



USHA MITTAL INSTITUTE OF TECHNOLOGY
SNDT Women's University
Faculty: Technology (Undergraduate Course) -BTech

NEP
2023

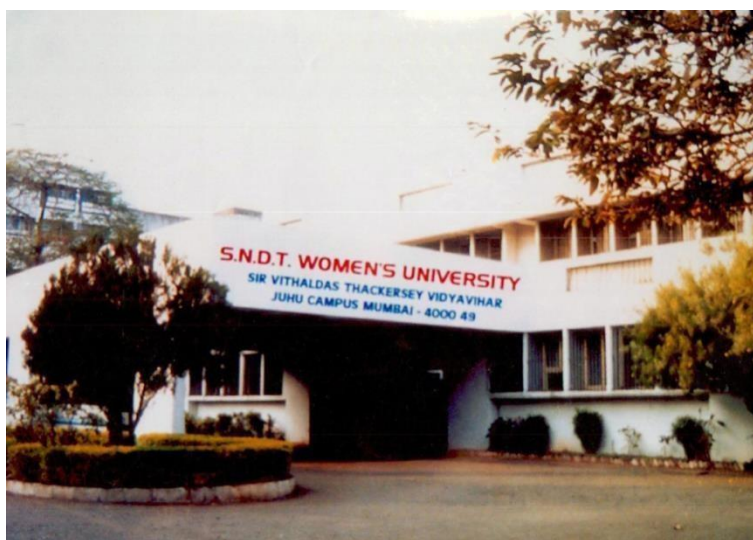
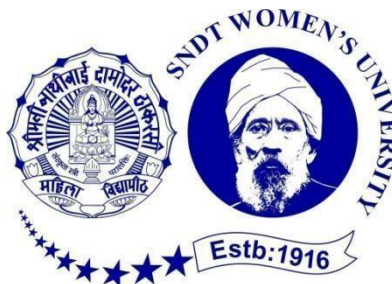
USHA MITTAL INSTITUTE OF TECHNOLOGY
(umit.ac.in)

SNDT Women's University

(Sndt.digitaluniversity.ac)

Syllabus B. Tech.

ENC/ CST/ IT/ CE/ DS/ AI Syllabus



SNDT Women's University

1, Nathibai Thackersey Road Mumbai 400 020

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Semester-I (Group A)

● Theory Courses

Category and Course Code	Course Title	Hours Per Week		Cr	D	TP	TW	P/V	Total
		L	P						
Basic Science course (BSC101)	Engineering Physics	2	-	2.0	2	50	50	-	100
Basic Science course (BSC102)	Mathematics –I	3	-	3.0	2	50	50	-	100
Engineering Science Courses(ESC101)	Basic Electronic Engineering	3	-	3.0	2	50	50	-	100
Engineering Science Courses(ESC102)	Engineering Graphics & Design	1	-	1.0	2	50	50	-	100
Engineering Science Courses	Biology For Engineers	2	-	2.0	2	50	-	-	50
Vocational and Skill Enhancement Course (VSEC)	Introduction to web programming	2	-	2.0	2	50	-	-	50
Ability Enhancement Course (AEC -01, AEC-02)	Technical Communication-I	2	-	2.0	2	50	-	-	50
	Introduction to web programming Lab		2	1.0			25	P/V	25
	Engg. Physics Lab		2	1.0		-	25	P/V	25
	Basic Electronics Engineering Lab		2	1.0		-	25	P/V	25
	Engineering Graphics & Design Lab	-	2	1.0		-	25	V	25
Co-curricular Courses (CC)	NSS/Yoga/ IPDC/Tourism			2.0		-	-	-	50
	Total			21					700

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Semester-II(Group A)

● Theory Courses

Category and Course Code	Course Title	Hours Per Week		Cr	D	TP	TW	P/V	Total
		L	P						
Basic Science course (BSC101)	Engineering Chemistry	2	-	2.0	2	50	50	-	100
Basic Science course (BSC103)	Mathematics –II	3	-	3.0	2	50	50	-	100
Engineering Science Courses(ESC101)	Digital Electronics	3	-	3.0	2	50	50	-	100
Engineering Science Courses(ESC102)	Programming for Problem Solving	3		3.0	2	50	50	-	100
Programme Core Course(PCC	Programming Methodologies	2	-	2.0	2	50	-	-	50
Vocational and Skill Enhancement Course (VSEC)	Mobile App Development	1		1.0		-	25		25
Humanities and Social Sciences including Management courses (HSMC101)	Technical Communication-II	2	-	2.0	2	50	-	-	50
	Engg Chemistry Lab		2	1.0			25	P/V	25
	Digital Electronics Lab		2	1.0	-	-	25	P/V	25
Vocational and Skill Enhancement Course (VSEC)	Mobile App Development Lab		2	1.0	-	-	25	P/V	25
	Programming for Problem Solving Lab		2	1.0			25	P/V	25
	Engineering Graphics & Design Lab- II		2	1.0			25	V	25
Co-curricular Courses (CC)	NSS/NCC/Yoga/IP DC/ Tourism			2.0		-	-	-	50
	Total			23					700

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SEM I

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Course code					
Category	Basic Science course (BSC101)				
Course title	Engineering Physics (Theory and Lab)				
Scheme and Credits	L	T	P	Credits	Semester I (Group A)
	2	-	2	3	
Pre-requisites (if any)	Fundamentals of science at 10+2 schooling levels				
Course Objectives	The concepts developed in this course will aid in quantification of several concepts in chemistry and physics that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic, and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer level or microscopic level, one has to understand the description of all chemical processes at molecular levels. All the phenomena of light could have been successfully explained by electromagnetic wave theory. The learners will be able to ● Learn the basic concept of electromagnetism such as electrostatics and magnetostatics. ● Learn the concept of electric polarization and magnetic polarization for electric and magnetic fields. ● Understand the different laws of electromagnetic wave theory based on Maxwell’s equations. ● Learn the principle of Huygen’s wave theory and superpositions of waves for understanding the concept of interference and diffraction. ● Acquire the concept of limit of resolution and its applications to vision. ● Understand the concept of laser beam based on properties of ordinary light and laser light, ● Learn the different types of lasers and various applications of Laser in different fields such as science and technology, medicinal field, defense, industry, and commercial products etc.				



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Course Outcomes	The learners will be able to • Understand and impart the knowledge about the concept of electromagnetic wave theory and its applications in various fields which will lead to innovation. • understand the concept of bound charges and bound currents under the polarization phenomena of electric and magnetic fields. • acquire the knowledge of all four Maxwell's equations in the field of electromagnetic wave theory in vacuum and nonconducting medium. • Recognize, explain, and apply thorough knowledge of interference and diffraction phenomena under the field of wave optics. • Recognize and explain the difference between ordinary light (Incandescent) and laser light based on laser properties
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Course code					
Category	Engineering Science Course				
Course title	Mathematics-I				
Scheme and Credits	L	T	P	Credits	Semester I
	3	-		3	
Pre-requisites (if any)	XI, XII std level mathematics				
Course Objectives	The learner will be able to ● To introduce the idea of applying differential and integral calculus to improper integrals, and give basic introduction on Beta and Gamma functions. ● To develop the tool of Fourier series for learning advanced Engineering Mathematics. ● To familiarize the student with functions of several variables that is essential in most branches of engineering. To develop the essential tool of matrices and linear algebra in a comprehensive manner.				
Course Outcomes	The learner will be able to ● apply the knowledge of differential and integral calculus to notions of improper integrals. ● recognise Beta and Gamma functions and use them in solving practical problems. ● use the tool of Fourier series for learning advanced Engineering problems. ● deal with functions of several variables that are essential in most branches of Engineering. ● use matrices as an essential tool to solve engineering problems..				

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Course code					
Category	Engineering Science Courses(ESC101)				
Course title	Basic Electronic Engineering (Theory and Lab)				
Scheme and Credits	L	T	P	Credits	Semester I (Group A)
	3	-	2	4	
Pre-requisites (if any)					
Course Objectives	The students will be able to ● Understand working of different electrical circuits ● Analyze AC and DC circuits ● Understand the working of a diode and bipolar junction transistor				
Course Outcomes	● To understand and analyze basic electric circuits ● Apply knowledge of AC fundamentals to analyze AC circuits. ● Apply the various simplification methods to analyze dc circuits. ● Explain the working, characteristics, and applications of diodes and BJT.				

