept of classes and objects with an idea of scope resolution operator and various access specifies.
				CO4: To be able to describe the concept of function overloading, operator overloading, virtual functions, and polymorphism.
				CO5: To be able to apply inheritance with an insight into an early and late binding, usage of exception handling, generic programming

				CO6: To be able to apply the knowledge C++ template in designing generic classes
13	4	Operating System		CO1: To be able to understand the design of an operating system and its types. I/O structures and storage structures
				CO2: To be able to apply process scheduling algorithm in various batch process scheduling scenarios
				CO3: To be able to solve process synchronization, and deadlock avoidance problems
				CO4: To be able to compare different memory and I/O management approaches and use system calls for managing processes, memory and the file system
				CO5:To be able to understand the structure and organization of the file system.
				CO6: To be able to compare and use different Disk scheduling techniques.
14	4	Database Management System		CO1: To be able to discuss basic concepts, data models, types of users and appreciate the applications of database systems
				CO2: To be able to understand the logical design of the database including E-R models and the concept of generalization, specialization and aggregation
				CO3: To be able to apply with a relational database system and Normalization
				CO4: To be able to explain the basic concepts of relational database design, relational algebra and SQL

				CO5: To be able to analyze relational database and formulate SQL queries on data.
				CO6: To be able to describe transaction processing and concurrency control concepts
15	4	Artificial intelligence		CO1: To be able to understand the informed and uninformed problem types and apply search strategies to solve them
				CO2: To be able to apply difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing
				CO3:To be able to design and evaluate intelligent expert models for perception and prediction from intelligent environment
				CO4: To be able to Identify valid solutions for problems involving uncertain inputs or outcomes by using decision making techniques
				CO5: To be able to demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area
				CO6: To be able to analyse the issues involved in knowledge bases, reasoning systems and planning
16	4	Algorithm II		CO1: To be able to apply the Amortized analysis to find the complexity/performance of different algorithms
				CO2: To be able to understand the concept of linear time sorting

				CO3: To be able to understand verity of approximation algorithms, such as Vertex cover problem, travelling salesman problem, set covering problem, randomization and linear programming, subset sum problem
				CO4: To be able to understand the concept of Computational Geometry
				CO5: To be able to analyse advanced issues related to design and analysis techniques of algorithms and their relation to NP-complete problems
				CO6: To be able to apply the most suitable algorithm for any given task
17	4	Compiler Design		CO1: To identify different phases and passes of the compiler and also able to use the compiler tools.
				CO2: To able to analyze and compare different types of compiler tools to meet the requirements of the realistic constraints of compilers
				CO3: To understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table and evaluate the issues
				CO4: To Construct the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes
				CO5: To collect knowledge about run time data structure like symbol table organization and different techniques used in that
				CO6: To understand the target machine's run time environment, its instruction set for code

				generation and techniques used for code optimization
18	4	Optimization Techniques		CO1: Understand the concept of Operations Research and the basic concepts linear algebra.
				CO2: Formulate Mathematical Model of various optimization problems and solve linear programming problems using appropriate techniques.
				CO3: Determine optimal strategy for Transportation and Assignment problems
				CO4: Determine the critical path, project time and its variance using the project scheduling techniques – Gantt chart, PERT & CPM
				CO5: Understand the concept of inventory costs, Basics of inventory policy and fixed order-quantity models like EOQ, POQ
				CO6: Understand the concept of queuing theory and identify the queuing models like M/M/1 and M/M/m
19	5	Computer Networks		CO1: To be able to understand data communication components, representation of data, physical topologies and protocols.
				CO2: To be able to understand Analog and Digital transmission, multiplexing and working of transmission media.
				CO3: To be able to solve problems related to error correction/detection and protocols of media access control layer.
				CO4: To be able to solve IP subnetting problems and routing problems.
				CO5: To analyze basic operations of transport layer and congestion control mechanisms.

				CO6: To be able to understand about various application layer functionalities.
20	5	Software Engineering		CO1: Ability to apply software engineering principles and techniques and understand the SDLC, SRS.
				CO2: Ability to develop, maintain and evaluate software design.
				CO3: Analyze the coding standard and justify the code with different testing techniques.
				CO4: Apply the knowledge of system design for testing software in various environment
				CO5: Estimate the scheduling and budgeting for maintaining the project management, and Illustrate the quality control and maintenance of software.
				CO6: To be able to analyze the interaction among various model in a software design using Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, and implementation diagram.
21	5	Digital Image Processing		CO1: To be able to understand basic fundamental concepts of image processing.
				CO2: To be able to implement various image enhancement techniques.
				CO3: To be able to apply different segmentation techniques based on the input image property.
				CO4: To be able to apply various morphological operations on various image.
				CO5: To be able to compare among image registration operations.
				CO6: To be able to establish new image processing techniques for preserving images.
22	5			CO1: To be able to discuss the basics of learning problems with hypothesis

