



MANONMANIAM SUNDARANAR UNIVERSITY,
TIRUNELVELI-12

SYLLABUS

PG - COURSES – AFFILIATED COLLEGES

Course Structure for M. Sc. Computer Science
(Choice Based Credit System)

(with effect from the academic year 2026-2027 onwards)



Semester-I				
Part	Subject Status	Subject Title	Subject Code	Credit
III	CORE I	ANALYSIS & DESIGN OF ALGORITHMS		4
III	CORE II	OBJECT ORIENTED ANALYSIS AND DESIGN & C++		4
III	CORE III	PYTHON PROGRAMMING		4
III	LAB I	ALGORITHM LAB		2
III	LAB II	PYTHON PROGRAMMING LAB		2
III	ELECTIVE I	ADVANCED SOFTWARE ENGINEERING		4
III	ELECTIVE II	ADVANCED COMPUTER NETWORK		4



Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. Scheme for internal Assessment:

Maximum marks for written test: **20 marks**

3 internal tests, each of **1 hour** duration shall be conducted every semester.

To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be:

Written test- 20 marks; Assignment -5 marks Total - 25 marks

B. Scheme of External Examination

3 hrs. examination at the end of the semester

A – Part : 1 mark question two - from each unit

B – Part : 5 marks question one - from each unit

C – Part : 8 marks question one - from each unit

➤ **Conversion of Marks into Grade Points and Letter Grades**

S.No	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	O	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	A	8	Very Good
4	60-69	B+	7	Good
5	50-59	B	6	Above Average
6	40-49	C	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

➤ **Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{\Sigma (GP \times C)}{\Sigma C}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

➤ **Classification**

- First Class with Distinction : CGPA $\geq 7.5^*$
- First Class : CGPA ≥ 6.0
- Second Class : CGPA ≥ 5.0 and < 6.0
- Third Class : CGPA < 5.0



ANALYSIS & DESIGN OF ALGORITHMS

Unit 1

INTRODUCTION

Introduction: - Algorithm Definition and Specification – Space Complexity- Time Complexity- Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heapsort- Graph.

Unit 2

TRAVERSAL AND SEARCH TECHNIQUES

Basic Traversal and Search Techniques: Techniques for Binary Trees-Techniques for Graphs - Divide and Conquer: - General Method – Binary Search – Merge Sort – Quick Sort.

Unit 3

GREEDY METHOD

The Greedy Method: -General Method–Knapsack Problem–Minimum Cost Spanning Tree– Single Source Shortest Path.

Unit 4

DYNAMIC PROGRAMMING

Dynamic Programming-General Method–Multistage Graphs–All Pair Shortest Path–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.

Unit 5

BACKTRACKING

Backtracking: -General Method–8-Queens Problem–Sum Of Subsets–Graph Coloring–Hamiltonian Cycles – Branch and Bound: - The Method – Traveling Salesperson

Unit 6

Contemporary Issues

Expert lectures, online seminars– webinars

Text Books

1. Ellis Horowitz, “Computer Algorithms”, Galgotia Publications.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms".

Reference Books

1. Goodrich, “Data Structures & Algorithms in Java”, Wiley 3rd edition.
2. Skiena, “The Algorithm Design Manual”, second edition, Springer, 2008



3. Anany Levith,” Introduction to the Design and Analysis of Algorithm”, Pearson Education Asia, 2003.
4. Robert Sedgewick, Phillipe Flajolet,” An Introduction to the Analysis of Algorithms”, Addison-Wesley Publishing Company,1996.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://nptel.ac.in/courses/106/106/106106131/>
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. <https://www.javatpoint.com/daa-tutorial>

OBJECT-ORIENTED ANALYSIS AND DESIGN & C++

Unit 1

OBJECT MODEL

The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. Classes and Objects: The Nature of an Object – Relationship among Objects.

Unit 2

CLASSES AND OBJECTS

Classes and Object: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. Classification: The importance of Proper Classification identifying classes and objects – Key Abstractions and Mechanism.

