



B.TECH

COMPUTER SCIENCE & ENGINEERING
CURRICULUM & SYLLABUS

2025 REGULATION

B.Tech COMPUTER SCIENCE & ENGINEERING 2025 REGULATION CURRICULUM & SYLLABUS

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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	B250005/CS310B	Data Structures and Algorithms	3	1	0	3	5	6
C	PCE	B250005/CS310C	Digital Electronics and Logic Design	3	1	0	3	5	6
D	PCB	B250005/CS320D	Theory of Computation	2	1	1	0	4	4
E	EST	B250005/CS300E	Functional Programming	3	0	0	0	5	4
F	HMT	B250908/HU900F	Engineering Economics	3	0	0	0	1	2
M	M		Minor	3	1	0	0	4	4
(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					
L	T	J	P	S	90	C	Theory			Practical		
							CIA	ESE	Total	CIA	ESE	Total
3	1	0	0	2		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 the Central Limit Theorem	Continuous random variables and their probability distributions, Cumulative distribution function, Expectation, Mean and variance, Uniform, Normal and Exponential distribution, 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

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 McGraw-Hill, 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
B250005/CS310B	Data Structures and Algorithms	PCE
PRE-REQUISITE		
1. B250905/CN110E : Algorithmic Thinking with Python 2. B250903/CN210D : Programming in C 3. B250904/CN200E : Discrete Mathematics		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
L	T	J	P	S	180	C	Theory			Practical			Total
							CIA	ESE	Total	CIA	ESE	Total	
3	1	0	3	5		6	25	40	65	20	15	35	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	Asymptotic Analysis, and Linear Data Structures	Introduction to Data Structures and Complexity Analysis - Basic Concepts of Data Structures, Definitions, Data Abstraction; - Performance Analysis - Time and Space Complexity, Growth of functions- Asymptotic Notations, Standard notations and common functions, solving exercise problems related to asymptotic notations; - Performance measurement. Linear Data Structures: Arrays and Linked List Arrays- Array as ADT, Array as a total order set, - Sparse Matrix (Tuple representation), - Binary Search – Complexity analysis; Singly Linked List - Operations on singly linked list, - Polynomial representation and Manipulation-Array and linked list representation. Doubly Linked List; Circular Linked List; Implementation of the binary search algorithm for efficient searching in a sorted data set. Implementation of operations on sparse matrices and polynomials using appropriate data structures. Implementation of singly linked lists, doubly linked lists, and circular linked lists and perform their fundamental operations.	27
2	Stacks and Queues	- Stacks - ADT, Implementation using arrays and linked list; Applications- Evaluation of Expressions- Infix to Postfix, Evaluating Postfix Expressions. - Queues - ADT, Implementation using arrays and linked list; Circular Queues; Double Ended Queues. Implementation of algorithms for converting infix expressions to postfix form and evaluating postfix expressions using stack data structures. Implementation of queue, double-ended queue (deque), and circular queue operations using appropriate data structures.	24
3	Trees and Graphs	Non-Linear Data structures Trees: - ADT, Trees as partial order, Representation Of Trees; Binary Trees - Binary Tree Representation, Types and Properties, Tree Operations, Tree Traversals; Expression Trees; Binary Search Trees (BST) – BST Operations; Binary	27

		Heaps - Binary Heap Operations, Priority Queue; Balanced Search Trees- AVL tree, Red Black trees; • Graphs: - Definitions, Graphs as relation on sets, Representation of Graphs, applications; Design a binary tree and perform its fundamental operations such as insertion, deletion, searching, and traversal Design a binary search tree and demonstrate its fundamental operations. Design an AVL tree and demonstrate its balancing operations through rotations. Design a Red-Black Tree and perform insertion, deletion, searching, and balancing operations to maintain a balanced binary search tree.	
4	Sorting and Hashing	• 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 of sorting algorithms and analyze their performance for arranging data in a specified order. Application suitable data structures and algorithms for developing efficient solutions to practical applications.	27

