

List of Subjects for Acquiring Minor Degree

Department: Computer Engineering/I.T.

Platform: NPTEL/SWAYAM

Sr. No.	Class & Sem	Subject	Teaching Scheme	Course Name at NPTEL (SME Name)	Resource Person	Institute	Duration	Credits	URL/Link
1.	TY Sem-V	Programming In C	4Hrs/week	Problem solving through Programming In C	Prof. Anupam Basu	IIT KGP	12 Weeks	4	
2.	TY Sem-V	Data Structure	4Hrs/week	Data Structure and algorithms using Java	Prof. Debasis Samanta	IIT KGP	12 Weeks	4	
3.	TY Sem-VI	Data Base Management System	4Hrs/week	Introduction To Database Systems	Prof. Sreenivasa Kumar	IIT Madras	12 weeks	4	https://nptel.ac.in/courses/106106220/
4.	TY Sem-VI	Operating Systems	4Hrs/week	Operating System Fundamentals	Prof. Santanu Chattopadhyay	IIT Kharagpur	12 weeks	4	https://nptel.ac.in/courses/106105214/
5.	Final Year Sem-VII	Software Engineering	4Hrs/week	Software Engineering	Prof. Rajib Mall	IIT KGP	12 weeks	4	

Course 1: Problem solving through Programming in C

Module 1

Lecture 1: Introduction

Lecture 2: Idea of Algorithms

Lecture 3: Flow Chart and Pseudocode

Lecture 4: Introduction to Programming Language Concepts

Lecture 5: Variables and Memory

Module 2

Lecture 6: Types of Software and Compilers

Lecture 7: Introduction to C Programming Language

Lecture 8: Variables and Variable Types in C

Lecture 9: Introducing Functions

Lecture 10: Address and Content of Variables and Types

Module 3

Lecture 11: Assignment Statement and Operators in C

Lecture 12: Arithmetic Expressions and Relational Expressions

Lecture 13: Logical Operators and Change in Control Flow

Lecture 14: Use of Logical Operatoers in Branching

Lecture 15: Branching: IF - ELSE Statement

Module 4

Lecture 16: IF-ELSE Statement (Contd.)

Lecture 17: Switch statement

Lecture 18: Switch Statement (Contd.) and Introduction to Loops

Lecture 19: Implementing Repetitions (Loops)

Lecture 20: Implementation of Loops with for Statement (Contd.)

Module 5

Lecture 21: For Statement (Contd.)

Lecture 22: Example of If-Else

Lecture 23: Example of Loops

Lecture 24: Example of Loops (Contd.)

Lecture 25: Example of Loops (Contd.), Use of FOR Loops

Module 6

Lecture 26: Introduction to Arrays

Lecture 27: Arrays (Contd.)

Lecture 28: Arrays (Contd.)

Lecture 29: Program using Arrays

Lecture 30: Array Problem

Module 7

Lecture 31: Linear Search

Lecture 32: Character Array and Strings

Lecture 33: String Operations

Lecture 34: 2-D Array Operation

Lecture 35: Introducing Functions

Module 8

Lecture 36: More on Functions

Lecture 37: Function (Contd.)

Lecture 38: Scanf and Printf Functions; Function Prototype

Lecture 39: Parameter Passing in Function Revision

Lecture 40: Parameter Passing in Function Revision (Contd.)

Module 9

Lecture 41: Substitution of # include and Macro

Lecture 42: "search" as a function

Lecture 43: Binary Search

Lecture 44: Binary Search (Contd.)

Lecture 45: Sorting Methods

Module 10

Lecture 46: Bubble Sort (Contd.)

Lecture 47: Use of Pointer in Function: Context Bubble Sort

Lecture 48: Arrays at Strings

Lecture 49: Data Representation

Lecture 50: Bisection Method

Module 11

Lecture 51: Interpolation

Lecture 52: Trapezoidal Rule and Runge-Kutta Method

Lecture 53: Recursion

Lecture 54: Recursion(Contd.)

Lecture 55: Structure

Module 12

Lecture 56: Structure (Contd.)

