MANONMANIAM SUNDARANAR UNIVERISTY,
TIRUNELVELI-12

SYLLABUS

PG - COURSES – AFFILIATED COLLEGES

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

(with effect from the academic year 2024-2025 onwards)

Semester-III				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	CORE VII	DIGITAL IMAGE PROCESSING		4
III	CORE VIII	NETWORK SECURITY AND CRYPTOGRAPHY		4
III	CORE IX	DATA SCIENCE & ANALYTICS		4
III	ELECTIVE V	BIG DATA ANALYTICS		3
III	CORE PRACTICAL V	DIGITAL IMAGE PROCESSING USING MATLAB		3
III	MINI PROJECT	WEB APPLICATION DEVELOPMENT & HOSTING USING OPEN-SOURCE SOFTWARE LIKE PHP, PYTHON, HTML, OR .NET BASED, ETC.,		6
III	SEC 3	CLOUD COMPUTING TOOLS		2
III		INTERNSHIP/ INDUSTRIAL ACTIVITY/RESEARCH UPDATING ACTIVITY		2

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 **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.

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)**

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

- **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

DIGITAL IMAGE PROCESSING

Course Objectives:

The main objectives of this course are to:

- Learn basic image processing techniques for solving real problems.
- Gain knowledge in information and image enhancement techniques.
- Learn Image compression and Segmentation procedures.

Unit:1 INTRODUCTION

Introduction: What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations.

Unit:2 IMAGE ENHANCEMENT

Image Enhancement in the spatial domain: - Background – some basic grey level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

Unit:3 IMAGE RESTORATION

Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.

Unit:4 IMAGE COMPRESSION

Image Compression: Fundamentals–Image compression models–Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.

Unit:5 IMAGE SEGMENTATION

Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary Deduction – Thresholding – Region-Based Segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation.

Unit:6 Contemporary Issues

Expert lectures, online seminars –webinars

Text Books

1. Rafael C. Gonzalez, Richard. Woods, "Digital Image Processing", Second Edition, PHI/Pearson Education.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.

Reference Books

1. Nick Efford,"Digital Image Processing a practical introducing using Java", Pearson Education, 2004.

Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]

1. https://nptel.ac.in/courses/117/105/117105135/
2. https://www.tutorialspoint.com/dip/index.htm
3. https://www.javatpoint.com/digital-image-processing-tutorial

NETWORK SECURITY AND CRYPTOGRAPHY

Course Objectives:

- The main objectives of this course are to:
- Enable students to learn the Introduction to Cryptography, Web Security and Case Studies in Cryptography.
- To gain knowledge of classical encryption techniques and concepts of modular arithmetic and number theory.
- To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
- To explore the design issues and working principles of various authentication Applications and various secure communication standards including Kerberos, IPsec, SSL/TLS and email.

Unit:1 INTRODUCTION

Introduction to Cryptography – Security Attacks – Security Services –Security Algorithm- Stream cypher and Block cypher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.

Unit:2 CRYPTOSYSTEM

Public-key cryptosystem: Introduction to Number Theory-RSA algorithm–Key Management-Diffie-Hellman Key exchange–Elliptic Curve Cryptography Message

Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.

Unit:3 NETWORK SECURITY

Network Security Practice: Authentication Applications–Kerberos–X.509Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.

Unit:4 WEB SECURITY

WebSecurity-SecureSocketLayer–SecureElectronicTransaction.SystemSecurity-Intruders and Viruses – Firewalls– Password Security.

Unit:5 CASE STUDY

Case Study: Implementation of Cryptographic Algorithms–RSA–DSA–ECC(C/JAVA Programming). Network Forensic – Security Audit - Other Security Mechanism: Introduction to Stenography – Quantum Cryptography – Water Marking - DNA Cryptography

Unit:6 Contemporary Issues

Expert lectures, online seminars–webinars

Text Books

1. William Stallings,"Cryptography and Network Security", PHI/ Pearson Education.
2. Bruce Schneir,"Applied Cryptography",CRC Press.

Reference Books

1. A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book of Applied Cryptography", CRC Press, 1997
2. Ankit Fadia,"Network Security",Mac Millan.

Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]

1. https://nptel.ac.in/courses/106/105/106105031/
2. http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html
3. https://www.tutorialspoint.com/cryptography/index.htm

DATA SCIENCE &ANALYTICS

Course Objectives:

The main objectives of this course are to:

- Introduce the students to data science, big data &its ecosystem.
- Learn data analytics &its life cycle.
- To explore the programming language, concerning the data mining algorithms.
- Relate the relationship between artificial intelligence, machine learning and data science.

Unit:1 INTRODUCTION

Introduction of Data Science: data science and big data –facets of data-data science process- Ecosystem- The Data Science process – six steps- Machine Learning.

Unit:2 BASICS OF DATA ANALYTICS

DataAnalyticslifecycle-reviewofdataanalytics-AdvanceddataAnalytics-technologyand tools.