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Course code						
Category	Engineering Science Courses(ESC102)					
Course title	Engineering Graphics & Design (Theory and Lab)					
Scheme and Credits	L	T	P	Credits	Semester I	
	1	-	2	2		
Pre-requisites (if any)						
Course Objectives	• Understand the importance and applications of engineering drawings in various fields. • Develop skills in creating basic engineering drawings using standard conventions and symbols. • Acquire proficiency in reading and interpreting engineering drawings, including dimensioning and tolerancing. • Familiarize with computer-aided design (CAD) software and its role in modern engineering drawing practices. • Learn about different types of projections, views, and sectional views in engineering drawings. • Explore the principles of geometric dimensioning and tolerancing					
Course Outcomes	By the end of this course, students will have a solid foundation in engineering drawing principles, enabling them to create, read, and interpret technical drawings accurately and effectively, thereby enhancing their professional capabilities in various engineering disciplines.					

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Course code					
Category	Engineering Science Courses				
Course title	Biology for Engineers (Theory)				
Scheme and Credits	L	T	P	Credit	Semester I
	2	-	-	2	
Pre-requisites (if any)	-				
Course Objective	Students will be introduced to the basics of biology such as cell structure and functions, inheritance & evolution, basic concepts of genetics, and an introduction to metabolism				
Course Outcomes	Describe how biological observations of 18th Century that lead to major discoveries. Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological				

Course code					
Category	Vocational and Skill Enhancement Course (VSEC)				
Course title	Introduction to Web Programming (Theory and Lab)				
Scheme and Credits	L	T	P	Credits	Semester I
	2	-	2	3	
Pre-requisites (if any)	1. Basic knowledge in HTML tags & skill of creating web pages should be known 2. Knowledge of basic Computer hardware & software is also necessary				
Course Objectives	The student will be able to 1. Define the principle of Web page design 2. Define the basics in web design 3. Visualize the basic concept of HTML. 4. Recognize the elements of HTML. 5. Introduce the basic concept of CSS. 6. Develop the concept of web publishing				
Course Outcomes	• Understanding of development of web pages • Hosting of website • Connecting web pages with database				

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Course code					
Category	Ability Enhancement Course (AEC-01)				
Course title	Technical Communication I (Theory)				
Scheme and Credits	L	T	P	Credits	Semester I
	2	-		2	
Pre-requisites (if any)					
Course Objectives	• Construct grammatically correct sentences • Design effective letters • Write effective essays • Make formal presentations				
Course Outcomes	1. The learners will be able to acquire basic proficiency in English including reading, writing, listening and speaking skills				

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SEM II

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Course code					
Category	Basic Science course (BSC101)				
Course title	Engineering Chemistry (Theory and Lab)				
Scheme and Credits	L	T	P	Credits	Semester II (Group A)
	2	-	2	3	
Pre-requisites (if any)	10+2 level Chemistry				
Course Objectives	Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to understand the description of all chemical processes at molecular levels. The course will enable the student to: • Learn the basics of electromagnetism. • Analyze microscopic chemistry in terms of atomic and molecular orbitals and energy level diagrams. • Differentiate the various electromagnetic radiations used for the study of molecular energy levels and their applications in various spectroscopic techniques. • Explain the thermodynamic concepts such as entropy, free energy, cell potentials and apply those to the real systems. • Understand the molecular forces existing in a bulk, macroscopic system.				
Course Outcomes	The learners will be able to • .Analyze atomic and molecular structure in terms of wavefunctions, charge densities and energy level diagrams. • Understand the nature of bonding existing in molecules and the electron distribution in molecular orbitals • Familiarize with the properties of the materials • Obtain quantitative information about energy levels through molecular spectroscopic methods such as electronic, vibrational, rotational and nuclear magnetic resonance (NMR) spectroscopy. • Rationalize bulk properties and processes using thermodynamic considerations. • Understand the energies existing in a bulk macroscopic system.				

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Course code					
Category	Basic Science course (BSC101)				
Course title	Engineering Physics (Theory and Lab)				
Scheme and Credits	L	T	P	Credits	Semester II (Group B)
	2	-	2	3	
Pre-requisites (if any)	Fundamentals of science at 10+2 schooling levels				
Course Objectives	The concepts developed in this course will aid in quantification of several concepts in chemistry and physics that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic, and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer level or microscopic level, one has to understand the description of all chemical processes at molecular levels. All the phenomena of light could have been successfully explained by electromagnetic wave theory. The learners will be able to • Learn the basic concept of electromagnetism such as electrostatics and magnetostatics. • Learn the concept of electric polarization and magnetic polarization for electric and magnetic fields. • Understand the different laws of electromagnetic wave theory based on Maxwell’s equations. • Learn the principle of Huygen’s wave theory and superpositions of waves for understanding the concept of interference and diffraction. • Acquire the concept of limit of resolution and its applications to vision. • Understand the concept of laser beam based on properties of ordinary light and laser light, • Learn the different types of lasers and various applications of Laser in different fields such as science and technology, medicinal field, defense, industry, and commercial products etc.				

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Course Outcomes	The learners will be able to • Understand and impart the knowledge about the concept of electromagnetic wave theory and its applications in various fields which will lead to innovation. • understand the concept of bound charges and bound currents under the polarization phenomena of electric and magnetic fields. • acquire the knowledge of all four Maxwell's equations in the field of electromagnetic wave theory in vacuum and nonconducting medium. • Recognize, explain, and apply thorough knowledge of interference and diffraction phenomena under the field of wave optics. • Recognize and explain the difference between ordinary light (Incandescent) and laser light based on laser properties
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Course code					
Category	Basic Science course (BSC103)				
Course title	Mathematics –II (Theory)				
Scheme and Credits	L	T	P	Credits	Semester II
	3	-		3	
Pre-requisites (if any)	Sem I, XI and XII std level mathematics				
Course Objectives	The learner will be able to ● To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage. ● To introduce effective mathematical tools for the solutions of differential equations that model physical processes. ● To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems				
Course Outcomes	Learner will be able to use ● Mathematical tools needed in evaluating multiple integrals. ● Effectively the mathematical tools for the solutions of differential equations that model physical processes. ● The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing with engineering problems.				

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Course code					
Category	Engineering Science Courses(ESC101)				
Course title	Digital Electronics (Theory and Lab)				
Scheme and Credits	L	T	P	Credits	Semester II (Group A)
	3	-	2	4	
Pre-requisites (if any)					
Course Objectives	The students will be able to ● Acquire knowledge about basic components of digital circuits ● Understand working of different combinational and sequential circuits ● Learn the working of logic families				
Course Outcomes	At the end of this course students will demonstrate the ability to ● Understand the working of logic gates ● Design and analyze combinational logic circuits ● Design & analyze synchronous sequential logic circuits ● Understand the working of logic families				

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Course code					
Category	Engineering Science Course				
Course title	Programming for Problem Solving Theory (Theory and Lab)				
Scheme and Credits	L	T	P	Credits	Semester II
	3	-	2	4	
Pre-requisites (if any)					
Course Objectives	● To formulate simple algorithms for arithmetic and logical problems. ● To translate the algorithms to programs (in C language). ● To test and execute the programs and correct syntax and logical errors. ● To implement conditional branching, iteration and recursion. ● To decompose a problem into functions and synthesize a complete program using divide and conquer approach. ● To use arrays, pointers and structures to formulate algorithms and programs. ● To apply programming to solve matrix addition and multiplication problems and searching and sorting problems. ● To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.				
Course Outcomes					

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Course code					
Category	Programme Core Course(PCC)				
Course title	Programming Methodology (Theory)				
Scheme and Credits	L	T	P	Credits	Semester II
	2	-		2	
Pre-requisites (if any)					
Course Objectives					
Course Outcomes	● To understand the different data types and that there exists a representation of each in the memory, as well as the limitation of the representations due to the limited number of bits; ● To develop a simple mental model of how a program is executed (CPU runs the code on data that is stored in memory, function call leads to the creation of call frames, which can explain recursion and variable scoping, etc). For interpreted language, understand the role of virtual machine/interpreter; ● To be able to understand at a high level the compilation process (from pre-processing to compiling to linking), where applicable				

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Course code					
Category	Ability Enhancement Course (AEC-02)				
Course title	Technical Communication II (Theory)				
Scheme and Credits	L	T	P	Credits	Semester II
	2	-		2	
Pre-requisites (if any)					
Course Objectives	The learners will be able to ● Identify and select many types of writing frequently required in a variety of careers, ● Practice audience analysis and develop effective communication strategies for a variety of audiences, ● Determine your purposes/objectives and develop skill in composing and revising on the computer documents with formats and language appropriate for those purposes, ● Demonstrate in your writing the effective communication principles encouraged by professional writers, ● Achieve a greater awareness of the importance of selecting and integrating graphics with written communication, ● To differentiate among and to use facts, inferences and judgments.				