Lecture 57: Structure with typedef

Lecture 58: Pointer

Lecture 59: Pointer (Contd.)

Lecture 60: Pointer in Structures

Lecture 61: Dynamic Allocation and File

Course 2: Data Structure and algorithms using Java

- Module 1:** 1D array, list and vector, 2D matrices and tables of objects
- Module 2:** Java implementation of 1D and 2D arrays and its operations
- Module 3:** Linked lists and its various operations, stack and queue
- Module 4:** Java implementation of linked lists, stack and queue
- Module 5:** Binary trees: Representation and operations. Variations of binary tree: Binary search tree, Height balanced search tree, Heap tree
- Module 6:** Java implementation of binary trees and its variations
- Module 7:** Graph : Structure, representation and operations
- Module 8:** Java implementations of graph data structures
- Module 9:** Algorithms (Part-I): Searching and sorting algorithms
- Module 10:** Java implementation of Part-I algorithms
- Module 11:** Algorithms (Part-II): Greedy algorithms, shortest path algorithms
- Module 12:** Java implementation of Part-II algorithms

Course 3: Introduction to Database Systems

Module 1

Introduction
Database Architecture
RDBMS Architecture

Module 2

Introduction to ER Model
Entities and Relationships
Modelling Weak Entities and Design Choices

Module 3

Introduction to ER Model
Entities and Relationships
Modelling Weak Entities and Design Choices

Module 4

Example Queries in Relation Model and Outer Join Operation
Convert ER-Model to a Relational Model
Introduction to tuple relational calculus
Example TRC queries

Module 5

Data definition using SQL
Basic SQL query block and subqueries
Correlated subqueries

Module 6

Aggregate functions
Views
Programmatic access of SQL

Module 7

Normal forms - Introduction
Deriving new functional dependencies
Proving soundness and completeness of Armstrong's Axioms

Module 8

Normal forms - 2 NF, 3NF, BCNF
Properties of decompositions
Normal forms - 4NF, 5NF

Module 9

Introduction to file organization
File organization methods
Dynamic File organization using Hashing
Index structures

Module 10

B+ trees on Disks
Performance and Reliability of Multiple Disks
Relational Query Evaluation

Module 11

Join operator processing algorithms
Query optimization
ACID properties and operations in transactions
Schedules

Module 12

Concurrency control using Locks
Recovery using undo logging method
Recovery using Redo and Undo-Redo logging methods
Recoverable schedules and transaction isolation levels

Course 4: Operating System Fundamentals

Module 1

Lecture 1: Introduction
Lecture 2: Introduction (Contd.)
Lecture 3: Introduction (Contd.)
Lecture 4: Introduction (Contd.)
Lecture 5: Introduction (Contd.)

Module 2

Lecture 6: Introduction (Contd.)
Lecture 7: Operating System Structures
Lecture 8: Operating System Structures (Contd.)
Lecture 9: Operating System Structures (Contd.)
Lecture 10: Operating System Structures (Contd.)

Module 3

Lecture 11: Operating System Structures (Contd.)
Lecture 12: Processes
Lecture 13: Processes (Contd.)
Lecture 14: Processes (Contd.)
Lecture 15: Processes (Contd.)

Module 4

Lecture 16: Processes (Contd.)
Lecture 17: Processes (Contd.)
Lecture 18: Processes (Contd.)
Lecture 19: Threads
Lecture 20: Threads (Contd.)

Module 5

Lecture 21: Threads (Contd.)
Lecture 22: Threads (Contd.)
Lecture 23: Threads, Scheduling
Lecture 24: Scheduling
Lecture 25: Scheduling (Contd.)

Module 6

Lecture 26: Scheduling (Contd.)
Lecture 27: Scheduling (Contd.)
Lecture 28: Scheduling (Contd.)
Lecture 29: Process Synchronization
Lecture 30: Process Synchronization (Contd.)

Module 7

Lecture 31: Process Synchronization (Contd.)

Lecture 32: Process Synchronization (Contd.)

Lecture 33: Process Synchronization (Contd.)

Lecture 34: Process Synchronization (Contd.)

