MANONMANIAM SUNDARANAR UNIVERISTY,
TIRUNELVELI-12

SYLLABUS

PG - COURSES – AFFILIATED COLLEGES

Course Structure for M. C. A.
(Choice Based Credit System)
(with effect from the academic year 2023-2024 onwards)

Semester-II				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
3	Core	DATA STRUCTURES AND ALGORITHMS		4
3	Core	ADVANCED SOFTWARE ENGINEERING		4
3	Core	ADVANCED JAVA PROGRAMMING		4
3	Elective 3	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING		3
3	Elective 4	INTERNET OF THINGS		3
3	Practical	DATA STRUCTURES AND ALGORITHMS LAB		2
3	Practical	ADVANCED JAVA PROGRAMMING LAB		2
	AEC - II	ENGLISH FOR COMPETITIVE EXAMS		1
3	SEC II	WEB DEVELOPMENT USING PHP		1

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

A. **Scheme for internal Assessment**:
Maximum marks for written test: **15 marks**
3 internal tests, each of **I 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 and Seminar for 5 marks

The break up for internal assessment shall be:
Written test- 15 marks; Assignment -5 marks; Seminar-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.	Percentage of Marks	Letter Grade	Grade Point	Performance
1	90 - 100	O+	10	Outstanding
2	80 - 89	O	9	Excellent
3	70 - 79	A+	8	Very Good
4	60 - 69	A	7	Good
5	55 - 59	B+	6	Above Average
6	50 - 54	B	5	Pass
7	0 - 49	RA	-	ReAppear
8	Absent	AA	-	Absent

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

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

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

- **Classification**
  a) First Class with Distinction : CGPA $\geq$ 7.5*****
  b) First Class : CGPA $\geq$ 6.0
  c) Second Class : CGPA $\geq$ 5.0 and $<$ 6.0
  d) Third Class : CGPA $<$ 5.0

Data Structures and Algorithms

Course Objectives:

- To get a clear understanding of various ADT structures.
- To understand how to implement different ADT structures with real-time scenarios.
- To analyze the various data structures with their different implementations.
- To get an idea of applying right models based on the problem domain.
- To realize, and understand how and where to implement modern data structures with Python language.

Unit-I

Abstract Data Types: Introduction-Date Abstract Data Type-Bags-Iterators. Arrays: Array Structure-Python List-Two Dimensional Arrays-Matrix Abstract Data Type. Sets, Maps: Sets-Maps- Multi-Dimensional Arrays.

Unit-II

Algorithm Analysis: Experimental Studies-Seven Functions-Asymptotic Analysis. Recursion: Illustrative Examples-Analyzing Recursive Algorithms-Linear Recursion Binary Recursion-Multiple Recursion.

Unit-III

Stacks, Queues, and Deques: Stacks- Queues- Double-Ended Queues Linked. Lists: Singly Linked Lists-Circularly Linked Lists-Doubly Linked Lists. Trees: General Trees-Binary Trees-Implementing Trees-Tree Traversal Algorithms.

Unit-IV

Priority Queues: Priority Queue Abstract Data Type- Implementing a Priority Queue- Heaps-Sorting with a Priority Queue. Maps, Hash Tables, and Skip Lists: Maps and Dictionaries-Hash Tables- Sorted Maps-Skip Lists-Sets, Multisets, and Multimaps.

Unit-V

Search Trees: Binary Search Trees-Balanced Search Trees-AVL Trees-Splay Trees. Sorting and Selection: Merge sort-Quick sort-Sorting through an Algorithmic Lens Comparing Sorting Algorithms-Selection. Graph Algorithms: Graphs-Data Structures for Graphs-Graph Traversals-Shortest Paths-Minimum Spanning Trees.

Text book:

1. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011. (Unit – 1) Chapters: 1, 2, 3.

2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", John Wiley & Sons, 2013. (Unit – 2, 3, 4, and 5) Chapters: 3 to 12, and 14.