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Course Outcomes	The learners will be able to 1. Participate actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace. 2. Understand how to apply technical information and knowledge in practical documents for a variety of a.) professional audiences (including peers and colleagues or management) and b) public audiences. 3. Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices. 4. Recognize, explain, and use the rhetorical strategies and the formal elements of these specific genres of technical communication: technical abstracts, data-based research reports, instructional manuals, technical descriptions, web pages, wikis, and correspondence. 5. Collect, analyze, document, and report research clearly, concisely, logically, and ethically; understand the standards for legitimate interpretations of research data within scientific and technical communities. 6. Recognize and develop professional format features in print, Html, and multimedia modes, as well as use appropriate nonverbal cues and visual aids. 7. Revise and edit effectively in all assignments, including informal media (such as emails to the instructor). 8. Develop professional work habits, including those necessary for effective collaboration and cooperation
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Course code					
Category	Vocational and Skill Enhancement Course (VSEC)				
Course title	Mobile App Development Lab				
Scheme and Credits	L	T	P	Credits	Semester II
	1	-	2	2	
Pre-requisites (if any)					
Course Objectives	The learners will be able to ● To facilitate students to understand android SDK ● To help students to gain a basic understanding of Android application development ● To inculcate working knowledge of Android Studio development tools.				
Course Outcomes	The learners will be able to 1. Demonstrate their understanding of the fundamentals of Android operating systems . 2. Demonstrate their skills of using Android software development tools. 3. Demonstrate their ability to develop software with reasonable complexity on mobile platforms. 4. Demonstrate their ability to deploy software to mobile devices. 5. Demonstrate their ability to debug programs running on mobile devices.				



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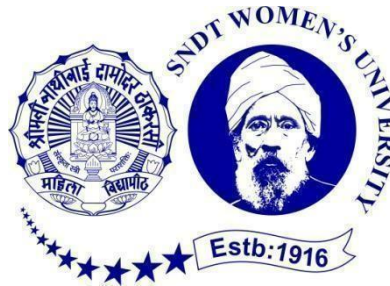
Subject: Syllabus for Computer Engineering

**Pattern
2023
Scheme**

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**Scheme B. Tech. in
Computer Engineering**



SNDT Women's University

1, Nathibai Thackersey Road,

Mumbai 400 020

(Applicable to students taking admission in and after 2023)

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Credit Definition

1 Hr. Lecture (L) per week	1 credit
2 Hours Practical (Lab)/week	1 credit

Range of credits –

- Credits of 168 for a student to be eligible to get an Undergraduate degree in Computer Engineering (CE).

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Semester III

Category	Subject Code	Course Title	Hours/Week			C	D	T P	T W	P/V	Total
			L	T	P						
PCC	30532101	Data Structures and Algorithms	3	-	-	3	2	50	50		100
PCC	30532201	Data Structures and Algorithms Lab	-	-	2	1			25	25	50
PCC	30540101	Object Oriented Programming	3	-	-	3	2	50	50		100
PCC	30540201	Object Oriented Programming Lab	-	-	2	1			25	25	50
MDM	30725101	Internet of Things	2	-	-	2	2	50	50		100
MDM	30725201	Internet of Things Lab	-	-	2	1			25	25	50
OE1	Refer Table 1	Open Elective I	3	-	-	3	2	50	50		100
HSSM	30400101	Accounts and Finance	2	-	-	2	2	50	50		100
HSSM (VEC)	30400102	Universal Human Values	2	-	-	2	2	-	50		50
Comm. Engg. Project (CEP)/Field Project (FP)	30905301	Mini Project	-	-	4	2	-	-	25	25	50
		Total	15	-	10	20					750

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OE-1 Table

Sr.No	Subject Code	Course Title
1	30841101	Discrete Mathematics
2	30825101	Graph Theory

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Semester IV

Category	Subject Code	Course Title	Hours/Week			C	D	TP	TW	P/V	Total
			L	T	P						
PCC	40525101	Operating Systems	3	-	-	3	2	50	50		100
PCC	40525201	Operating Systems Lab	-	-	2	1			25	25	50
PCC	40532101	Design and Analysis of Algorithms	3	-	-	3	2	50	50		100
PCC	40532201	Design and Analysis of Algorithms Lab	-	-	2	1			25	25	50
MDM Course	40730101	Computer Architecture and Organization	2	-	-	2		50	50		100
OE2	Refer Table 2	Open Elective II	2	-	-	2	2	50	50		100
Skill Courses	40332101	Java Programming	2	-	-	1		50	25		75
Skill Courses	40332201	Java Programming Lab	-	-	2	1				25	25
HSSM (AEC)	40400101	Advanced Technical Communication	2	-	-	2	2	-	50		50
HSSM (Entrepreneurship)	40400102	Principles of Entrepreneurship	2	-	-	2	2-	-	50		50
HSSM (VEC)	40400103	Environmental Science	2	-	-	2	2	-	50		50
		Total	18	-	6	20					750

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OE 2- Table 2

Sr.No	Subject Code	Course Title
1	40837101	Foundations of Linear Algebra, Probability, and Statistics
2	40842101	Design Thinking

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Category	Professional Core Courses				
Course title	Data structures & Algorithms				
Scheme and Credits	L	T	P	Credit	Semester III
	3	-	1	4	
Pre-requisites (if any)	C Programming				
Course Objective	1. To impart the basic concepts of data structures and algorithms. 2. To understand concepts about searching and sorting techniques 3. To understand basic concepts about stacks, queues, lists, trees, and graphs. 4. To enable them to write algorithms for solving problems with the help of fundamental data structures				
Course Outcomes	1. For a given algorithm student will be able to analyze the algorithms to determine the time and computation complexity and justify the correctness 2. For a given Search problem (Linear Search and Binary Search) students will be able to implement it. 3. For a given problem of Stacks, Queues and linked list students will be able to implement it and analyze the same to determine the time and computation complexity. 4. Students will be able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in terms of Space and Time complexity. 5. Students will be able to implement Graph search and traversal algorithms and determine the time and computation complexity.				

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Category	Professional Core Course (PCC)				
Course title	Object Oriented Programming				
Scheme and Credits	L	T	P	Credit	Semester III
	3	0	1	4	
Pre-requisites (if any)	C Programming				
Course Objective	The students will be able to 1. The course will introduce standard tools and techniques for software development, using object oriented approach, use of a version control system, an automated build process, an appropriate framework for automated unit and integration tests.				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Specify simple abstract data types and design implementations, using abstraction functions to document them. 2. Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity. 3. Name and apply some common object-oriented design patterns and give examples of their use. 4. Design applications with an event-driven graphical user interface.				

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Category	MDM				
Course title	Internet of Things				
Scheme and Credits	L	T	P	Credit	Semester III
	2	-	1	3	
Course Objective	The students will be able to To make students know the IoT ecosystem. To provide an understanding of the technologies and the standards relating to the 1. Internet of Things. 2. To develop skills on IoT technical planning.				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. To understand the technology and standards relating to IoTs. 2. To understand the critical ecosystem required to mainstream IoTs. 3. To Acquire skills on developing their own national and enterprise level technical strategies.				

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Category	Open Elective I				
Course title	Discrete Mathematics				
Scheme and Credits	L	T	P	Credit	Semester III
	3		-	3	
Pre-requisites (if any)	Basic Mathematics				
Course Objective	Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following: 1. Use mathematically correct terminology and notation. 2. Construct correct direct and indirect proofs. 3. Use division into cases in a proof. 4. Use counterexamples. 5. Apply logical reasoning to solve a variety of problems.				
Course Outcomes	1. For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives 2. For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference 3. For a given a mathematical problem, classify its algebraic structure 4. Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra 5. Develop the given problem as graph networks and solve with techniques of graph theory.				

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Course code					
Category	Open Elective I				
Course title	Graph Theory				
Scheme and Credits	L	T	P	Credits	Semester III
	3	-	-	3	
Pre-requisites(if any)	Basic Mathematics				
Course Objective	The students will be able to 1. Acquire the knowledge of graph theory and theoretic problems 2. Learn to formulate graphs and theorems 3. Apply basic algorithms for graphs				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Know some important classes of graph theoretic problems; 2. Be able to formulate and prove central theorems about trees, matching, connectivity, coloring and planar graphs; 3. Be able to describe and apply some basic algorithms for graphs; 4. Be able to use graph theory as a modelling tool.				

Category	Humanities & Social Sciences including Management courses				
Course title	Accounts and Finance				
Scheme and Credits	L	T	P	Credit	Semester III
	2	-	-	2	
Pre-requisites (if any)	Basic Mathematics				
Course Objective	1. To enable the students to gain knowledge about Accountancy & Finance. 2. To improve the financial thinking skills of students. 3. To develop students’ ability to identify and evaluate accounting problems and arrive at reasoned conclusions.				