Lecture 35: Synchronization Examples

Module 8

Lecture 36: Synchronization Examples, Deadlock

Lecture 37: Deadlock

Lecture 38: Deadlock (Contd.)

Lecture 39: Deadlock (Contd.)

Lecture 40: Deadlock (Contd.)

Module 9

Lecture 41: Memory Management

Lecture 42: Memory Management (Contd.)

Lecture 43: Memory Management (Contd.)

Lecture 44: Memory Management (Contd.)

Lecture 45: Memory Management (Contd.)

Module 10

Lecture 46: Memory Management (Contd.)

Lecture 47: Memory Management (Contd.)

Lecture 48: Memory Management (Contd.)

Lecture 49: Virtual Memory

Lecture 50: Virtual Memory (Contd.)

Module 11

Lecture 51: Virtual Memory (Contd.)

Lecture 52: Virtual Memory (Contd.)

Lecture 53: Virtual Memory (Contd.)

Lecture 54: Virtual Memory (Contd.)

Lecture 55: Virtual Memory (Contd.)

Module 12

Lecture 56: Virtual Memory (Contd.)

Lecture 57: File System and Secondary Storage

Lecture 58: File System and Secondary Storage (Contd.)

Lecture 59: File System and Secondary Storage (Contd.)

Lecture 60: File System and Secondary Storage (Contd.)

Software Engineering

Module 1

Lecture 1 : Introduction-I
Lecture 2 : Introduction-II
Lecture 3 : Introduction-III
Lecture 4 : Introduction-IV
Lecture 5 : Introduction-V

Module 2

Lecture 6 : Life Cycle Model
Lecture 7 : Life Cycle Model
Lecture 8 : Waterfall Model
Lecture 9 : Waterfall Derivatives
Lecture 10 : Incremental Model

Module 3

Lecture 11 : Evolutionary Model
Lecture 12 : Agile Model
Lecture 13 : Extreme Programming and Scrum
Lecture 14 : Scrum
Lecture 15 : Introduction to requirement specification

Module 4

Lecture 16: Requirement gathering and analysis
Lecture 17: Functional requirements
Lecture 18: Representation of complex programming logic
Lecture 19: Design Fundamentals
Lecture 20: Modular Design

Module 5

Lecture 21: Classification of Cohesion
Lecture 22: Classification of Coupling
Lecture 23: Introduction to structured analysis and structured design
Lecture 24: Basics of Data Flow Diagrams (DFD)
Lecture 25: Developing DFD Model

Module 6

Lecture 26: Examples of DFD Model development
Lecture 27: DFD Model - More Examples
Lecture 28: Essentials of Structure Chart
Lecture 29: Transform Analysis, Transaction Analysis
Lecture 30: Structured Design Examples

Module 7

Lecture 31: Use Case Modelling
Lecture 32: Factoring Use Cases
Lecture 33: Overview of Class diagram
Lecture 34: Inheritance relationship
Lecture 35: Association relationship
Lecture 36: Aggregation/ Composition and dependency relations

Module 8

Lecture 37: Interaction Modelling
Lecture 38: Development of Sequence diagrams
Lecture 39: State-Machine diagram
Lecture 40: An Object-Oriented design process

Module 9

Lecture 41: Domain Analysis
Lecture 42: Examples of object-oriented design
Lecture 43: Basic concepts in Testing-I
Lecture 44: Basic concepts in Testing-II
Lecture 45: Basic concepts in Testing-III

Module 10

Lecture 46: Unit testing strategies-I
Lecture 47: Unit testing strategies-II
Lecture 48: Equivalence Class Testing-I
Lecture 49: Equivalence Class Testing-II
Lecture 50: Special Value Testing

Module 11

Lecture 51: Combinatorial Testing
Lecture 52: Decision Table Testing
Lecture 53: Cause effect graphing
Lecture 54: Pairwise Testing
Lecture 55: White box Testing

Module 12

Lecture 56: Condition Testing
Lecture 57: MC/DC Coverage
Lecture 58: MC/DC Testing
Lecture 59: Path Testing
Lecture 60: Dataflow and Mutation Testing