



B. TECH

ARTIFICIAL INTELLIGENCE & DATA SCIENCE CURRICULUM & SYLLABUS 2025 REGULATION

B.Tech

ARTIFICIAL INTELLIGENCE

AND DATA SCIENCE

2025 REGULATION

CURRICULUM & SYLLABUS

SEMESTER 3

CURRICULUM

SLOT	COURSE CATEGORY	COURSE CODE	COURSE NAME	L	T	J	P	S	C
A	BST	B250904/MA300A	Mathematics for Information Science-3	3	1	0	0	2	3
B	PCE	B250802/CN310B	Fundamentals of Data Structures and Algorithms	3	1	0	3	5	6
C	PCE	B250802/CN310C	Advanced Object Oriented Programming	3	1	0	3	5	6
D	PCB	B250802/CN320D	Logic System Design	2	1	1	0	4	4
E	EST	B250007/AD300E	Numerical Methods for Data Science	3	0	0	0	5	4
F	HMT	B250908/HU900F	Engineering Economics	3	0	0	0	1	2
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work, C- Credit)									

COURSE DESCRIPTION							
REGULATION	2025	L-T-J-P-S	3-1-0-0-2	VERSION	25/0	CREDITS	3
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250904/MA300A	Mathematics For Information Science -3	BST
PRE-REQUISITE		
Basic knowledge in probability.		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	90	C	CIA	ESE	Total	CIA	ESE	Total	
3	1	0	0	2		90	3	40	60	100	-	-	-
L: Lecture (One unit is of one-hour duration), T: Tutorial (One unit is of one-hour duration), P: Practical (One unit is of one-hour duration), J: Project (One unit is of one-hour duration), S: Self-Learning & Team Work (One unit is of one-hour duration), CIA: Continuous Internal Assessment, ESE: End Semester Examination													

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Discrete Probability Distributions	Random variables, Discrete random variables and their probability distributions, Cumulative distribution function, Expectation, Mean and variance, the Binomial probability distribution, the Poisson probability distribution, Poisson distribution as a limit of the binomial distribution, Joint pmf of two discrete random variables, Marginal pmf, Independent random variables, Expected value of a function of two discrete variables. [Text 1: Relevant topics from sections 3.1 to 3.4, 3.6, 5.1, 5.2]	11
2	Continuous Probability distribution and Central Limit Theorem	Continuous random variables and their probability distributions, Cumulative distribution function, Expectation, Mean and variance, Uniform, Normal and Exponential distributions, Joint pdf of two Continuous random variables, Marginal pdf, Independent random variables, Expectation value of a function of two continuous variables, Central limit theorem(without proof). [Text 1: Relevant topics from sections 3.1, 4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.4]	13
3	Statistical Inference and Hypothesis Testing	Confidence Intervals, Confidence Level, Confidence Intervals and One-side confidence intervals for a Population Mean for large and small samples (normal distribution and t-distribution), Hypotheses and Test Procedures, Type I and Type II error, z Tests for Hypotheses about a Population Mean (for large sample), t Test for Hypotheses about a Population Mean (for small sample), Tests concerning a population proportion for large and small samples. [Text 1: Relevant topics from sections 7.1, 7.2, 7.3, 8.1, 8.2, 8.3, 8.4]	11
4	Stochastic Processes and Markov Chains	Stochastic process concept, classification of stochastic process, Markov Chains, Random Walk Model, Transition probability matrix, Chapman-Kolmogorov Equations, Classification of States, Irreducible Markov chain, Recurrent state, Transient state. [Text 2: Relevant topics from sections 2.9, 4.1, 4.2, 4.3,4.4]	10

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Probability and Statistics for Engineering and the Sciences	Devore J. L	9 th edition, 2016
2	Introduction to Probability Models	Sheldon M. Ross	Academic Press, 13th edition, 2024

Reference			
Sl. No.	Title of Book	Author	Publication
1	Probability Models for Computer Science	Sheldon M. Ross	Academic Press, 1st edition, 2001.
2	Probability, Random Variables and Stochastic Processes	Papoulis, A. & Pillai, S.U.	Tata McGrawHill, 4th edition, 2002.
3	Introduction to Probability and Statistics for Engineers and Scientists	Ross S. M	Academic Press, 6th edition, 2020.
4	Probability Statistics and Random Process	Kousalya Pappu	Pearson, 2013

COURSE DESCRIPTION							
Regulation	2025	L-T-J-P-S	3-1-0-3-5	Version	25/0	Credits	6
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250802/CN310B	Fundamentals of Data Structures and Algorithms	PCE
PRE-REQUISITE		
B250802/CN210D Programming in C++		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	180	C	CIA	ESE	Total	CIA	ESE	Total	
3	1	0	3	5		180	6	25	40	65	15	20	35
L: Lecture (One unit is of one-hour duration), T: Tutorial (One unit is of one-hour duration), P: Practical (One unit is of one-hour duration), J: Project (One unit is of one-hour duration), S: Self-Learning & Team Work (One unit is of one-hour duration), CIA: Continuous Internal Assessment, ESE: End Semester Examination													