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Course Outcomes	The students will be able to: 1. Identify the main financial statements and their purposes. 2. Complete a Project/ Written Assignment that integrates career orientation and or professional development skills. 3. Develop the ability to use accounting information to solve a variety of business problems.
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Category	HSSM (VEC)				
Course title	Universal Human Values				
Scheme and Credits	L	T	P	Credit	Semester III
	2	0	0	2	
Course Objective	The objective of the course is fourfold: 1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society, and nature/existence. 2. Understanding (or developing clarity) of the harmony in the human being, family, society, and nature/existence Strengthening of self-reflection. 3. Development of commitment and courage to act.				
Course Outcomes	By the end of the course, students were able to 1. Become more aware of themselves, and their surroundings (family, society, nature) 2. More responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. 3. Better critical ability, sensitive to their commitment towards what they have understood (human values, human relationship and human society). 4. Able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.				



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Semester IV

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Category	Professional Core Course (PCC)				
Course title	Operating Systems				
Scheme and Credits	L	T	P	Credit	Semester IV
	3	-	1	4	
Pre-requisites (if any)	Good knowledge of C, Computer Organization and Architecture, x86 Assembly level programming.				
Course Objective	To learn the fundamentals of Operating Systems. 1. To learn the mechanisms of OS to handle processes and threads and their communication 2. To learn the mechanisms involved in memory management in contemporary OS 3. To gain knowledge on distributed operating system concepts that includes architecture. 4. Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols 5. To know the components and management aspects of concurrency management				
Course Outcomes	Students should able to 1. Create processes and threads. 2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. 3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time. 4. Design and implement a file management system.				

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Category	Professional Core Courses				
Course title	Design and Analysis of Algorithms				
Scheme and Credits	L	T	P	Credit	Semester IV
	3	-	1	4	
Pre-requisites (if any)	Data Structure and Algorithms				
Course Objective	1. Analyze the asymptotic performance of algorithms. 2. Write rigorous correctness proofs for algorithms. 3. Demonstrate a familiarity with major algorithms and data structures. 4. Apply important algorithmic design paradigms and methods of analysis. 5. Synthesize efficient algorithms in common engineering design situations				
Course Outcomes	1. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms. 2. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms. 3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation. 4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problem of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity. 5. For a given model engineering problem model, it uses a graph and writes the corresponding algorithm to solve the problems. 6. Explain the ways to analyze randomized algorithms (expected running time, probability of error).				

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	7. Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).
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Category	MDM				
Course title	Computer Architecture and Organization				
Scheme and Credits	L	T	P	Credit	Semester IV
	2	-	-	2	
Pre-requisites (if any)	Basic Electronics				
Course Objective	To expose the students to the following: - How Computer Systems work & the basic principles - Instruction Level Architecture and Instruction Execution - The current state of art in memory system design - How I/O devices are accessed and its principles. - To provide the knowledge on Instruction Level Parallelism - To impart the knowledge on micro programming - Concepts of advanced pipelining techniques.				
Course Outcomes	- Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Write assembly language program for specified microprocessor for computing 16-bit multiplication, division, and I/O device interface (ADC, Control circuit, serial port communication). - Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process. - Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU. - Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology				

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Category	Open Elective II				
Course title	Foundations of Linear Algebra, Probability, and Statistics				
Scheme and Credits	L	T	P	Credit	Semester IV
	2	-	-	2	
Pre-requisites (if any)	Basic Mathematics				
Course Objective	The objective of this course is to understand the fundamental concepts of vector spaces, matrices, and linear transformations and develop a strong foundation in probability, statistics theory and its applications.				
Course Outcomes	The students will learn: 1. Apply foundational principles of linear algebra to solve problems in various domains. 2. Utilise probability theory to model and analyse uncertainty and randomness in data. 3. Apply statistical methods to analyse data, make inferences, and draw conclusions. 4. Perform matrix operations and determine eigenvalues and eigenvectors. 5. Analyse and apply probability distributions and random variables to real-world problems.				

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Category	Open Elective II				
Course title	Design Thinking				
Scheme and Credits	L	T	P	Credits	Semester IV
	2	-	-	2	
Course Objective	The students will be able to 1. Acquire the knowledge of design thinking concepts and principles 2. Learn the different phases of design thinking 3. Apply various methods in design thinking to different problems				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Define key concepts of design thinking 2. Utilize design thinking in all stages of problem solving 3. Apply design thinking approach to real world problems				

Category	Skill Course				
Course title	Java Programming				
Scheme and Credits	L	T	P	Credit	Semester IV
	1	-	1	2	
Pre-requisites (if any)	C programming				

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Course Objective	1. To introduce object oriented programming concepts. 2. To understand object oriented programming concepts, and apply them in solving problems. 3. To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes 4. To introduce the implementation of packages and interfaces 5. To introduce the concepts of exception handling and multithreading. 6. To introduce the design of Graphical User Interface using applets and swing controls.
Course Outcomes	1. Able to solve real world problems using OOP techniques. 2. Able to understand the use of abstract classes. 3. Able to solve problems using java collection framework and I/o classes 4. Able to develop multithreaded applications with synchronization. 5. Able to develop applets for web applications. 6. Able to design GUI based applications

Category	Humanities and Social Sciences Including Management courses (HSSM) AEC				
Course title	Advanced Technical Communication				
Scheme and Credits	L	T	P	Credit	SEMESTER IV
	2	-	-	2	
Pre-requisites (if any)	Technical Communication I				
Course Objective	1. To introduce the learners to the nuances of various genres of technical communication, both oral and written 2. To guide students through self-study and assignments, in performing their communicative tasks in the real-life work environment. 3. To enable them to strengthen their oral and written communication skills so that they can achieve their professional goals more effectively				

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Course Outcomes	Learners will be able to 1. Eliminate barriers and use verbal/non-verbal cues in social and workplace situations. 2. Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone, and pronunciation 3. Prepare effectively for speaking in social, academic, and business situations. 4. Use reading strategies for faster comprehension, summarization, and evaluation of texts. 5. Acquire effective writing skills for drafting academic, business, and technical documents.
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Category	Humanities & Social Sciences including Management courses				
Course title	Principles of Entrepreneurship				
Scheme and Credits	L	T	P	Credit	Semester IV
	2	-	-	2	
Course Objective	1. The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the Fundamentals of Entrepreneurship.				
Course Outcomes	The students will be able to: 1. It enables students to learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up. 2. After completing this module, students will be prepared to launch and effectively manage a startup, taking into account legal, operational, and marketing considerations.				

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Category	Humanities & Social Sciences including Management courses (VEC)				
Course title	Environmental Science				
Scheme and Credits	L	T	P	Credit	Semester IV
	2	-	-	2	
Course Objective	The Ability Enhancement Course on Environmental Science: 1. Aims to train students to cater to the need for ecological citizenship through development of a strong foundation on the critical linkages between ecology-society-economy. The Learning Objectives of this course are as follows: 2. Disciplinary knowledge 3. Enable students to develop a comprehensive understanding of various facets of life forms, ecological processes, and the impacts on them by humans during the Anthropocene era. Critical thinking 4. Build capabilities to identify relevant environmental issues, analyse the various underlying causes, evaluate the practices and policies, and develop a framework to make informed decisions. Moral and ethical awareness/reasoning 5. Develop empathy for all life forms, appreciation for the various ecological linkages within the web of life, awareness and responsibility towards environmental protection and nature preservation.				
Course Outcomes	The Learning Outcomes of this course are as follows. After the course the students will be empowered and able to: 1. Analyze natural processes and resources that sustain life and govern the economy. 2. Predict the consequences of human actions on the web of life, global economy, and quality of human life. 3. Think critically and develop appropriate strategies (scientific, social, economic, 4. administrative, and legal) for environmental protection, conservation of biodiversity, environmental equity, and sustainable development. 5. Demonstrate values and show compassionate attitudes towards complex environmental-economic-social challenges, and participate at national				

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	and international levels in solving current environmental problems and preventing the future ones. 6. Adopt sustainability as a practice in life, society, and industry.
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Semester V

Category	Subject Code	Course Title	Hours/Week			Cr	D	T P	T W	P/V	Total
			L	T	P						
PCC	50540111	Computer Networks	3	-	-	3	2	50	50		100
PCC	50540121	Computer Networks lab		-	2	1			25	25	50
PCC	50520611	Database Management Systems	3	-	-	3	2	50	50		100
PCC	50520621	Database Management Systems Lab		-	2	1			25	25	50
PCC	50520612	Formal Language and Automata Theory	2	-		2	2	50	50		100
PEC1	Refer Table	Program Elective I	3	-	-	3	2	50	50		100
PEC1		Program Elective I Lab	-	-	2	1			25	25	50
MDM	50731111	Artificial Intelligence	3	-	-	3	2	50	50		100
MDM	50731121	Artificial Intelligence Lab			2	1			25	25	50
OE3	Refer Table	Open Elective III	2			2	2	50	50		100
OE3		Open Elective III Lab			2	1			25	25	50
		Total	16	-	10	21					850