Reference books:

1. Dr. Basant Agarwal; Benjamin Baka, "Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7", Packt Publishing, 2018.
2. Magnus Lie Hetland, "Python Algorithms: Mastering Basic Algorithms in the Python Language", Apress, 2014.

ADVANCED SOFTWARE ENGINEERING

Course Objectives:

The main objectives of this course are to:

- Introduce to Software Engineering, Design, Testing and Maintenance.
- Enable the students to learn the concepts of Software Engineering.
- Learn about Software Project Management, Software Design & Testing.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

- Understand about Software Engineering process
- Understand about Software project management skills, design and quality management
- Analyze on Software Requirements and Specification
- Analyze on Software Testing, Maintenance and Software Re Engineering
- Design and conduct various types and levels of software quality for a software project

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,3rdEdition.

Reference Books

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

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 JAVA PROGRAMMING

Course Objectives:

The main objectives of this course are to:

- Enable the students to learn the basic functions, principles and concepts of advanced java programming.
- Provide knowledge on concepts needed for distributed Application Architecture.
- Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format

Unit:1 BASICS OF JAVA

Java Basics Review: Components and event handling–Threading concepts–Networking features –Media techniques

Unit:2 REMOTEMETHOD INVOCATION

Remote Method Invocation-Distributed Application Architecture- Creating stubs and skeletons-Defining Remote objects- Remote Object Activation Object Serialization-Java Spaces

Unit:3 DATABASE

Java in Databases-JDBC principles–database access-Interacting database search Creating multimedia databases – Database support in web applications

Unit:4 SERVLETS

Java Servlets: Java Servlet and CGI programming- A simple java Servlet Anatomy of a java Servlet-Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP page-Expressions-Scriptlets-Directives-Declarations-A complete example

Unit:5 ADVANCED TECHNIQUES

JAR file format creation–Internationalization–Swing Programming–Advanced java Techniques

Unit:6 Contemporary Issues

Expert lectures, online seminars –webinars

Text Books

1. Jamie Jaworski, "Java Unleashed", SAMS Tech media Publications,1999.
2. Campione, Walrath and Huml, "The Java Tutorial", Addison Wesley,1999.

Reference Books

1. JimKeogh,"TheCompleteReferenceJ2EE",Tata McGraw Hill Publishing Company Ltd, 2010.
2. DavidSawyerMcFarland,"JavaScriptAndJQuery-TheMissingManual",Oreilly Publications,3rd Edition,2011. Deitel and Deitel, "Java How to Program", Third Edition, PHI/Pearson Education Asia.

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

1. https://www.javatpoint.com/servlet-tutorial
2. https://www.tutorialspoint.com/java/index.htm
3. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Data Structures and Algorithms Lab

Course Objectives:

- To understand Stack, Queue and Doubly Linked ADT structures.
- To implement different ADT structures with real-time scenarios.
- To analyze the recursion concepts.
- To apply different sorting and tree techniques.
- To implement modern data structures with Python language.

Implement the following problems using Python 3.4 and above

1. Recursion concepts.
    i) Linear recursion
    ii) Binary recursion.
2. Stack ADT.
3. Queue ADT.
4. Doubly Linked List ADT.
5. Heaps using Priority Queues.
6. Merge sort.
7. Quick sort.
8. Binary Search Tree.
9. Minimum Spanning Tree.
10. Depth First Search Tree traversal.

ADVANCED JAVA LAB

Course Objectives:

The main objectives of this course are to:

- To enable the students to implement the simple programs using JSP, JAR
- To provide knowledge on using Servlets, Applets
- To introduce JDBC and navigation of records
- To understand RMI & its implementation
- To introduce to Socket programming

LIST OF PROGRAMS

1. Display a welcome message using Servlet.
2. Design a Purchase Order form using Html form and Servlet.
3. Develop a program for calculating the percentage of marks of a student using JSP.
4. Design a Purchase Order form using Html form and JSP.
5. Prepare a Employee pay slip using JSP.
6. Write a program using JDBC for creating a table, Inserting, Deleting records and list out the records.
7. Write a program using Java servlet to handle form data.