		Machine Learning		CO2: To be able to understand the features of machine learning to deal with real world problems
				CO3: To be able to differentiate the machine learning algorithms as supervised learning and unsupervised learning
				CO4: To be able to design and analyze various classification and clustering algorithms
				CO5: To be able to develop and tune the machine learning models with datasets
				CO6: To be able to evaluate the models for optimization engineering problems
23	6	Introduction to Data Science		CO1: Students should gain a solid understanding of the fundamental concepts and principles of Data Science, including data collection, cleaning, exploration, visualization, statistical analysis, machine learning, and data-driven decision-making.
				CO2: Students should develop proficiency in programming languages commonly used in Data Science, such as Python or R. They should be able to write code to manipulate data, perform statistical analysis, and build machine learning models.
				CO3: Students should acquire skills to effectively manipulate and analyze large and complex datasets. This includes skills in data pre-processing, feature engineering, data transformation, and data visualization.
				CO4: Students should learn various statistical analysis techniques and modeling approaches used in Data Science. This includes understanding of descriptive statistics, inferential statistics, hypothesis testing, regression analysis, time series analysis, and other statistical modeling techniques.

				CO5: Students should become familiar with a range of machine learning algorithms and techniques, such as linear regression, logistic regression, decision trees, random forests, support vector machines, clustering, and neural networks. They should understand the principles behind these algorithms and know how to apply them to real-world problems.
				CO6: Students should develop skills in visualizing and communicating data insights effectively. This includes creating meaningful visualizations, interpreting and presenting results, and effectively communicating findings to both technical and non-technical audiences.
24	6	Cryptography & Network Security		CO1: To understand the fundamental of attacks and the need of security
				CO2: To be able to secure a message over insecure channel by various means.
				CO3: Have a strong understanding of different cryptographic algorithms and techniques and be able to use them
				CO4: To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
				CO5: To understand various protocols for network security to protect against the threats in the networks.
				CO6: To apply methods for authentication, access control, intrusion detection and prevention. Identify and mitigate software security vulnerabilities in existing systems
25	6	Artificial Neural Networks		CO1: Understand the principles of Neural Networks.
				CO2: Identify different types of models of artificial neural networks (ANN).
				CO3: Analyse the feedback and feed-forward neural networks.

				CO4: Develop neural network models.
				CO5: Compare different applications of artificial neural networks.
				CO6: Design and develop applications using neural networks.
26	6	Cloud Computing		CO1: To be able to articulate the business model concepts, architecture and infrastructure of cloud computing, including cloud service models and deployment models.
				CO2: To be able to apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
				CO3: To be able to explore some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.
				CO4: To be able to analyse the core issues of cloud computing such as security, privacy, interoperability, and its impact on cloud application.
				CO5: To be able to analyze the flow of service oriented architecture and protocol stack
				CO6: To be able to evaluate different cloud applications in different platforms.
27	6	Soft Computing		CO1: To Understand intelligent systems leveraging the paradigm of soft computing techniques.
				CO2: To get the knowledge solutions by various soft computing approaches for finding the optimal solutions.
				CO3: To Recognize the feasibility of applying a soft computing methodology for a particular problem

				CO4: To Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
				CO5: To Design hybrid system to revise the principles of soft computing in various applications
				CO6: To analyse the applications of Soft Computing Systems
28	7	INTERNET OF THINGS		CO1: To be able to understand the various concepts, terminologies, and architecture of IoT systems.
				CO2: To be able to use sensors and actuators for design and architecture of IoT.
				CO3: To be able to understand and apply various protocols for design of IoT systems.
				CO4: To be able to apply various techniques of web applications and analytics in IoT.
				CO5: To be able to analyze various applications of IoT.
				CO6: To be able to develop different APIs to connect IoT related technologies.

ii. List of Courses for B. Tech in CSBS

- *Document is in process. Yet to be updated*

iii. List of Courses for B. Tech in CSE (Cyber Security)

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iv. List of Courses for B. Tech in CSE (Data Science)

- *Document is in process. Yet to be updated*

v. List of Courses for B. Tech in CSE (AI/ML)

- *Document is in process. Yet to be updated*

vi. List of Courses for B. Tech in CSE (IoT)