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Program Elective I

Sr.No	Subject Code	Course Title
1	51031311	Cyber Security
	51031321	Cyber Security Lab
2	51020611	Soft Computing
	51020621	Soft Computing Lab
3	51010211	Augmented and Virtual Reality
	51010221	Augmented and Virtual Reality Lab

Open Elective III

Sr.No	Subject code	Course Title
1	50830111	Microprocessor and Microcontroller
	50830121	Microprocessor and Microcontroller Lab
2	50841111	VLSI System Design
	50841121	VLSI System Design Lab
3	50810211	Computer Oriented Numerical Methods
	50810221	Computer Oriented Numerical Methods Lab

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Semester VI

Category	Subject Code	Course Title	Hours/Week			Cr	D	T P	T W	P/V	Total
			L	T	P						
PCC	60520611	Compiler Design	3	-	-	3	2	50	50		100
PCC	60520621	Compiler Design Lab	-	-	2	1			25	25	50
PCC	60530211	Software Engineering and Modelling	3	-	-	3	2	50	50		100
PCC	60530221	Software Engineering and Modelling Lab		-	2	1			25	25	50
PEC2	Refer Table	Program Elective II	3	-	-	3	2	50	50		100
PEC2		Program Elective II Lab	-	-	2	1			25	25	50
PCE3	Refer Table	Program Elective III	3	-	-	3	2	50	50		100
PCE3		Program Elective III lab	-	-	2	1			25	25	50
MDM	60710211	Image processing and Computer Vision	3	-	-	3	2	50	50		100
MDM	60710221	Image processing and Computer Vision Lab	-	-	2	1			25	25	50
Skill Courses	60310211	Programming Skills for Data Science	1	-	-	1			25		25
Skill Courses	60310221	Programming Skills for Data Science Lab	-	-	2	1				25	25
Project	60910231	Project I			4	2			50	50	100
		Total	16		16	24					900

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Program Elective II

Sr.No	Subject Code	Course Title
1	61031311	Drone Technology
	61031321	Drone Technology Lab
2	61020611	Data Mining and Data Warehousing
	61020621	Data Mining and Data Warehousing Lab
3	61040111	Quantum Computing
	61040121	Quantum Computing Lab

Program Elective III

Sr.No	Subject Code	Course Title
1	61020711	Machine Learning and Computing
	61020721	Machine Learning and Computing Lab
2	61040112	Optimization Techniques
	61040122	Optimization Techniques Lab
3	61040113	Human Computer Interaction
	61040123	Human Computer Interaction Lab

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Category	Program core Course				
Course title	Computer Networks				
Scheme and Credits	L	T	P	Credit	Semester V
	3	-	1	4	
Course Objective	The students will be able to 1. To develop an understanding of modern network architectures from a design and performance perspective. 2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). 3. To provide an opportunity to do network programming. 4. To provide WLAN measurement ideas.				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Explain the functions of the different layers of the OSI Protocol. 2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) to describe the function of each block. 3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component 4. For a given problem related TCP/IP protocol developed the network programming. 5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.				

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Category	Program core Course				
Course title	Database Management System				
Scheme and Credits	L	T	P	Credit	Semester V
	3	-	1	4	
Course Objective	The students will be able to : 1. To understand the different issues involved in the design and implementation of a database system. 2. To study the physical and logical database designs, database modelling, relational, hierarchical, and network models 3. To understand and use data manipulation language to query, update, and manage a database 4. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing. 5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. For a given query write relational algebra expressions for that query and optimise the developed expressions. 2. For a given specification of the requirement design the databases using E-R method and normalisation. 3. For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2. 4. For a given query, optimise its execution using Query optimization algorithms. 5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability. 6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.				

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Category	Program Core Course				
Course title	Formal Language and Automata Theory				
Scheme and Credits	L	T	P	Credit	Semester V
	2	-	-	2	
Course Objective	The students will be able to 1. Develop a formal notation for strings, languages and machines. 2. Design finite automata to accept a set of strings of a language. 3. Prove that a given language is regular and apply the closure properties of languages. 4. Design context free grammars to generate strings from a context free language and convert them into normal forms. 5. Prove equivalence of languages accepted by languages generated by context free grammars. 6. Identify the hierarchy of formal languages, grammars and machines. 7. Distinguish between computability and non-computability and Decidability and undecidability				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Write a formal notation for strings, languages and machines. 2. Design finite automata to accept a set of strings of a language. 3. For a given language, determine whether the given language is regular or not. 4. Design context free grammars to generate strings of context free language . 5. Determine equivalence of languages accepted by PushDown Automata and languages generated by context free grammars. 6. Write the hierarchy of formal languages, grammars and machines. 7. Distinguish between computability and non-computability and Decidability and undecidability.				

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Category	Program Elective Course I				
Course title	Cyber Security				
Scheme and Credits	L	T	P	Credit	Semester V
	3	-	1	4	
Course Objective	1. Understand cybersecurity fundamentals, digital asset protection, and threat landscapes. 2. Learn structured classification of attacks, vulnerabilities, and defenses across OSI/TCP-IP layers. 3. Apply cryptography, network security, and system security techniques. 4. Understand cyber laws, ethics, forensics, and risk management aligned with industry practices.				
Course Outcomes	1. Explain cybersecurity fundamentals, attack taxonomy, and security policies. 2. Analyze cyberattacks, malware, and system/network vulnerabilities using standard models. 3. Apply cryptographic and network security mechanisms for CIA and authentication. 4. Evaluate digital forensic processes, incident response, and risk management. 5. Interpret cyber laws and ethical principles in real-world cybercrime scenarios.				

Category	MDM Multidisciplinary Minor				
Course title	Artificial Intelligence				
Scheme and Credits	L	T	P	Credit	Semester V
	3	-	1	4	

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Course Objective	The students will be able to ● To give deep knowledge of AI and how AI can be applied in various fields to make the life easy ● To know the difficulties that arise from attempting to define Artificial Intelligence. ● To know the areas of research of AI, and give examples of problems from each area. ● To understand how advanced searches are performed. ● Assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving particular engineering problems. ● Provide you with the knowledge and expertise to become a proficient Robot Developer, data scientist. ● Demonstrate an understanding of Artificial concepts that are vital for Robotics, Expert Systems, Machine Learning and data science; ● Develop an interest in the field sufficient to take more advanced subjects.		
Course Outcomes	At the end of this course students will demonstrate the ability to ● To understand various AI techniques. ● To decide when to use which type of AI technique. ● To correlate AI and solutions to modern problems. ● To decide when to use which type of AI technique. ● Develop intelligent systems by assembling solutions to concrete computational problems. ● Understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering.		

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Category	Open Elective III				
Course title	Microprocessor and Microcontroller				
Scheme and Credits	L	T	P	Credit	Semester V
	2	-	-	2	
Pre-requisites (if any)	Computer Architecture and Organization				
Course Objective	The students will be able to 1. Study Architecture of microprocessor 8085 2. Details of all the Peripherals 3. Study the interfacing of the peripherals with 8085 4. Understand the difference between microcontrollers and processor				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Do assembly language programming 2. Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc. 3. Develop systems using different microcontrollers 4. Understand RISC processors and design ARM microcontroller based systems				

Category	Open Elective III				
Course title	VLSI System Design				
Scheme and Credits	L	T	P	Credit	Semester V
	2	-	-	2	
Pre-requisites (if any)	Digital Electronics				

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Course Objective	The students will be able to 1. To understand the Basic NMOS, CMOS & Bi CMOS circuits and their process technology. 2. To understand the Designing of stick diagrams and layouts for OS transistors. 3. To learn the concepts of modelling of Delay techniques and MOS layers. 4. To learn the concepts of Technology Scaling of MOS transistors. 5. To understand the concepts of testing of combinational and sequential circuits and also the scan of design techniques.
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Knowledge on various I.C fabrication technologies like NMOS, PMOS, CMOS and Bi-CMOS and their Electrical properties 2. Draw the stick diagrams and layout diagrams of various logic circuits and analyze various design rules. 3. Design various combinational gate level logics 4. Implement and design of building blocks of data path and array sub systems 5. Design and implement different programmable logic devices.