Unit:3 DATA ANALYTICS USING R

Basic Data Analytics using R: R Graphical User Interfaces – Data Import and Export – Attribute and Data Types –Descriptive Statistics – Exploratory Data Analysis – Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.

Unit:4 CLUSTERING

Overview of Clustering: K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R –Classification – Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes' Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R.

Unit:5 ARTIFICIAL INTELLIGENCE

Artificial intelligence: Machine Learning and Deep Learning in data science-clustering, association rules. Linear regression-logistic regression-Additional regression methods.

Unit:6 Contemporary Issues

Expert lectures, online seminars –webinars

Text Books

1. Introducing Data Science BIG DATA, MACHINE LEARNING, AND MORE, USING PYTHON TOOLS DAVY CIELEN ARNO D. B. MEYSMAN

MOHAMED ALI
2. Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services, WILEY
3. Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf
4. Data science in big data analytics-Wiley 2015 John Wiley & Sons

Reference Books

1. AsimpleintroductiontoDataScience-LarsNielson2015
2. Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication
3. R Programming for Data Science-Roger D. Peng 2015 Lean Publication
4. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data
5. O'Reilly Media https://www.oreilly.com › view › machine-learning-and Supervised Learning: Models and Concepts

Related Online Contents [MOOC,SWAYAM,NPTEL,Websitesetc.]

1. https://www.tutorialspoint.com/python_data_science/index.htm
2. https://www.javatpoint.com/data-science
3. https://nptel.ac.in/courses/106/106/106106179/

BIG DATA ANALYTICS

Course Objectives:

The main objectives of this course are to:

- To understand the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To know about the research with the integration of large amounts of data.

Unit:1 INTRODUCTION

Introduction to Big Data Analytics: Big Data Overview–Data Structures–Analyst Perspective on Data Repositories - State of the Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – Big Data Ecosystem – Key Role for the New Big Data Ecosystem.

Unit:2 BIG DATA TECHNOLOGIES & TOOLS

Advanced Analytics-Technology and Tools: MapReduce and Hadoop: Analytics for Unstructured Data. - Use Cases - MapReduce - Apache Hadoop – The Hadoop Ecosystem – pig – Hive – Hbase – Mahout – NoSQL - Tools in Database Analytics: SQL Essentials – Joins – Set operations – Grouping Extensions – In Database Text

Analysis - Advanced SQL – Windows Functions – User Defined Functions and Aggregates – ordered aggregates- MADLib.

Unit 3 CLUSTERING AND CLASSIFICATION

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes_ Theorem - Naïve Bayes

Unit:4 Time Series Analysis & Text Analysis

Time Series Analysis: Overview –Box–Jenkins Methodology–ARIMA Model – Autocorrelation Function – Autoregressive Models – Moving Average Models – ARMA and ARIMA Models–Building and Evaluating and ARIMA Model-Text Analysis: Text Analysis Steps – Example – Collecting – Representing Term Frequency – Categorizing –Determining Sentiments – Gaining Insights

Unit:5 Machine Learning with BIG DATA & Applications

MACHINE LEARNING BASICS- Classifying with Nearest Neighbors -SVM - REGRESSION: Logistic-Tree based Regression-A-Priori Algorithm-Principal Component Analysis-Neural Network-spam filtering-Ranking-Multidimensional Scaling-Social Graphing Application Evolution, Big Data Analysis Fields - Structured Data Analysis, Text Data Analysis, Web Data Analysis, Multimedia Data Analysis, Network Data Analysis, Mobile Traffic Analysis, Key Applications - Application of Big Data in Enterprises, Application of IoT Based Big Data, Application of Online Social Network-Oriented Big Data, Applications of Healthcare and Medical Big Data, Collective Intelligence, Smart Grid.

Unit:6 Contemporary Issues

Expert lectures, online seminars –webinars

Text Books

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services Published by John Wiley &Sons,
2. Noreen Burlingame, "The Little Book on Big Data", NewStreetpublishers,2012.
3. Anil Maheshwari, "Data Analytics", McGrawHillEducation,2017.
4. Kim S.Priesand Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
5. Min Chen, Shiwen Mao, Yin Zhang, Victor C.M. Leung, "Big Data: Related Technologies, Challenges and Future Prospects", Springer; 2014 edition

Reference books

1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. DietmarJannachandMarkusZanker, "Recommended Systems: An Introduction", Cambridge University Press, 2010.
4. Tom White, "Hadoop- The Definitive Guide", O'Reilly, 2nd Edition.
5. Vignesh Prajapati," Big Data Analytics with R and Hadoop", PACKT Publishing, November 2013.