Unit 3

C++ INTRODUCTION

Introduction to C++-Input and output statements in C++-Declarations-control structures– Functions in C++.

Unit 4

INHERITANCE AND OVERLOADING

Classes and Objects–Constructors and Destructors–operators overloading–Type Conversion- Inheritance – Pointers and Arrays.

Unit 5

POLYMORPHISM AND FILES

Memory Management Operators-Polymorphism–Virtual Functions–Files–Exception Handling – String Handling -Templates.

Unit 6

Contemporary Issues

Expert lectures, online seminars – webinars



Text Books

1. “Object Oriented Analysis and Design with Applications”, Grady Booch, Second Edition, Pearson Education.
2. “Object-Oriented Programming with ANSI & Turbo C++”, Ashok N.Kamthane, First Indian Print -2003, Pearson Education.

Reference Books

1. Balagurusamy “Object Oriented Programming with C++”, TMH, Second Edition, 2003.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2. <https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/>
3. https://www.tutorialspoint.com/object_oriented_analysis_design/ood_object_oriented_analysis.htm

PYTHON PROGRAMMING

Unit 1**INTRODUCTION**

Python: Introduction–Numbers–Strings–Variables–Lists–Tuples–Dictionaries–Sets–Comparison.

Unit 2**CODE STRUCTURES**

Code Structures: if, else if, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.

Unit 3**MODULES, PACKAGES AND CLASSES**

Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super–Inself Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.

Unit4**DATA TYPES AND WEB**

Data types: Text Strings–Binary Data, Storing and Retrieving Data: File Input/Output– Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores.



Web: Web Clients –Web Servers–Web Services and Automation

Unit 5

SYSTEMS AND NETWORKS

Systems: Files–Directories–Programs and Processes–Calendars and Clocks.

Concurrency: Queues– Processes–Threads–Green Threads and event–twisted–Redis.

Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – Zero MQ – Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds.

Unit 6

Contemporary Issues

Expert lectures, online seminars –webinars

Text Books

1. BillLubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014.
2. Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013.

Reference Books

1. David M. Beazley, “Python Essential Reference”, Developer’s Library, Fourth Edition, 2009
2. Sheetal Taneja, Naveen Kumar, Approach”, Pearson Publications. “Python Programming-A Modular

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.programiz.com/python-programming/>
2. <https://www.tutorialspoint.com/python/index.htm>
3. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

CORE LAB I: ALGORITHM LAB

LIST OF PROGRAMS

1. Write a program to solve the tower of Hanoi using recursion.
2. Write a program to traverse through binary search tree using traversals.
3. Write a program to perform various operations on stack using linked list.
4. Write a program to perform various operation in circular queue.
5. Write a program to sort an array of an elements using quick sort.
6. Write a program to solve number of elements in ascending order using heap sort.
7. Write a program to solve the knap sack problem using greedy method
8. Write a program to search for an element in a tree using divide& conquer strategy.



9. Write a program to place the 8 queens on an 8X8 matrix so that no two queens Attack.
10. Write a C++ program to perform Virtual Function
11. Write a C++ program to perform Parameterized constructor
12. Write a C++ program to perform Friend Function
13. Write a C++ program to perform Function Overloading
14. Write a C++ program to perform Single Inheritance
15. Write a C++ program to perform Employee Details using files.

Expert lectures, online seminars –webinars

Text Books

1. Goodrich, “Data Structures & Algorithms in Java”, Wiley 3rd edition.
2. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008

Reference Books

1. Anany Levith, “Introduction to the Design and Analysis of Algorithm”, Pearson Education Asia, 2003.
2. Robert Sedgewick, Phillipe Flajolet, “An Introduction to the Analysis of Algorithms”, Addison-Wesley Publishing Company, 1996.

Related Online Contents [MOOC, SWAYAM, NPTEL, Web sites etc.]