Category	Open Elective III				
Course title	Computer Oriented Numerical Methods				
Scheme and Credits	L	T	P	Credit	Semester V
	2	-	-	2	
Course Objective	1. Upon completion of this course, students will be able to understand the basic concepts used in evolving numerical methods. 2. And will be able to develop computational algorithms for solving problems in algebra and calculus on a computer.				
Course Outcomes	1. Understand how to use numerical methods to solve linear and nonlinear equations 2. Understand how to use numerical methods to solve ordinary differential equations 3. Understand how to use numerical methods to obtain approximate solutions to mathematical problems 4. Formulate and solve optimization problems using linear programming techniques				

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Category	Program Elective Course I				
Course title	Augmented and Virtual Reality				
Scheme and Credits	L	T	P	Credit	Semester V
	3	-	1	4	
Pre-requisites (if any)	Foundation of Linear Algebra ,Probability and Statistics				
Course Objective	1. To gain the knowledge of historical and modern overviews and perspectives on virtual reality. 2. To learn the fundamentals of sensation, perception, and perceptual training. 3. To have the scientific, technical, and engineering aspects of augmented and virtual reality systems. 4. To learn the Evaluation of virtual reality from the lens of design. 5. To learn the technology of augmented reality and implement it to have practical knowledge.				
Course Outcomes	On successful completion of this course, the student should be able to: 1. Identify, examine, and develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences. 2. Describe how VR and AR systems work. Choose, develop, explain, and defend the use of particular designs for AR and VR experiences. 3. Evaluate the benefits and drawbacks of specific AR and VR techniques on the human body. 4. Identify and examine state-of-the-art AR and VR design problems and solutions from the industry and academia.				

Category	Program Elective Course I				
Course title	Data Warehousing and Data Mining				
Scheme and Credits	L	T	P	Credit	Semester V
	3	-	1	4	

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	Course Objective	1. Understand the techniques contributing to recent development in data Warehousing 2. Understand the On Line Analytical Processing(OLAP) 3. Prepare data models 4. Understand conceptual design methodologies and storage techniques 5. Understand data mining process.	
	Course Outcomes	1. Understand the functionality of the various data mining and data warehousing component 2. Appreciate the strengths and limitations of various data mining and data warehousing models 3. Explain the analyzing techniques of various data 4. Describe different methodologies used in data mining and data warehousing. 5. Compare different approaches of data warehousing and data mining with various technologies.	



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Semester VI

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Category	Program core Course				
Course title	Compiler Design				
Scheme and Credits	L	T	P	Credit	Semester VI
	3	-	1	4	
Pre-requisites (if any)	Formal Language and Automata Theory				
Course Objective	The students will be able to 1. To understand and list the different stages in the process of compilation. 2. Identify different methods of lexical analysis. 3. Design top-down and bottom-up parsers. 4. Identify synthesised and inherited attributes. 5. Develop syntax directed translation schemes . 6. Develop algorithms to generate code for a target machine.				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. For a given grammar specification develop the lexical analyser 2. For a given parser specification design top-down and bottom-up parsers 3. Develop syntax directed translation schemes 4. Develop algorithms to generate code for a target machine				

Category	Program core Course				
Course title	Software Engineering and Modelling				
Scheme and Credits	L	T	P	Credit	Semester VI
	3	-	1	4	

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Course Objective	The students will be able to 1. In this course, students will gain a broad understanding of the discipline of software engineering and its application to the development and management of software systems. 2. Knowledge of basic SW engineering methods and practices, and their appropriate application. 3. A general understanding of software process models such as the waterfall and evolutionary models. 4. An understanding of the role of project management including planning, scheduling, risk management, etc. 5. An understanding of software requirements and the SRS document, architectural styles. 6. An understanding of implementation issues such as modularity and coding standards. An understanding of approaches to verification and validation including static analysis, reviews and testing.
Course Outcomes	At the end of this course students will demonstrate the ability to 1. A general understanding of software process models such as the waterfall and evolutionary models 2. Apply system modeling techniques (DFD, ER diagrams, UML) and software design principles. 3. Analyze software testing strategies, software quality metrics, and risk management techniques. 4. Evaluate different software development approaches and assess software quality using industry standards. 5. Create software solutions by integrating requirement analysis, design, testing, and quality assurance.

Category	Program Elective Course II					
Course title	Drone Technology					
Scheme and Credits	L	T	P	Credit	Semester VI	
	3	-	1	4		
Pre-requisites (if any)	Internet of Things					
Course Objective	1. Understand drone types and components 2. Learn how to fly a drone 3. Learn about drone applications 4. Learn about drone design and programming					

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Course Outcomes	Upon successful completion of the course, students should be able to: 1. Know about a various type of drone technology, drone fabrication and programming. 2. Execute the suitable operating procedures for functioning a drone 3. Select appropriate sensors and actuators for Drones 4. Develop a drone mechanism for specific applications 5. Create the programs for various drones
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Category	Program Elective Course III				
Course title	Machine Learning and Computing				
Scheme and Credits	L	T	P	Credit	Semester V
	3		1	4	
Course Objective	The students will be able to 1. Identify merits of machine learning algorithms and suggest suitable algorithms for the application. 2. Learn about the most effective machine learning techniques, and gain practice implementing them and getting them to work for yourself 3. To review and strengthen important mathematical concepts required for ML. Introduce the concept of learning patterns from data and develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms				
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Design and implement machine learning solutions to classification, regression and clustering problems. 2. Evaluate and interpret the results of the different ML techniques. 3. Design and implement various machine learning algorithms in a range of Real-world applications 4. Optimize and fine-tune machine learning models using hyperparameter tuning, feature engineering, and advanced optimization techniques for improved performance				

Category	Multidisciplinary Minor courses				
Course title	Image processing and Computer Vision				
Scheme and Credits	L	T	P	Credit	Semester VI
	3	-	1	4	

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Course Objective	The learners will be able to 1. To develop a comprehensive understanding of computer vision and its real-world applications. 2. To apply methods to improve image quality and perform image analysis. 3. To implement algorithms of image segmentation and object detection 4. To apply methods to classify and analyse static & dynamic objects in image & videos.
Course Outcomes	At the end of this course students will demonstrate the ability to 1. Recognize key image features and understand their importance in computer vision applications. 2. Implement techniques to analyse and process images effectively 3. Apply methods in pattern recognition, understand the significance of classifiers and their practical applications. 4. Utilise motion analysis techniques to track dynamic actions of objects in videos

Course title	Skill Courses				
Scheme and Credits	Programming Skills for Data Science				
	L	T	P	Credit	Semester VI
	1	-	1	2	
Pre-requisites (if any)	-				
Course Objective	At the end of this course, students will be able to: ● Use the Tableau workspace to create visualisations. ● Build a range of essential chart types for analysis. ● Create basic calculations, including arithmetic calculations,Combine data sources by creating relationships, joins, unions, and blends. ● Build interactive dashboards and stories to reveal data insights. ● Understanding the Flask framework,Creating basic Flask applications ● Learn web development with Django				

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Course Outcomes	At the end of this course students will demonstrate the ability to ● Create data visualisations, dashboards, and Tableau Services ● Apply Tableau performance optimization to improve the speed of working with large data. ● Design and implement a secure login system for web applications using Flask. ● How to create routes (or views) with Django . ● How to serve static content and files using Django .
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Category	Program Elective Course III				
Course title	Optimization Techniques				
Scheme and Credits	L	T	P	Credit	Semester VI
	3	-	1	4	
Course Objective	1. To grasp the fundamental concepts of optimization, including the definition of an optimization problem, objective functions, constraints, optimality conditions, and different classifications of optimization problems. 2. To develop skills in translating real-world problems into mathematical optimization models, including the ability to formulate objective functions and constraints appropriately. 3. To learn and understand the working principles of various optimization algorithms like gradient descent, Newton's method, simplex method, dynamic programming, genetic algorithms, and others, depending on the course level.				
Course Outcomes	1. Ability to recognize optimization problems in real-world scenarios and define the objective function and constraints clearly. 2. Ability to analyze and interpret the results obtained from optimization algorithms, including sensitivity analysis and validation of solutions. 3. Ability to apply classical and advanced optimization techniques, such as gradient-based methods, Lagrangian optimization, and Kuhn-Tucker conditions, to solve constrained and unconstrained problems. 4. Ability to formulate and solve linear and dynamic programming problems, utilizing methods like the simplex algorithm, recursive equations, and multistage decision processes for real-world applications.				

Category	Program Elective Course III				
Course title	Human Computer Interaction				

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Scheme and Credits	L	T	P	Credit	Semester VI
	3	-	1	4	
Course Objective	1. To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design in general, and alternatives to traditional "keyboard and mouse" computing; become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans 2. Be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation; appreciate the importance of a design and evaluation methodology that begins with and maintains a focus on the user 3. Be familiar with a variety of both conventional and non-traditional user interface paradigms, the latter including virtual and augmented reality, mobile and wearable computing, and ubiquitous computing 4. Understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems. 5. Finally, working in small groups on a product design from start to finish will provide you with invaluable team-work experience.				
Course Outcomes	1. Ability to apply HCI and principles to interaction design. 2. Ability to design certain tools for blind or PH people.				