Text Book			
Sl. No.	Title of Book	Author	Publication
1.	Fundamentals of Data Structures in C	Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed	Universities press, 2/e, 2007
2.	Introduction to Algorithms	Thomas H Cormen, Charles Leiserson, Ronald L Rivest, Clifford Stein	PHI 3/e, 2009

Reference			
Sl. No.	Title of Book	Author	Publication
1	Classic Data Structures	Samanta D.	Prentice Hall India. 2/e, 2018
2	Introduction to Data Structures with Applications	Tremblay J. P. and P. G. Sorenson	Tata McGraw Hill. 2/e, 2017
3	Theory and Problems of Data Structures	Lipschuts S.	Schaum's Series 2/e, 2014
4	Data Structures and Algorithm analysis in C	Mark Allen Weiss	Pearson Education India 2/e, 2002

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
B250005/CS310C	Digital Electronics and Logic Design	PCE
PRE-REQUISITE		
B250904/CN200E : Discrete Mathematics		

TEACHING AND ASSESSMENT SCHEME												
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme					
L	T	J	P	S	180	C	Theory			Practical		
							CIA	ESE	Total	CIA	ESE	Total
3	1	0	3	5		6	25	40	65	20	15	35
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	Introduction to Digital Systems	Introduction to Digital Systems – Fundamentals of Boolean algebra, Boolean function simplification and implementation of basic and universal logic gates, Number representations, Simulation of gates and simple circuits in Verilog.	22
2	Combinational Logic Circuits	Design and Implementation of Combinational Logic - Binary arithmetic, Binary adders and subtractors, Multiplier, Multiplexers, Decoders, Encoders, Demultiplexers, Code converters, Comparators, Simulation of combinational circuits in Verilog.	28
3	Sequential Logic Circuits	Design and Implementation of Sequential Logic - Latches and flip-flops- SR, D, T and JK with enable and reset features, Triggering of Flip-Flops, Implementation of shift registers and counters, Simulation of sequential circuits in Verilog.	26
4	Digital System Design	Finite State Machines - Finite State Machines (FSM) – Design and synthesis, Mealy and Moore machines representation and implementation, Design examples, Algorithmic State Machines (ASM), Implementation of FSM and ASM in Verilog,	29

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Fundamentals of Digital Logic with Verilog Design	Stephen Brown and Zvonko Vranesic	3/e, Tata McGraw-Hill, 2014
2	Digital Logic & Computer Design	M. Morris Mano	4/e, Pearson Education, 2013
3	Introduction to Logic Circuits & Logic Design with Verilog	Brock J. LaMeres	2/e, Springer International Publishing, 2017
4	Digital Principles and Design	Donald D Givone	Tata McGraw-Hill, 2003
5	Verilog Digital System Design	Zainlabedin Navabi	2/e, Mc-Graw-Hill, 2006.

Reference			
Sl. No.	Title of Book	Author	Publication
1	Digital Design and Computer Architecture	David Money Harris, Sarah L. Harris	2/e, Elsevier, 2013
2	Digital Design With An Introduction to the Verilog	M. Morris Mano, Michael D Ciletti	5/e, Pearson Education, 2013
3	Digital Fundamentals	Thomas Floyd	11/e, Pearson, 2015
4	Digital Design: Principles and Practices	J F Wakerly	5/e, Pearson, 2018
5	Verilog HDL: A Guide to Digital Design and Synthesis	Samir Palnitkar	2/e, Prentice Hall, 2003

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
B250005/CS320D	Theory of Computation	PCB
PRE-REQUISITE		
B250904/CN200E : Discrete Mathematics, B250005/CS200C : Foundations of Computing		