1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2. <https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/>
3. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

CORE LAB II: PYTHON PROGRAMMING LAB

LIST OF PROGRAMS

Implement the following in Python:

1. Programs using elementary data items, lists, dictionaries and tuples
2. Programs using conditional branches,
3. Programs using loops.
4. Programs using functions
5. Programs using exception handling
6. Programs using inheritance
7. Programs using polymorphism
8. Programs to implement file operations.
9. Programs using modules.
10. Programs for creating dynamic and interactive Web Pages using forms.

Text Books

1. Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release,



- 2014.
2. Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013.

Reference Books

1. David M. Beazley, “Python Essential Reference”, Developer’s Library Fourth Edition, 2009.
2. Sheetal Taneja, Naveen Kumar, ”Python Programming-A Modular Approach”, Pearson Publications.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.programiz.com/python-programming/>
2. <https://www.tutorialspoint.com/python/index.htm>
3. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

ADVANCED SOFTWARE ENGINEERING

Unit 1

INTRODUCTION

Introduction: The Problem Domain – Software Engineering Challenges - Software Engineering Approach – Software Processes: Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.

Unit 2

SOFTWARE REQUIREMENTS

Software Requirements Analysis and Specification: Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management –Software Quality, Software Quality Management System, ISO 9000, SEI CMM.

Unit 3

PROJECT MANAGEMENT

Software Project Management: Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead’s software science – Staffing level estimation – Scheduling– Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.



Unit 4**SOFTWARE DESIGN**

Software Design: Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.

Unit 5**SOFTWARE TESTING**

Software Testing: A Strategic approach to software testing – Terminologies – Functional testing– Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging–Testingtools-Metrics-ReliabilityEstimation.SoftwareMaintenance -Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.

Unit 6**Contemporary Issues**

Expert lectures, online seminars –webinars

Text Books

1. An Integrated Approach to Software Engineering – Pankaj Jalote, Narosa Publishing House, Delhi, 3rd Edition.
2. Fundamentals of Software Engineering –Rajib Mall, PHI Publication, 3rd Edition.

Reference Books

1. Software Engineering– K.K. Aggarwal and Yogesh Singh, New Age International Publishers, 3rd edition.
2. A Practitioners Approach-Software Engineering,- R.S. Pressman, McGraw Hill.
3. Fundamentals of Software. Engineering – Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHI Publication

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://www.javatpoint.com/software-engineering-tutorial>
2. https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3. https://onlinecourses.nptel.ac.in/noc19_cs69/preview

ADVANCED COMPUTER NETWORKS**Unit 1****INTRODUCTION**

Introduction- data communications – networks – The internet – Protocols and standards – OSI model – layers in OSI model – TCP/IP protocol suite – addressing – guided media – Unguided media



Unit 2

DATA LINK LAYER

Switching – Circuit switched networks – datagram networks – virtual circuit networks
– Framing – Flow and error control Multiple access – random access – wired Lan –
wireless Lan – Cellular telephony – satellite networks

Unit 3

NETWORK LAYER

Network layer – IP V4 addressing – IPV6 addressing – ICMP – IGMP –Network layer
delivery – forwarding – unicast and multicast routing protocols

Unit 4

TRANSPORT LAYER

Transport layer – Process to process delivery – UDP -TCP -Congestion – congestion
control – QOS – Techniques to improve QOS

Unit 5

APPLICATION LAYER

Domain name system – name space – domain name space – distribution of name
space – DNS in the internet – remote logging - email – file transfer -Network
management system – SNMP Protocol

Unit 6

Contemporary Issues

Expert lectures, online seminars– webinars

Text Books

1. Data communications and networking – Behrouz A Forouzan McGraw Hill 4th
Edition 2015 Reprint

Reference Books

1. Computer Networks – Tenenbaum -Pearson -2022
2. Computer networking –Kurose James F, Ross Keith W -Pearson – 2017
3. Data and computer communications – William Stallings – Pearson 2017
4. Computer networks and Internet – Douglas E Comer – Pearson - 2018

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. <https://nptel.ac.in/courses/106105080>
2. <https://www.tutorialspoint.com/computer-networks/index.asp>
3. <https://www.javatpoint.com/computer-network-tutorial>