- *Document is in process. Yet to be updated*

10. CO-PO Mapping

i. CO-PO map for B. Tech in CSE

Course Name		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Discrete Mathematics	CO1	3	2	0	0	0	0	0	0	0	0	0	1
	CO2	3	2	0	0	0	0	0	0	0	0	0	0
	CO3	2	1	0	0	0	0	0	0	0	0	0	0
	CO4	2	1	0	0	0	0	0	0	0	0	0	1
	CO5	2	1	0	0	0	0	0	0	0	0	0	0
	CO6	3	2	0	0	0	0	0	0	0	0	0	1
Fundamentals of Computer Science & Problem Solving	CO1	3	3	3	0	0	0	0	0	0	0	0	1
	CO2	3	3	3	0	0	0	0	0	0	0	0	1
	CO3	3	3	3	0	0	0	0	0	0	0	0	1
	CO4	3	3	3	0	0	0	0	0	0	0	0	1
	CO5	3	3	3	0	0	0	0	0	0	0	0	1
	CO6	3	3	3	0	0	0	0	0	0	0	0	1
Digital Electronics	CO1	3	3	3	3	3	0	0	0	0	0	0	3
	CO2	3	3	3	3	3	2	0	0	2	2	0	3
	CO3	3	3	3	3	3	2	0	0	2	2	0	3
	CO4	3	3	3	3	3	2	0	0	2	2	0	3
	CO5	3	3	3	3	3	2	0	0	2	2	0	3
	CO6	3	3	3	3	3	2	0	0	2	2	0	3
	CO1	3	3	2	1	0	0	0	0	0	0	0	1

Probability and Statistics	**CO2**	3	3	2	2	0	0	0	0	0	0	0	1
	CO3	3	3	2	1	0	0	0	0	0	0	0	1
	CO4	3	3	2	0	0	0	0	0	0	0	0	1
	CO5	3	3	2	2	0	0	0	0	0	0	0	1
	CO6	3	3	2	2	0	0	0	0	0	0	0	1
Linear Algebra	**CO1**	3	2	0	0	0	0	0	0	0	0	0	1
	CO2	3	2	0	0	0	0	0	0	0	0	0	0
	CO3	3	2	0	0	0	0	0	0	0	0	0	0
	CO4	3	3	0	0	0	0	0	0	0	0	0	1
	CO5	2	3	0	0	0	0	0	0	0	0	0	0
	CO6	3	3	3	0	0	0	0	0	0	0	0	1
Programming and Data Structures	**CO1**	3	2	1	0	0	0	0	0	0	0	0	0
	CO2	3	3	3	1	0	0	0	0	0	0	0	1
	CO3	3	3	3	2	0	0	0	0	0	0	0	1
	CO4	3	3	3	1	0	0	0	0	0	0	0	1
	CO5	3	3	3	2	0	0	0	0	0	0	0	1
	CO6	3	3	3	2	0	0	0	0	0	0	0	1
Computer Organization	**CO1**	3	2	2	1	0	0	0	0	0	0	0	1
	CO2	0	3	2	2	0	0	0	0	0	0	0	0
	CO3	2	3	1	1	0	0	0	0	0	0	0	1
	CO4	2	3	3	0	3	0	0	0	0	0	0	2
	CO5	1	1	3	3	1	0	0	0	0	0	0	1
	CO6	2	1	1	2	0	0	0	0	0	0	0	1
Signal and Systems	**CO1**	3	2	2	2	0	0	0	0	0	0	0	3
	CO2	3	0	0	3	2	0	0	0	0	0	0	3
	CO3	2	3	3	3	2	0	0	0	0	0	0	2
	CO4	0	2	1	2	0	0	0	0	0	0	0	0
	CO5	2	2	2	2	1	0	0	0	0	0	0	3