TEACHING AND ASSESSMENT SCHEME												
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme					
L	T	J	P	S	120	C	Theory			Practical		
							CIA	ESE	Total	CIA	ESE	Total
2	1	1	0	4		4	60	40	100			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	Introduction to Computation, Languages, and Formal Models	Introduction to Theory of Computation, Chomsky Hierarchy of languages, Determinism and Non-determinism, Formal models of computation, Formal definitions of grammars, Finite Automata	12
2	Regular Languages, Regular expressions and Regular Grammars	Regular expressions, Properties of Regular Languages, Regular Grammars	10
3	Context-Free Grammars and Pushdown Automata	Context-Free Grammars, Simplification of Context-Free Grammars, Pushdown Automata, Relationship between PDA and CFG, Properties of Context-Free Languages	12
4	Turing Machines, and Computability	Turing Machines, Universal Computation and Simulation, Turing Machine Time Complexity, Computability and Decidability	11

Text Book				
Sl. No.	Title of Book	Author	Publication	
1	Automata, Computability and Complexity: Theory and Applications	Elaine Rich	Pearson	1/e,2008
2	An Introduction to Formal Languages and Automata	Peter Linz and Susan H. Rodger	Jones and Bartlett Publishers, Inc	7/e, 2022
3	Introduction to Automata Theory Languages And Computation	John Hopcroft, Jeffrey D. Ullman	Rainbow Book Distributors	3/e, 2015
4	Automata and Computability	Dexter C. Kozen	Springer	1/e,2007

Reference				
Sl. No.	Title of Book	Author	Publication	
1	Introduction to the Theory of Computation	Michael Sipser	Cengage India Private Limited	3/e, 2014
2	Introduction to Languages and the Theory of Computation	John C Martin	McGraw-Hill Education	4/e, 2010
3	Theory of Computation: A Problem-Solving Approach	Kavi Mahesh	Wiley	1/e, 2012
4	Elements of the Theory of Computation	Harry R. Lewis, Christos Papadimitriou	Pearson Education	2/e, 2015

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
B250005/CS300E	Functional Programming	EST
PRE-REQUISITE		
B250904/CN200E : Discrete Mathematics, B250005/CS200C : Foundations of Computing		

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
L	T	J	P	S	120	C	Theory			Practical			Total
							CIA	ESE	Total	CIA	ESE	Total	
3	0	0	0	5		4	40	60	100				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	Functional Programming Foundations	Programming paradigms; Functional programming principles	9
2	Data Types, Recursion & Evaluation	Data types and patterns, Type class, Higher-order list operations, Evaluation strategies	12
3	Types & Safety	Type checking, Polymorphic functions, Generic programming basics, Algebraic Data Types (ADTs), Monads, Option type & safe error handling	12
4	Introduction to Reasoning	Introduction to functional data structures, Mathematical reasoning in Programming, Verification and proofs	12

Reference			
Sl. No.	Title of Book	Author	Publication
1	Functional Programming in Lean	David Thrane Christiansen	Copyrighted by Lean FRO, LLC
2	Theorem Proving in Lean 4	Leonardo de Moura et al.	Lean Community
3	Lean Official Documentation	Lean Community	Lean FRO (Lean Focused Research Organization)
4	Learn Functional Programming	Goran Jovic	Packt Publishing
5	Programming in Haskell	Graham Hutton	Cambridge University Press
6	Thinking Functionally with Haskell	Richard Bird	Cambridge University Press
7	Functional Programming in Scala	Paul Chiusano, Rúnar Bjarnason	Manning Publications
8	Learning Functional Programming: Managing Code Complexity by Thinking Functionally	Jack Widman	O'Reilly Media
9	Kotlin Design Patterns and Best Practices	Alexey Soshin	Packt Publishing Limited
10	Real World OCaml. Functional Programming for the Masses	Yaron Minsky , Anil Madhavapeddy, Jason Hickey	Packt Publishing

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						
L	T	J	P	S	60	C	Theory			Practical			Total
							CIA	ESE	Total	CIA	ESE	Total	
3	0	0	0	1		2	60	40	100	-	-	-	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

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
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