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Basic Concepts of Data Structures and Searching	Definitions; Abstract Data Types (ADT); RAM model of computation and basic operation cost analysis; Performance Analysis – Time & Space Complexity; Asymptotic Notations; Growth of functions and basic recurrence relations (intro); Polynomial representation using arrays (concept only); Sparse matrix; Stacks and Queues – stack, circular queue, double ended queue; Evaluation of Expressions – infix to postfix, postfix evaluation; Searching – linear and binary search; Implementation using STL.	15
2	Linked List	Dynamic memory allocation, Singly Linked List - Operations on Linked List, Stacks and Queues using Linked List, Doubly Linked List; Circular Linked List; Implementation using STL List container.	15
3	Trees and Graphs	Trees: Binary Trees - Types and Properties, Binary Tree Representation, Tree Operations, Tree Traversals- Recursion; Expression Trees; Binary Search Trees - Binary Search Tree Operations; Graphs: - Definitions; Representation of Graphs; Depth First Search and Breadth First Search; Applications of Graphs	15
4	Hashing, Sorting and Dynamic Programming	Sorting Techniques: - Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort, Hashing - Hashing functions: Mid square, Division, Folding, Digit Analysis; Collision Resolution: Linear probing, Quadratic Probing, Double hashing, Open hashing. Implementation using STL. Basics to Dynamic Programming – overlapping subproblems, optimal substructure, memoization, tabulation (bottom-up), introductory problem solving using Coin Change or 0/1 Knapsack.	15

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	C++ Data Structures and Algorithms (1st Edition)	Wisnu Anggoro	Packt Publishing, 2018

Reference			
Sl. No.	Title of Book	Author	Publication
1	Data Structures and Algorithms in C++ (2nd Edition)	Michael T. Goodrich, Roberto Tamassia, David M. Mount	Wiley, 2020

2	Problem Solving with Algorithms and Data Structures using C++ (Updated Edition)	Bradley N. Miller, David L. Ranum	Franklin, Beedle & Associates, 2019
3	Data Structures Using C++ (2nd Edition)	D.S. Malik	Cengage Learning, 2011
4	Open Data Structures (in C++) (1st Edition)	Pat Morin	Carleton University, 2013

COURSE DESCRIPTION							
REGULATION	2025	L-T-J-P-S	3-1-0-3-5	VERSION	25/0	CREDITS	6
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250802/CN310C	Advanced Object Oriented Programming	PCE
PRE-REQUISITE		
Programming in C++		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	180	C	CIA	ESE	Total	CIA	ESE	Total	
3	1	0	3	5		180	6	25	40	65	15	20	35
L: Lecture (One unit is of one-hour duration), T: Tutorial (One unit is of one-hour duration), P: Practical (One unit is of one-hour duration), J: Project (One unit is of one-hour duration), S: Self-Learning & Team Work (One unit is of one-hour duration), CIA: Continuous Internal Assessment, ESE: End Semester Examination													

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Fundamentals of Object Oriented Programming	Java programming Environment and Runtime Environment (Command Line & IDE), Java compiler, Java Virtual Machine, Primitive Data types and Wrapper Types, Casting and Autoboxing, Arrays; Strings, Operators, Control Statements - Selection Statements, Iteration Statements and Jump Statements, Functions, Command Line Arguments, Variable Length Arguments Object Oriented Programming in Java : Declaring Objects, Object Reference, Methods, this keyword	15
2	Exploring Methods in Java using OOP principles	Encapsulation- Access Control mechanisms - Static Members, Final Variables Polymorphism- Method Overloading, Using Objects as Parameters, Returning Objects, Recursion Inheritance - Super Class, Sub Class, Types of Inheritance, The super keyword, protected Members, Calling Order of Constructors. Method Overriding, Dynamic Method Dispatch, Using final with Inheritance, Abstract classes and methods	15
3	Packages, Interfaces, Exceptions & Collections	Packages, Interfaces, Exception Handling, Custom Exceptions, Collection Framework, List and Set Interfaces, ArrayList and HashMap Basics, Iterator, Comparator, Functional Interfaces, Lambda Expressions, Introduction to Stream API, Creating streams from collections, Intermediate and terminal operations	15
4	Multithreading, I/O & frameworks	Design patterns in Java, Singleton, Factory, and Adaptor, Creating Multiple Threads, Synchronization, using an Executor, Using Callable and Future, Concurrent collections, Stream based I/O--Byte streams and Character streams, Reading console Input and Writing Console Output, Reading and writing Files, Serialization, Introduction to REST API, JUnit test framework, Postman for API testing, Spring Boot & connection establishment.	15