	CO6	3	0	0	3	2	0	0	0	0	0	0	3
Algorithm-I	**CO1**	3	3	0	0	0	0	0	0	0	0	0	1
	CO2	3	3	3	0	0	0	0	0	0	0	0	1
	CO3	3	3	3	1	0	0	0	0	0	0	0	1
	CO4	3	3	3	0	0	0	0	0	0	0	0	1
	CO5	3	3	3	0	0	0	0	0	0	0	0	1
	CO6	3	3	3	0	0	0	0	0	0	0	0	1
Computer Architecture	**CO1**	3	2	1	2	0	0	0	0	0	0	0	0
	CO2	3	2	1	2	0	1	0	0	0	0	0	1
	CO3	2	0	2	2	0	0	0	0	0	0	0	1
	CO4	3	1	2	1	0	0	0	0	0	0	0	1
	CO5	2	0	-	2	0	0	0	0	0	0	0	0
	CO6	2	0	2	2	0	1	0	0	0	0	0	1
Formal Language and Automata Theory	**CO1**	3	0	2	2	0	0	0	0	0	0	0	1
	CO2	3	0	0	1	0	0	0	0	0	0	0	1
	CO3	3	2	1	0	0	1	0	0	0	0	0	0
	CO4	0	2	2	1	0	0	0	0	0	0	0	1
	CO5	2	0	0	1	2	1	0	0	0	0	0	1
	CO6	2	2	2	0	0	1	0	0	0	0	0	0
Object Oriented Programming through C++	**CO1**	3	1	3	0	0	0	0	0	0	0	0	0
	CO2	2	1	3	0	0	0	0	0	0	0	0	0
	CO3	3	0	1	2	0	0	0	0	0	0	0	0
	CO4	3	2	0	1	1	0	0	0	0	0	0	2
	CO5	3	2	2	2	0	0	0	0	0	0	0	2
	CO6	3	0	3	3	2	0	0	0	0	0	0	3
Operating System	**CO1**	3	2	2	0	0	0	0	0	0	0	0	1
	CO2	3	3	3	1	0	0	0	0	0	0	0	2

	CO3	3	2	3	2	0	0	0	0	0	0	0	2
	CO4	3	3	2	3	0	0	0	0	0	0	0	2
	CO5	3	2	1	2	0	0	0	0	0	0	0	1
	CO6	3	2	1	2	0	0	0	0	0	0	0	2
Database management System	**CO1**	3	2	2	1	1	0	0	0	0	0	0	1
	CO2	3	0	2	0	0	1	0	0	0	0	0	2
	CO3	2	2	0	2	1	0	0	0	0	0	0	1
	CO4	0	0	2	1	0	1	0	0	0	0	0	0
	CO5	2	2	0	0	1	0	0	0	0	0	0	0
	CO6	0	2	2	1	0	0	0	0	0	0	0	2
Artificial Intelligence	**CO1**	3	2	2	0	0	0	0	0	0	0	0	1
	CO2	1	2	2	2	0	0	0	0	0	0	0	0
	CO3	0	0	0	2	2	2	0	0	0	0	0	2
	CO4	1	3	2	1	0	0	0	0	0	0	0	1
	CO5	1	2	0	2	1	0	0	0	0	0	0	1
	CO6	0	2	2	2	2	0	0	0	0	0	0	1
Algorithm II	**CO1**	3	0	0	0	0	0	0	0	0	0	0	0
	CO2	1	1	1	0	0	0	0	0	0	0	0	0
	CO3	3	3	3	0	0	0	0	0	0	0	0	0
	CO4	2	2	0	0	0	0	0	0	0	0	0	0
	CO5	2	2	0	2	2	0	0	0	0	0	0	0
	CO6	3	3	0	3	0	0	0	0	0	0	0	0
Compiler Design	**CO1**	1	1	0	0	0	0	0	0	0	0	0	0
	CO2	2	2	0	2	1	0	0	0	0	0	0	0
	CO3	2	3	0	1	1	0	0	0	0	0	0	0
	CO4	2	2	0	1	0	0	0	0	0	0	0	0
	CO5	1	1	0	1	0	0	0	0	0	0	0	0
	CO6	0	0	0	1	0	0	0	0	0	0	0	1

Optimization Technique	**CO1**	3	0	0	0	0	0	0	0	0	0	0	1
	CO2	3	3	0	0	0	0	0	0	0	0	0	1
	CO3	3	3	0	0	0	0	0	0	0	0	0	0
	CO4	3	0	0	0	0	0	0	0	0	0	0	0
	CO5	3	0	0	0	0	0	0	0	0	0	0	1
	CO6	2	3	0	0	0	0	0	0	0	0	0	1
Computer Networks	**CO1**	2	2	1	2	0	0	0	0	0	0	0	1
	CO2	3	3	2	3	0	0	0	0	0	0	0	1
	CO3	3	3	2	2	2	0	0	0	0	0	0	0
	CO4	2	3	3	3	2	2	0	0	0	0	0	0
	CO5	3	2	1	2	2	2	0	0	0	0	0	0
	CO6	2	2	1	1	2	0	0	0	0	0	0	1
Software Engineering	**CO1**	0	2	0	1	0	0	0	0	0	1	0	0
	CO2	2	2	3	0	0	0	0	0	0	0	0	0
	CO3	3	2	3	0	0	2	0	0	0	0	0	0
	CO4	0	2	0	0	0	0	0	0	1	1	0	0
	CO5	1	2	0	1	0	0	0	0	2	0	0	1
	CO6	0	1	3	0	3	0	0	0	0	1	0	1
Digital Image Processing	**CO1**	3	3	2	0	2	2	0	0	0	0	0	1
	CO2	3	0	2	0	0	0	0	0	0	0	0	0
	CO3	0	3	0	2	0	0	0	0	0	0	0	1
	CO4	3	2	0	0	1	2	0	0	0	0	0	0
	CO5	2	0	2	0	0	2	0	0	0	0	0	0
	CO6	2	3	2	2	0	2	0	0	0	0	0	2
Machine Learning	**CO1**	3	3	2	1	0	0	0	0	0	0	0	1
	CO2	3	2	0	2	1	0	0	0	0	0	0	2
	CO3	2	2	3	2	2	0	0	0	0	0	0	2