8. Write a simple Servlet program to create a table of all the headers it receives along with their associated values.
9. Write a program in JSP by using session object.
10. Write a program to build a simple Client Server application using RMI.
11. Create an apple for a calculator application.
12. Program to send a text message to another system and receive the text message from the system (use socket programming).

Expert lectures, online seminars –webinars

Text Books

1. JamieJaworski,"JavaUnleashed",SAMSTechmediaPublications,1999.
2. Campione, Walrath and Huml,"TheJavaTutorial",AddisonWesley,1999.

Reference Books

1. JimKeogh,"The Complete Reference J2EE",Tata Mc Graw Hill Publishing Company Ltd,2010.
2. David Sawyer McFarland, "Java Script And J Query-The Missing Manual", Oreilly Publications, 3rd Edition, 2011.

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

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2. https://www.tutorialspoint.com/java/index.htm
3. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

ENGLISH FOR COMPETITIVE EXAMS

Objectives:

- To help the students prepare for competitive exams
- To enable the students to learn the techniques to ace the tests
- To enable the students to learn English grammar
- To enhance the students' reading skills
- To teach the students how to answer comprehension questions
- To focus on vocabulary and its importance
- To guide the students about IELT exams
- To discuss various components of vocabulary
- To introduce a variety of reading passages to the students

Course Contents Reading

Comprehension

- Introduction to a variety of reading passages - Key to comprehension – Tackling questions - Techniques for answering comprehension questions

Reading Skills
- Skimming - Scanning - Intensive reading - Extensive reading

Vocabulary
Synonyms - Antonyms - Analogy - Sentence completion

Grammar
Basics of grammar (Parts of speech, tense form, articles, etc.) - Identifying errors

Writing
- Importance of writing - Responding to the task - Coherence and cohesion – Lexical resource - Grammatical range and accuracy - Planning and preparation – Using examples
- Writing general essays - Descriptive writing.

Web Development using PHP

UNIT I
Introduction to PHP as a programming Language: - Advantages of PHP, the server side architecture Decomposed, overview of PHP, history, object oriented support, benefits in running PHP as a server side script.

UNIT II
The basics of PHP: - data types, variables, constants, operators, Arrays, Conditional statements (if statement, Executing Multiple Statements, else if clause and switch statement), Iterations (for loop, while loop, controlling an array using a while loop, do while statement.

UNIT III
Functions, user defined functions, functions with arguments, built in functions (print(), includer(), header(), phpinfo()), Working with Strings.

UNIT IV
Working with forms, form elements (Text Box, Text Area, Password, Radio Button, Checkbox, The Combo Box, Hidden Field and image), adding elements to a form

UNIT V
Data base connectivity using PHP (MySQL, ODBC, ORACLE, SQL) Performing, executing Commands, different types of Data Base Operations like Insertion, deletion, update and query on dat

Books for Reference:

1. Mastering PHP, WebTech Solutions, Khanna Publishing House
2. Learning PHP, Ramesh Bangia, Khanna Publishing House

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Course Objectives:

The main objectives of this course are to:

- Enable the students to learn the basic functions of AI, Heuristic Search Techniques.
- Provide knowledge on concepts of Representations and Mappings and Predicate Logic.
- Introduce Machine Learning with respect Data Mining, Big Data and Cloud.
- Study about Applications & Impact of ML.

Unit:1 INTRODUCTION

Introduction: AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.

Unit:2 SEARCH TECHNIQUES

Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations Issues in Knowledge representations – Frame Problem.

Unit:3 PREDICATE LOGIC

Using Predicate logic: Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge- Logic programming -Forward Vs Backward reasoning -Matching-Control knowledge.

Unit:4 MACHINE LEARNING

Understanding Machine Learning: What Is Machine Learning? - Defining Big Data - Big Data in Context with Machine Learning - The Importance of the Hybrid Cloud - Leveraging the Power of Machine Learning - The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning.