PRACTICAL V: DIGITAL IMAGE PROCESSING Using MATLAB

Course Objectives:

The main objectives of this course are to:

- To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques
- Toenablethestudentstolearnthefundamentalsofimagecompressionandsegmentation
- To understand Image Restoration & Filtering Techniques Implementation of the above using MATLAB

LIST OF PROGRAMS

1. Implement Image enhancement Technique.
2. Histogram Equalization
3. Image Restoration.
4. Implement Image Filtering.
5. Edge detection using Operators (Roberts, Prewitts and Sobels operators)
6. Implement image compression.
7. Image Subtraction
8. Boundary extraction using morphology.
9. Image Segmentation

Text Books

1. RafaelC.Gonzalez,RichardE.Woods,"Digital ImageProcessing",Second Edition, PHI/PearsonEducation.
2. B.Chanda,D.DuttaMajumder,"DigitalImageProcessingandAnalysis",PHI, 2003.

ReferenceBooks

1. NickEfford,“DigitalImageProcessingapracticalintroducingusingJava”,Pearson Education, 2004.

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1. https://nptel.ac.in/courses/117/105/117105135/
2. https://www.tutorialspoint.com/dip/index.htm
3. https://www.javatpoint.com/digital-image-processing-tutorial

Mini Project

Course Objectives:

The main objectives of this course are to:

- To enable the third-semester students to study Project development
- To undertake a unique project title
- To get a novel idea for the project
- To define the problem
- To design and implement using a n available software development tool /Programming
- Prepare a report

Mini Project Guidelines

Mode of Mini Project: Individual Project

Nature of Mini Project: Every student shall undertake a unique project title (Novel Concept/ idea/system or a small research problem, which shall be designed and implemented using Web Application Development and hosting using open-source software like Python, PHP, HTML, or .NET based etc., approved by her/his guide.

Guide: Each Student shall be allotted under the Guidance of one Department faculty member by the Programme coordinator/Head

Duration: One semester - (6 hours per week)

Students carry out the Mini Project work in her/his college itself. In the case of a Company project, students are permitted to do the mini project work in reputed IT companies without affecting the minimum attendance and other classes of the third semester

Continuous Assessment: Based on periodic reviews (Three reviews during the semester.

Tentative review dates are decided by the department and will be communicated to the students at the beginning of the third semester.)

Internal (CIA) (50 Marks)

(All the three reviews are mandatory)

External (50 Marks)

Review I

(Problem identification, Title & Abstract submission, Novelty of the idea, proposed outcomes, issues in existing methods, tools to be used) 15 Marks

Both the internal and external examiners will evaluate the student at the end of the semester based on the following criteria: an internal examiner, determined by the HOD, such as a faculty member from the Guide or any other department, and an external examiner appointed by the COE.

Review II

System Design / Database Design or Research Methodology / A l g o r i t h m s and Techniques/ detailed Implementation plan 15 Marks

Internal Examiner

Project Report

20 Marks

Review III External Examiner shall evaluate under the following criteria

- Presentation of the Mini Project
- Demonstration of the mini-project working
- Viva -voce

System Implementation status, Testing, demo of 20 Marks

working system and 10 Marks

completion of report writing 10 Marks

10 Marks

Total 50 Marks 50 Marks

CLOUD COMPUTING TOOLS

Objectives:

- Analyze the components of cloud computing showing how business agility in an organization can be created
- Evaluate the deployment of web services from cloud architecture
- Critique the consistency of services deployed from an architecture
- Compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.

UNIT I Introduction

Basic Concepts and Terminology-Goals and Benefits-Risk and Challenges

UNIT II Fundamental Concepts and Models

Roles and Boundaries-Cloud Characteristics-Cloud Delivery Model: IaaS, PaaS, SaaS, Comparing Cloud Delivery Model, Combining Cloud Delivery Model-Cloud Deployment Model.

UNIT III Cloud Enabling Technology

Broadband Networks and Internet Architecture-Data Center Technology-Virtualization Technology-Web Technology-Multitenant Technology-Service Technology.

UNIT IV Developing for Cloud

Cloud Application Design: Introduction-Design Considerations for Cloud Applications-Cloud Application Design Methodologies-Data Storage Approach

UNIT V Service Development

Development environments for service development; Amazon, Azure, Google App.

Text Book(s):

1. Cloud Computing Concepts, Technology & Architecture by Thomas Erl, Zaigham Mahmood, and Ricardo Puttini
2. "Cloud Computing: A Hands-On Approach" by Arshdeep Bahga and Vijay Madisetti,2014

Reference Book(s):

1. The Basics of Cloud Computing: Understanding the Fundamentals of Cloud Computing in Theory and Practice by Derrick Rountree and Ileana Castrillo 2013
2. "Architecting the Cloud: Design Decisions for Cloud Computing Service Models

Internship/Industrial Activity/Research Updation Activity

Course Objectives:

The main objectives of this course are to:

- to build the necessary skills
- to gain industry working Experience
- a high capacity for analysis to solve problems,
- to achieve a goal
- adapting easily to changes

Guidelines:

- Internal: 50marks External: 50 marks TOTAL 100 marks
- A report should be submitted at the end of 3rd semester and evaluated by the external examiners
- Internship students should submit a certificate of attendance from the industry along with a report