Category	Program Elective course II				
Course title	Soft Computing				
Scheme and Credits	L	T	P	Credit	Semester VI
	3	-	1	4	
Course Objective	After completing this course, you will be able to learn: 1. Fuzzy logic and its applications. 2. Artificial neural networks and its applications. 3. Solving single-objective optimization problems using GAs. 4. Solving multi-objective optimization problems using Evolutionary algorithms (MOEAs). 5. Applications of Soft computing to solve problems in varieties of application domains.				

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Course Outcomes	1. Understand soft computing techniques and their role in problem solving. 2. Conceptualize and parameterize various problems to be solved through basic soft computing techniques. 3. Analyze and integrate various soft computing techniques in order to solve problems effectively and efficiently. 4. Implement and optimize soft computing techniques to develop intelligent systems for real-world problem-solving
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Category	Program Elective course II				
Course title	Quantum Computing				
Scheme and Credits	L	T	P	Credit	Semester VI
	3	-	1	4	
Pre-requisites (if any)	Foundation of Linear Algebra , Probability and Statistics				
Course Objective	1. To understand the components of computing in a Quantum world 2. To gain knowledge on mathematical representation of quantum physics and operations. 3. To write computations in the real world (standard) in a Quantum computer and simulator.				
Course Outcomes	1. Understand the computation with Qubits 2. Apply Quantum algorithms -Fourier Transform and Grovers amplification 3. Apply Quantum problem solving using tree search 4. Understand and explore the models of Quantum Computer and Quantum Simulation tools				



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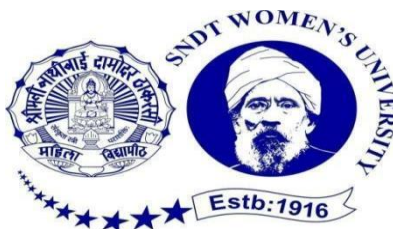
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B. Tech.

Computer Engineering



**SNDT Women's University
1, Nathibai Thackersey Road,
Mumbai 400 020**

(Applicable to students taking admission in and after 2023)



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Credit Definition

1 Hr. Lecture (L) per week	1 credit
2 Hours Practical (Lab)/week	1 credit

Range of credits –

1. Credits of 168 for a student to be eligible to get an Undergraduate degree in Computer Engineering (CE).

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Semester VII

Theory/ Lab Courses

Category	Subject Code	Course Title	Hours/Week			Cr	D	TP	TW	P/V	Total
			L	T	P						
PCC	70510211	Cloud and Edge Computing	3			3	2	50	50		100
	70510221	Cloud and Edge Computing Lab			2	1			25	25	50
PCC	70510212	Neural Network and Deep Learning	3			3	2	50	50		100
	70510222	Neural Network and Deep Learning Lab			2	1			25	25	50
(PEC) IV	Refer Table-1	Program Elective IV	3			3	2	50	50		100
	Refer Table-1	Program Elective IV Lab			2	1			25	25	50
(PEC) V	Refer Table-2	Program Elective V	2			2	2	50	50		100
(MDM)	70731211	Fuzzy Logic	2			2	2	50	50		100
	71510231	Project II			8	8			100	200	300
		Total	-	-	-	24					950

**USHA MITTAL INSTITUTE OF TECHNOLOGY****SNDT Women's University****Faculty: Technology (Undergraduate Course) - BTech****Subject: Syllabus for Computer Engineering****Proposed
in 2023****Table 1: Program Elective Course- IV**

Sr.No	Subject Code	PEC IV Subject Name
1	71010211	Natural Language Processing
	71010221	Natural Language Processing Lab
2	71031111	Advance Cyber Security
	71031121	Advance Cyber Security Lab
3	71010212	Parallel and Distributed Algorithm
	71010222	Parallel and Distributed Algorithm Lab

Table 2: Program Elective Course- V

Sr.No	Subject Code	PEC V Subject Name
1	71040211	Blockchain Technology
2	71010213	Advance Computer Architecture
3	71020711	Introduction to Information Theory and Coding

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Semester-VIII

Theory / Lab Courses

Category	Subject Code	Course Title	Hours/Week			Cr	D	TP	TW	P/V	Total
			L	T	P						
PEC	Refer Table -3	Program Elective VI	2			2	2	50	50		100
MDM	80750111	Intellectual Property Rights	2			2	2	50	50		100
ELC	80960111	Research Methodology	4			4	2	50	50		100
Internship/ OJT	81510261	Internship				10			100	100	200
		Total	8			18					500

Table 1: Program Elective Course- VI

Sr.No	Subject Code	PEC VI Subject Name
1	81050611	Agentic AI Systems
2	81020111	Big Data Analytics
3	81020911	Robotics Engineering



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Semester VII

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Category	Programme Core Course(PCC)				
Course title	Cloud and Edge Computing				
Scheme and Credits	L	T	P	Credit	Semester VII
	3	-	2	4	
Pre-requisites (if any)	Computer Network				
Course Objective	The objectives of this course are to: 1. Understand basic concepts, components, and models of cloud computing. 2. Learn virtualization techniques and tools used in cloud environments. 3. Study OpenStack architecture and its cloud operation modes. 4. Understand cloud deployment factors, networking, performance, and security. 5. Explore cloud application architecture, migration, and modern trends like edge and serverless computing.				
Course Outcomes	On successful completion of the course learners will be able to: 1. Describe cloud concepts, service models, and deployment models. 2. Explain virtualization types, hypervisors, and OS-level virtualization. 3. Demonstrate understanding of OpenStack components and operations. 4. Analyze cloud deployment needs, network issues, and security measures. 5. Apply cloud programming tools and understand edge, fog, and serverless computing.				

Category	Programme Core Course (PCC)				
Course title	Neural Network and Deep Learning				
Scheme and Credits	L	T	P	Credit	Semester VII
	3	-	1	4	
Pre-requisites (if any)	Machine Learning				

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Course Objective	The objectives of this course are to: 1. To strengthen important Mathematical concepts required for Deep learning and neural network. 2. To get a detailed insight of advanced algorithms of ML
Course Outcomes	On successful completion of the course learners will be able to: 1. To design and implement Artificial Neural networks. 2. To decide when to use which type of NN.

Category	Program Elective Course IV				
Course title	Natural Language Processing				
Scheme and Credits	L	T	P	Credit	Semester VII
	3	-	1	4	
Pre-requisites (if any)	Formal Language Automata and Theory, Compiler				
Course Objective	The objectives of this course are to: 1. The prime objective of this course is to introduce the students to the field of Language Computing and its applications ranging from classical era to modern context. 2. To provide understanding of various NLP tasks and NLP abstractions such as Morphological analysis, POS tagging, concept of syntactic parsing, semantic analysis etc. 3. To provide knowledge of different approaches/algorithms for carrying out NLP tasks. 4. To highlight the concepts of Language grammar and grammar representation in Computational Linguistics.				
Course Outcomes	On successful completion of the course learners will be able to: 1. Understanding the importance and concepts of Natural Language Processing (NLP) 2. Applying algorithms available for the processing of linguistic information and computational properties of natural languages. 3. Knowledge on various morphological, syntactic, and semantic NLP tasks. 4. Introducing various NLP software libraries and data sets publicly available. 5. Designing and developing practical NLP based applications				



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Category	Program Elective Course V				
Course title	Blockchain Technology				
Scheme and Credits	L	T	P	Credit	Semester VII
	2	-	-	2	
Pre-requisites (if any)	Students should have the prior knowledge of the following subjects: 1. Fundamentals of Computer Networks 2. Basics of Data Structures 3. Discrete Mathematics concepts 4. Basic Programming knowledge (C / Java / Python) 5. Introductory understanding of Operating Systems				
Course Objective	The objectives of this course are to: 1. Understand fundamentals and architecture of blockchain systems 2. Study cryptography and consensus mechanisms 3. Learn smart contracts and blockchain platforms 4. Analyze blockchain security, applications, and legal aspects				
Course Outcomes	On successful completion of course learner will be able to: 1. Explain blockchain concepts, components, and types 2. Apply cryptographic and consensus mechanisms 3. Design basic smart contracts and DApps 4. Evaluate blockchain applications and security challenges				

Category	Multidisciplinary Minor (MDM)				
Course title	Fuzzy Logic				
Scheme and Credits	L	T	P	Credit	Semester VII
	2	-	-	2	
Pre-requisites (if any)	Students should have the prior knowledge of the following subjects: 1.Fundamentals of AI				



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Course Objective	The objective of this course are to: 1. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations. 2. To learn about the fuzzification of scalar variables and the defuzzification of membership functions. 3. To learn three different inference methods to design fuzzy rule based systems. 4. To develop fuzzy decision making by introducing some concepts and also Bayesian decision methods 5. To learn different fuzzy classification methods.
Course Outcomes	On successful completion of the course learners will be able to: 1. Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations. 2. Understand the basic features of membership functions, fuzzification process and defuzzification process. 3. Design a fuzzy rule based system. 4. Know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision making process. 5. Gain knowledge about fuzzy C-Means clustering.

