B.Tech CSE (Data Science) - 4 Year Roadmap

■ Year 1 – Foundation (Python + DSA only)

Goal: Build strong programming + problem-solving base.

Semester 1 (Months 1–6):

1. Python basics → Syntax, OOPs, Error handling, File I/O
2. DSA basics → Arrays, Strings, Recursion, Linked List, Stack, Queue
3. Solve 50–80 problems on LeetCode/GFG
4. Mini Project → Simple Python app (To-Do, Expense tracker, CSV analyzer)

Semester 2 (Months 7–12):

1. DSA intermediate → Sorting, Searching, Hashmaps, Sliding Window
2. Python Libraries → NumPy, Pandas, Matplotlib
3. Solve 100–120 problems (easy → medium)
4. Mini Project → Data visualization dashboard

■ Year 2 – Core Strength (DSA + Core CS + Intro to ML)

Goal: Be good at DSA + learn CS fundamentals + touch ML basics.

Semester 3 (Months 13–18):

1. DSA advanced → Trees, BST, Heaps, Backtracking
2. Core CS → DBMS basics (SQL), OS basics (scheduling)
3. Projects → CRUD app (Flask/Django + MySQL), SQL mini-project
4. Solve 100–150 problems (medium)

Semester 4 (Months 19–24):

1. DSA stronger → Graphs, BFS/DFS, Union-Find, DP (basic → medium)
2. Core CS → CN basics (HTTP, TCP/IP, DNS), OS advanced (deadlocks, memory)
3. Intro to ML → Linear Regression, Logistic Regression, Decision Trees
4. Projects → ML mini-project (housing prices, spam detection)
5. Solve 150–200 problems (medium)

■ Year 3 – Specialization (AI/ML + Strong DSA + Projects)

Goal: Use Python + DS skills to build real projects + prepare for internships.

Semester 5 (Months 25–30):

1. DSA hardcore → Advanced DP, Graph Algorithms, Tries
2. System Design (Low-level) → APIs, OOP Design, UML
3. ML intermediate → Random Forests, SVM, XGBoost
4. Projects → Recommendation system, Python API + ML model
5. Internship prep (resume, LinkedIn, GitHub)

Semester 6 (Months 31–36):

1. DSA advanced → Segment Trees, Fenwick Tree, Hard DP

2. System Design (High-level) → Scalability, Caching, Databases
3. Deep Learning start → Neural Nets, CNN, RNN
4. Projects → AI Chatbot (NLP), Image classification (CNN)
5. Internship applications (summer)

■ Year 4 – Career Launch (Placements + AI/DS Expert)

Goal: Crack FAANG/product-based interviews + have AI expertise.

Semester 7 (Months 37–42):

1. Interview prep → Revise DSA patterns + CS subjects (OS, DBMS, CN, OOPs)
2. System Design → LLD + HLD
3. AI advanced → Transformers, NLP (BERT, HuggingFace), GANs
4. Project → End-to-end ML product (deployed on AWS/GCP)
5. Mock interviews

Semester 8 (Months 43–48):

1. Final placement prep → LeetCode top 300, System Design, Behavioral
2. AI/DS specialization → MLOps (Docker, FastAPI, AWS)
3. Projects → AI-powered web app, Cloud-deployed ML pipeline
4. Placement season → Crack FAANG / top startups

■ Final Checklist by Graduation:

1. DSA → 600–800 problems solved (LeetCode/GFG/CF)
2. Core CS → OS, DBMS, CN, OOPs, System Design strong
3. Python + DS/AI → Strong in ML, DL, NLP, Kaggle comps
4. Projects → 6–8 solid (Web + ML + AI mix)
5. Internships → At least 1–2 product-based or AI/ML
6. Prep → Ready for FAANG/Product-based interviews