Unit:5 APPLICATIONS OF MACHINE LEARNING

Looking Inside Machine Learning: The Impact of Machine Learning on Applications - DataPreparation -The Machine Learning Cycle.

Unit:6 Contemporary Issues

Expert lectures, online seminars –webinars

Text Books

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill Publisherscompany Pvt Ltd, Second Edition, 1991.
2. George F Luger, "Artificial Intelligence", 4thEdition, Pearson Education Publ,2002.

Reference Books

1. Machine Learning For Dummies ®, IBM Limited Edition by Judith Hurwitz, DanielKirsch.

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

1. https://www.ibm.com/downloads/cas/GB8ZMQZ3
2. https://www.javatpoint.com/artificial-intelligence-tutorial
3. https://nptel.ac.in/courses/106/105/106105077/

INTERNET OF THINGS

Course Objectives:

The main objectives of this course are to:

- To get familiar with the evolution of IOT with its design principles.
- To outline the functionalities and protocols of internet communication.
- To analyze the hardware and software components needed to construct IOT applications.
- To identify the appropriate protocol for API construction and writing embedded code.
- To realize various business models and ethics in Internet of Things.

Unit:1 INTRODUCTION

Internet of Things: An Overview : IoT Conceptual Framework - IoT Architectural View - Technology Behind IoT - Sources of IoT - M2M Communication – Examples of IoT - Design Principles for Connected Devices : IoT/M2M Systems Layers and Designs Standardization - Communication Technologies - Data Enrichment, Data Consolidation and Device Management at Gateway

Unit:2 Design Principles for Web Connectivity

Communication Protocols for Connected Devices – Message Communication Protocols for Connected Devices – Web Connectivity for Connected Devices – Network Using Gateway , SOAP, REST, HTTP, RESTful and WebSockets - Internet

Connectivity Principles : Internet Connectivity - Internet Based Communication – IP Addressing in the IoT – Media Access Control – Application Layer Protocols: HTTP, HTTPS, FTP, Telnet and Others

Unit:3 Data Acquiring, Organizing, Processing and Analytics :

Data Acquiring and Storage – Organising the Data – Transactions, Business Processes, Integration and Enterprise Systems – Analytics – Knowledge Acquiring, Managing and Storing Processes - DataCollection, Storage and Computing Using a Cloud Platform: Cloud Computing Paradigm for Data Collection, Storage and Computing – Everything as a Service and Cloud Service Models.

Unit:4 SENSORS AND ACTUATORS

Sensors, Participatory Sensing, RFIDs, and Wireless Sensor Networks: Sensor Technology –Wireless Sensor Networks Technology - Prototyping the Embedded Devices for loT and M2M : Embedded Computing Basics – Embedded Platforms for Prototyping.

Unit:5 Prototyping and Designing the Software for IoT Applications

Prototyping Embedded Device Software - Devices, Gateways, Internet and Web/Cloud Services Software Development – Prototyping online Component APIs and Web APIs – Security for IoT : Vulnerabilities, Security Requirements and Threat Analysis – IoT Security Tomography and LayeredAttacker Model – Security Models, Profiles and Protocols for IoT – IoT Application Case Study : Design Layers, Design Complexity and Designing using Cloud PaaS – IoT / IIoT Applications in the premises, Supply – Chain and Customer Monitoring – Connected Car and its Applications and Services.

Unit:6 Contemporary Issues

Expert lectures, online seminars –webinars

Text Book

1. Raj Kamal , " Internet of Things Architecture and Design Principles", McGraw Hill, 2017

Reference Books

1. Ovidiu Vermesan and Peter Friess, "Internet of Things – From Research and Innovation to MarkDeployement" , River Publishers, 2014.
2. Peter Waher, "Learning Internet of Things" ,Packt Publishing, 2015.
3. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino,Raspberry Pi and Beagle Bone Black", Mc Graw Hill, 2015

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

1. https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2. https://www.javatpoint.com/iot-internet-of-things
3. https://www.tutorialspoint.com/internet_of_things/index.htm