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Java: The Complete Reference	Herbert Schildt	Tata McGraw Hill 13/e, 2024
2	Introduction to Java Programming and Data Structures , Comprehensive Version	Y Daniel Liang	Pearson 12/e ,2022
3	Head First Design Patterns	Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra	O'Reilly Media 2/e, 2020
4	Functional Programming in Java	Venkat Subramaniam	2/e 2023

Reference			
Sl. No.	Title of Book	Author	Publication
1	Head First Java: A Brain Friendly Guide	Kathy Sierra & Bert Bates	O'Reilly 3/e, 2022
2	Effective Java	Joshua Bloch	Pearson 3/e, 2018
3	Functional Programming in Java	Venkat Subramaniam	2/e 2023
4	Java For Dummies	Barry A. Burd	Wiley 8/e.2022

COURSE DESCRIPTION							
REGULATION	2025	L-T-J-P-S	2-1-1-0-4	VERSION	25/0	CREDITS	4
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250802/CN320D	Logic System Design	PCB
PRE-REQUISITE		
Introduction to Electrical and Electronics Engineering		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	120	C	CIA	ESE	Total	CIA	ESE	Total	
2	1	1	0	4		120	4	60	40	100	-	-	-
L: Lecture (One unit is of one-hour duration), T: Tutorial (One unit is of one-hour duration), P: Practical (One unit is of one-hour duration), J: Project (One unit is of one-hour duration), S: Self-Learning & Team Work (One unit is of one-hour duration), CIA: Continuous Internal Assessment, ESE: End Semester Examination													

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Digital Fundamentals and Boolean Design	Digital hardware and fundamentals: Digital Hardware and its technologies,Digital Hardware Systems-Design Process, Structure of a computer. Digital Representation of Information- Digital and Analog Information, Base-N Number Systems and Conversions ,ASCII Character Code,Signed and Unsigned Number Representation, Fixed-Point and Floating Point Representation. Logic Gates and Digital Circuits : Basic logic gates: NOT, AND, OR Universal gates: NAND and NOR,XOR and XNOR gates, Multiple-input logic gates Boolean Logic : Boolean algebra and laws,Sum-of-Products (SOP) and Product-of-Sums (POS),Logic simplification techniques,Gate-level implementation of Boolean functions,Multilevel combinational logic, Karnaugh Maps (K-Maps),Don't-care conditions,Logic minimization using K-Maps.	12
2	Combinational Logic Circuits	Introduction to Verilog HDL -HDL Abstraction, Modern digital design flow - Verilog constructs: data types, the module, Verilog operators. Combinational Logic Circuit: Half adder and full adder,Subtractors,Comparators,Multiplexers,De-multiplexer, Decoders,Encoders ,Timing concepts,Propagation delay.	12
3	Sequential Logic Design	Sequential Logic Circuit :SR Latch,D Latch, Flip flops - SR, JK, Master-Slave JK, D and T Flip flops,Shift Registers, Synchronous and asynchronous counters. Modeling concurrent functionality in Verilog- Continuous assignment -Continuous Assignment with logical operators, conditional operators and delay.	12
4	Finite State Machines and Verilog Modelling	Finite State Machines: FSM concepts and modeling,State diagrams and state tables,FSM design examples,State encoding techniques, Moore and Mealy machines. Verilog-based modelling- Procedural assignments, conditional constructs,test benches, and design of flip-flops.	12

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1.	Digital Design and Computer Architecture	David Money Harris, Sarah L. Harris	Morgan Kaufmann Publishers, 4th Edition
2.	Fundamentals of Digital Logic with Verilog Design	Stephen Brown	McGraw Hill Education, 3rd Edition

Reference			
Sl. No.	Title of Book	Author	Publication
1	Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog	M Morris Mano, Michael D. Ciletti	D. Ciletti Pearson India, 6th Edition
2	Introduction to Logic circuits and Logic Design with Verilog	Brock J. LaMeres	3rd Edition, Springer
3	Fundamentals of Digital Circuits	A. Ananthakumar	PHI Learning Pvt. Ltd, 4th Edition
4	Digital Design Verilog HDL and Fundamentals	Joseph Cavanagh	CRC Press, 1st Edition