	CO4	1	2	3	3	2	0	0	0	0	0	0	3
	CO5	2	2	3	3	3	0	0	0	0	0	0	3
	CO6	0	2	3	3	2	0	0	0	0	0	0	0
Introduction to Data Science	**CO1**	1	2	3	0	0	0	0	0	0	0	1	2
	CO2	2	2	2	3	0	0	0	0	0	0	3	2
	CO3	2	2	3	0	0	0	0	0	0	0	3	2
	CO4	1	2	3	3	0	0	0	0	0	0	2	2
	CO5	1	2	2	1	0	0	0	0	0	0	1	2
	CO6	2	2	2	3	0	0	0	0	0	0	2	2
Cryptography & Network Security	**CO1**	2	3	1	0	0	0	0	0	0	0	2	3
	CO2	1	3	2	0	0	0	0	0	0	0	0	3
	CO3	3	3	3	2	0	0	0	0	0	0	2	3
	CO4	1	3	2	0	0	0	0	0	0	0	0	3
	CO5	3	3	3	2	0	0	0	0	0	0	2	3
	CO6	2	3	3	3	0	0	0	0	0	0	0	3
Artificial Neural Networks	**CO1**	2	0	0	0	0	0	0	0	0	0	0	2
	CO2	2	2	0	0	0	0	0	0	0	0	0	2
	CO3	2	0	0	0	0	0	0	0	0	0	0	0
	CO4	3	3	0	3	0	0	0	0	0	0	2	0
	CO5	2	3	0	0	0	0	0	2	0	0	2	0
	CO6	0	3	2	0	0	0	0	0	0	0	2	0
Cloud Computing	**CO1**	1	2	1	1	0	0	0	0	0	0	2	3
	CO2	2	3	3	3	0	0	0	0	0	0	0	2
	CO3	2	3	3	3	0	0	0	0	0	0	2	2
	CO4	3	2	2	2	0	0	0	0	0	0	0	3
	CO5	3	2	2	2	0	0	0	0	0	0	2	2
	CO6	2	3	3	3	0	0	0	0	0	0	0	1
	CO1	3	2	2	0	0	0	0	0	0	0	0	3

Soft Computing	**CO2**	3	3	3	2	1	0	0	0	0	0	3	3
	CO3	3	3	3	2	2	0	0	0	0	0	2	2
	CO4	2	3	3	3	1	0	0	0	0	0	2	1
	CO5	3	3	3	2	2	0	0	0	0	0	3	1
	CO6	2	3	3	3	2	0	0	0	0	0	3	1
Internet of Things [IoT]	**CO1**	3	2	2	1	0	0	0	0	0	0	0	2
	CO2	0	3	2	2	0	0	0	0	0	1	0	0
	CO3	2	3	1	1	0	1	1	0	0	0	0	1
	CO4	2	3	3	0	3	0	0	1	0	0	0	2
	CO5	1	1	3	3	1	0	0	0	0	0	1	1
	CO6	2	1	1	2	0	0	0	0	0	0	0	1

Highly Correlated: 3
Moderately Correlated: 2
Slightly Correlated: 1
Not Correlated: 0

ii. CO-PO map for B. Tech in CSBS

- *Document is in process. Yet to be updated*

iii. CO-PO map for B. Tech in CSE (Cyber Security)

- *Document is in process. Yet to be updated*

iv. CO-PO map for B. Tech in CSE (Data Science)

- *Document is in process. Yet to be updated*

v. CO-PO map for B. Tech in CSE (AI/ML)

- *Document is in process. Yet to be updated*

vi. CO-PO map for B. Tech in CSE (IoT)

- *Document is in process. Yet to be updated*