Category	Program Elective Course IV				
Course title	Advanced Cyber Security				
Scheme and Credits	L	T	P	Credit	Semester VII
	3	-	1	4	
Pre-requisites (if any)	Cryptography and System Security				
Course Objective	The objectives of this course are to: 				



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Course Outcomes	On successful completion of course learner will be able to : 1. Analyze modern cyber threats, advanced attacks, and adversary techniques using Cyber Kill Chain and MITRE ATT&CK framework. 2. Apply advanced network, system, endpoint, and SOC-based security controls for attack detection and prevention. 3. Implement cryptographic techniques and secure communication protocols to protect data and systems. 4. Evaluate security challenges and protection mechanisms in cloud, mobile, and IoT environments. 5. Perform incident response, digital forensic investigation, and apply cyber laws, governance, and compliance requirements.
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Category	Program Elective Course IV				
Course title	Parallel and Distributed Algorithm				
Scheme and Credits	L	T	P	Credit	Semester VII
	3	-	1	4	
Pre-requisites (if any)					
Course Objective	The objectives of this course are to: 1. To learn parallel and distributed algorithms development techniques for shared memory and message passing models. 2. To study the main classes of parallel algorithms. 3. To study the complexity and correctness models for parallel algorithms.				
Course Outcomes	On successful completion of the course learners will be able to: 1. Understand Parallel Algorithms 2. Understand Parallel Algorithm Complexity 3. Understand PRAM and Basic Algorithms 4. Understand Shared-Memory Algorithms 5. Designing Sorting and Selection Networks 6. Understand and design Mesh-Base Architectures 7. Understand Distributed Algorithms				

Category	Program Elective Course V				
Course title	Advanced Computer Architecture				
Scheme and	L	T	P	Credit	Semester VII

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Credits	2 - - 2
Pre-requisites (if any)	Computer Architecture and Organization
Course Objective	The objectives of this course are to: 1. Teach advanced design principles of modern processors by addressing key issues such as instruction set design, micro-architecture of superscalar processors, its interaction with other hardware components, and constraints to be addressed when going from single-core to multi-core systems 2. Teach students different techniques to estimate, analyze and enhance performance as well as reduce power dissipation of computing systems.
Course Outcomes	On successful completion of the course learners will be able to: 1. Interpret the performance of a processor based on metrics such as execution time, cycles per instruction (CPI), Instruction count etc 2. Predict the challenges of realizing different kinds of parallelism (such as instruction, data, thread, core level) and leverage them for performance advancement 3. Apply the concept of memory hierarchy for efficient memory design and virtual memory to overcome the memory wall 4. Explore emerging computing trends, computing platforms, and design trade-offs

Category	Program Elective Course V				
Course title	Introduction to Information Theory and Coding				
Scheme and Credits	L	T	P	Credit	Semester VII
	2	-	-	2	
Pre-requisites (if any)					

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Objective****The objectives of this course are to:**

1. Introduce the principles and applications of information theory.
2. To teach study how information is measured in terms of probability and entropy, and the relationships among conditional and joint entropies.
3. To teach coding schemes, including error correcting codes.
4. Explain how this quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problems.

**Course
Outcomes****After successful completion of this course, student will be able to:**

1. Apply information theory and linear algebra in source coding and channel coding
2. Understand various error control encoding and decoding techniques
3. Analyze the performance of error control codes



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Semester VIII



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Category	Program Elective Course VI				
Course title	Agentic AI Systems				
Scheme and Credits	L	T	P	Credit	Semester VIII
	2	-	-	2	
Pre-requisites (if any)					
Course Objective	The objectives of this course are to: 1. Understand the conceptual foundations of agentic AI systems. 2. Design structured autonomous workflows using AI agents. 3. Analyze agent architectures involving planning, memory, and tools. 4. Evaluate safety, ethical, and reliability concerns in autonomous AI systems				
Course Outcomes	On successful completion of the course learners will be able to: 1. Explain the fundamental concepts, components, and characteristics of agentic AI systems, including autonomy, reasoning, and decision-making capabilities. 2. Design structured autonomous workflows using AI agents by decomposing goals into tasks and integrating planning, memory, and tool usage. 3. Analyze and compare different agent architectures (single-agent and multi-agent) with respect to reasoning strategies, memory management, and system reliability. 4. Evaluate agentic AI systems from the perspectives of safety, ethics, auditability, and human-in-the-loop control in real-world application scenarios.				

Category	Multidisciplinary Minor(MDM)				
Course title	Intellectual Property Rights				
Scheme and Credits	L	T	P	Credit	Semester VIII
	2	-	0	2	
Pre-requisites (if any)					
Course Objective	The objectives of this course are to:				



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	1. Provide students with a fundamental understanding of Intellectual Property Rights (IPR) and their role in protecting intellectual creations. 2. Enable students to identify and distinguish between various IPR instruments such as patents, trademarks, copyrights, and industrial designs. 3. Create awareness of emerging challenges and contemporary issues in IPR 4. Equip students with basic knowledge of patent law
Course Outcomes	On successful completion of the course learners will be able to: 1. Define and explain Intellectual Property Rights (IPR) 2. Identify and differentiate between various IPR instruments such as patents, trademarks, copyrights, industrial designs 3. Analyze the causes and impact of counterfeiting and piracy in global and Indian contexts. 4. Discuss emerging challenges in IPR 5. Apply the basics of patent law

Category	Experimental Learning Course				
Course title	Research Methodology				
Scheme and Credits	L	T	P	Credit	Semester VIII
	4	-	-	4	
Pre-requisites (if any)	1. Basic knowledge of research process				
Course Objective	The objectives of this course are to: 1. Understand the fundamentals of research methodology in engineering and technology. 2. Learn to design, conduct, and present research effectively. 3. Gain hands-on experience with open-source tools for writing, diagrams, and figures. 4. Develop critical thinking and ethical awareness in research practices.				



USHA MITTAL INSTITUTE OF TECHNOLOGY

SNDT Women's University

Faculty: Technology (Undergraduate Course) - BTech

Subject: Syllabus for Computer Engineering

**Proposed
in 2023**

Course Outcomes

On successful completion of the course learners will be able to:

1. Prepare a preliminary research design for projects in their subject matter areas
2. Accurately collect, analyze and report data
3. Present complex data or situations clearly
4. Review and analyze research findings

Category	Program Elective Course VI				
Course title	Big Data Analytics				
Scheme and Credits	L	T	P	Credit	Semester VIII
	2	-	-	2	
Pre-requisites (if any)	DBMS				
Course Objective	The objectives of this course are to: 1. To provide an overview of an exciting growing field of big data analytics. 2. To introduce the tools required to manage and analyze big data like Hadoop,NoSQL,MapReduce. 3. To enable students to have skills that will help them to solve complex real-world problems in decision support.				
Course Outcomes	On successful completion of the course learners will be able to: 1. Explain Big Data concepts, characteristics, challenges, application domains, and compare traditional and Big Data-driven business approaches. 2. Describe Hadoop architecture, ecosystem, and limitations, and explain the role of NoSQL databases in managing large-scale and unstructured data. 3. Analyze analytics architectures, distributed system design patterns, and principles such as CAP theorem, sharding, Bloom filters, and consensus mechanisms. 4. Apply MapReduce programming model, distance measures, and data stream mining techniques to process and analyze large-scale and streaming data. 5. Implement data mining techniques including frequent itemset mining, clustering, and social network analysis using scalable and distributed approaches.				

Category	Program Elective Course VI
Course title	Robotics Engineering

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Scheme and Credits	L	T	P	Credit	Semester VIII
	2	-	-	2	
Pre-requisites (if any)					
Course Objective	The objectives of this course are to: 1. Understand the fundamentals of robotic systems and their mathematical modeling 2. Learn kinematics, sensing, and control of robotic manipulators and mobile robots 3. Apply Artificial Intelligence techniques for perception, planning, and decision-making in robotics 4. Design intelligent robotic systems for real-world applications				
Course Outcomes	On successful completion of the course learners will be able to: 1. Explain the structure, components, and working principles of robotic systems 2. Analyze robot kinematics, dynamics, and control mechanisms 3. Apply AI techniques for robot perception, learning, and task planning 4. Design intelligent robotic applications integrating sensing, control, and AI				