COURSE DESCRIPTION							
REGULATION	2025	L-T-J-P-S	3-0-0-0-5	VERSION	25/0	CREDITS	4
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250007/AD300E	Numerical Methods for Data Science	EST
PRE-REQUISITE		
Linear Algebra, Calculus		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	120	C	CIA	ESE	Total	CIA	ESE	Total	
3	0	0	0	5			4	40	60	100			
L: Lecture (One unit is of one-hour duration), T: Tutorial (One unit is of one-hour duration), P: Practical (One unit is of one-hour duration), J: Project (One unit is of one-hour duration), S: Self-Learning & Team Work (One unit is of one-hour duration), CIA: Continuous Internal Assessment, ESE: End Semester Examination													

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Errors, Approximations & Numerical Computing	Taylor series approximation, Introduction to numerical computing in Python	8
2	Nonlinear and Linear Equations	Bracketing methods, Open methods, Systems of linear equations	12
3	Interpolation & Curve Fitting	Polynomial Approximation, Polynomial interpolation, Spline interpolation, Regularization	10
4	Optimization Techniques	Unconstrained optimization, Convex optimization, Stochastic optimization	14

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1.	Python Programming and Numerical Methods: A Guide for Engineers and Scientists	Qinghai Kong, Timmy Siau, Alexandre M. Bayen	Elsevier
2.	Optimization for Machine Learning	Suvrit Sra, Sebastian Nowozin, Stephen J. Wright	MIT Press
3.	Mathematics for Machine Learning	Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong	Cambridge University Press
4.	Numerical Analysis	Timothy Sauer	Pearson
5.	Practical Linear Algebra for Data Science	Mike X Cohen	O'Reilly Media

Reference			
Sl. No.	Title of Book	Author	Publication
1	Numerical Methods for Engineers	Chapra, S.C. and Canale, R.P	Tata McGraw
2.	Numerical Methods	E. Balagurusamy	Tata McGraw -Hill
3	Numerical Methods for Scientific and Engineering Computation	Jain, M. K., Iyengar, S. R. K. and Jain, R. K.	New Age Pvt. Pub, New Delhi.

COURSE DESCRIPTION							
REGULATION	2025	L-T-J-P-S	3-0-0-0-1	VERSION	25/0	CREDITS	2
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B250908/HU900F	Engineering Economics	HMT
PRE-REQUISITE		
There are no prerequisites for taking this course.		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	60	C	CIA	ESE	Total	CIA	ESE	Total	
3				1		60	2	60	40	100	-	-	-
L: Lecture (One unit is of one-hour duration), T: Tutorial (One unit is of one-hour duration), P: Practical (One unit is of one-hour duration), J: Project (One unit is of one-hour duration), S: Self-Learning & Team Work (One unit is of one-hour duration), CIA: Continuous Internal Assessment, ESE: End Semester Examination													

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Economic Foundations for Engineering Decision-Making	Introduction to Economics, Demand and Supply Analysis, Elasticity of Demand, Market Structures Relevant topics from Text 1,2 & 3	6
2	Production Economics	Cost and Revenue Analysis, Break Even and Decision Analysis, Equipment Replacement Analysis Relevant topics from Text 4,5 & 6	8
3	Investment Decision Techniques	Introduction to Capital Budgeting, Non-Discounted Techniques, Discounted Techniques - Evaluation Methods and Economic Comparison Methods Relevant topics from Text 7 & 8	8
4	Project Economics, Sustainability & Contemporary Engineering Decisions	Project Economic Analysis & Public Sector Decisions, Life Cycle Cost Analysis Relevant topics from Text 6,7, 9 & 10.	8

SUGGESTED LEARNING RESOURCES			
Text Book			
Sl. No.	Title of Book	Author	Publication
1	Macro-Economic Theory and Policy	D. N. Dwivedi	McGraw Hill
2	Principles of Macroeconomics	N. Gregory Mankiw	Cengage
3	Principles of Economics	N. Gregory Mankiw	Cengage
4	Managerial Economics	D. N. Dwivedi	Vikas Publishing House
5	Engineering Economics	R. Panneerselvam	PHI Learning
6	Engineering Economy	William G. Sullivan, Elin M. Wicks & C. Patrick Koelling	Pearson
7	Engineering Economy	Leland Blank & Anthony Tarquin	McGraw Hill
8	Financial Management	Prasanna Chandra	Tata McGraw Hill
9	Macroeconomic Theory	M. L. Jhingan	Vrinda Publications
10	Sustainable Engineering: Concepts, Design and Case Studies	David T. Allen & David R. Shonnard	Pearson-Prentice Hall

Reference			
Sl. No.	Title of Book	Author	Publication
1	Contemporary Engineering Economics	Chan S. Park	Pearson-Prentice Hall
2	Principles of Engineering Economy	Eugene L. Grant, W. Grant Ireson & Richard S. Leavenworth	Wiley
3	Economic Analysis of Investment Projects	World Bank Group	World Bank Publications
4	LCOE and Renewable Energy Economics in India	NITI Aayog or MNRE	NITI Aayog or MNRE Publications