



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India

(Autonomous Institute Affiliated to University of Mumbai)

Department of Computer Engineering

TEMPLATE CURRICULUM SCHEME FOR MINOR ACADEMIC PROGRAM AT SPIT

2020 ITERATION: Computer Engineering/Embedded Systems

| Sem IV | | | | | | | | |
|--------|------|--------------|----------|----------|----------|----------|-----------|----------|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Minor-I | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem V | | | | | | | | |
|-------|------|--------------|----------|----------|----------|----------|-----------|----------|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Minor-II | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem VI | | | | | | | | |
|--------|------|--------------|----------|----------|----------|----------|-----------|----------|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Minor-III | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem VII | | | | | | | | |
|---------|------|--------------|----------|----------|----------|----------|-----------|----------|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Minor-IV | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |



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CURRICULUM SCHEME FOR MINOR ACADEMIC PROGRAM AT SPIT

2020 ITERATION: **Computer Engineering**

| Sem IV | | | | | | | | |
|--------|------|--------------------------------|----------|----------|----------|----------|-----------|----------|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Data Structures and Algorithms | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem V | | | | | | | | |
|-------|------|-----------------------------|----------|----------|----------|----------|-----------|----------|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Database Management Systems | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem VI | | | | | | | | |
|--------|------|------------------|----------|----------|----------|----------|-----------|----------|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Machine Learning | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem VII | | | | | | | | |
|---------|------|--|----------|----------|----------|----------|-----------|----------|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Computer Network and Internet Technology | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

Registration Fees for Minor in Computer Engineering is Rs. 24,000/- (Rs. 6000 per course) for SPIT students

Registration Fees for Minor in Computer Engineering is Rs. 32,000/- (Rs. 8000 per course) for Non SPTI students

Data Structures and Algorithms –

Course Contents:

1. Random-access-machine model, asymptotic behavior of time/space complexity.
2. Elementary data-structures: arrays, lists, queues, stacks and their applications.
3. Binary search algorithm, binary trees, binary-search-tree data-structure.
4. Balanced binary-search-tree: Red-Black trees.
5. Hashing data structure.
6. Heap data structure.
7. disjoint-set union structure
8. Sorting algorithms, Greedy paradigm, Divide and conquer, Dynamic-programming paradigm
9. Data structures for graphs: adjacency lists, adjacency matrix.
10. Graph algorithms: Depth First Search, Breadth First Search, Minimum Spanning Tree



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11. Single-source shortest path computation, topological sorting of a partially ordered set, convex- hull computation.

Database Management Systems –

Course Contents:

1. Relational model, Relational query languages, Relational algebra, Tuple and domain calculus
2. Structured Query Language: structure, Join expressions, views.
3. E-R model, Database integrity, Triggers.
4. Functional Dependency theory, Normal forms, algorithms for decomposition
5. Row-wise and column database, database buffering. Indexing, B+-tree indices, hashed files, bitmap indices, R-trees.
6. Query Processing
7. Query Optimization
8. Transactions, ACID properties, Concurrency Control, Recovery
9. Parallel Databases: I/O parallelism, Inter-query and intra operation parallelism.
10. Distributed Databases: Storage, distributed transactions, commit protocols, concurrency control in distributed databases.

Machine Learning –

Course Contents:

1. Preliminaries: Multivariate calculus, Linear algebra, Probability theory
2. Supervised and Unsupervised Learning
3. Model and feature selection, over-fitting and generalization, bias-variance tradeoffs
4. Optimization for machine learning: (stochastic/mini-batch) gradient descent
5. Deep learning: CNN, RNN, LSTM, auto-encoders
6. Structured output prediction: multi-label classification, sequence tagging, ranking
7. Ensemble methods: boosting, bagging, random forests
8. Recommendation systems: ranking methods, collaborative filtering via matrix completion
9. Kernel extensions for PCA, clustering, spectral clustering, manifold learning
10. Probability density estimation and anomaly detection
11. Time-series analysis and modeling sequence data
12. Sparse modeling and estimation
13. Online learning algorithms: Perceptron, Widrow-Hoff, explore-exploit
14. Statistical learning theory: PAC learning,

Internet Technology –

Course Contents:

1. OSI & TCP/IP Reference Models
2. Data Link Layer: Framing, Error Detection and Correction, Flow Control. Data Link Protocols,
3. Medium Access Control Sub layer, Channel Allocation, Multiple Access Protocols and LAN Technology
4. Network Layer: Store-and-Forward Packet Switching, Virtual-Circuit and Datagram Networks, Routing,
5. Congestion Control, Quality Of Service, Internet Control Protocols



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6. Transport Layer: Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing, Congestion Control Algorithms
7. UDP, Remote Procedure Call, RTP, TCP, Delay Tolerant Networks.
8. Application Layer: Client Server Concepts DNS, Telnet, FTP, E-mail,
9. World Wide Web, HTML, XML, CGI Scripts, PERL, Java Client-Server Programming
10. Basic Cryptographic Concepts



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CURRICULUM SCHEME FOR MINOR ACADEMIC PROGRAM AT SPIT

2020 ITERATION: Industrial Internet of Things Engineering (I²oTE)

| Sem IV | | | | | | | | |
|--------|------|------------------------------------|---|---|---|---|----|---|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Application Specific System Design | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem V | | | | | | | | |
|-------|------|---|---|---|---|---|----|---|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Embedded "C" Programming & Real-time Software Development | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem VI | | | | | | | | |
|--------|------|--|---|---|---|---|----|---|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Software Design for Discrete time Control Algorithms | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |

| Sem VII | | | | | | | | |
|---------|------|---|---|---|---|---|----|---|
| No | Type | Course | L | T | P | O | E | C |
| 1 | S/M | Industrial Internet of Things (IIoT) System design and Applications | 2 | 0 | 2 | 4 | 08 | 3 |
| | | TOTAL | 2 | 0 | 2 | 4 | 08 | 3 |