MANONMANIAM SUNDARANAR UNIVERSITY,
TIRUNELVELI-12

SYLLABUS

UG - COURSES – AFFILIATED COLLEGES

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

(with effect from the academic year 2023-2024 onwards)

Semester-V				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	CORE	SOFTWARE ENGINEERING	EMCS51	4
III	CORE	DATABASE MANAGEMENT SYSTEM	EMCS52	4
III	CORE	IMAGE PROCESSING	EMCS53	4
III	CORE	PRACTICAL: IMAGE PROCESSING LAB	EMCSP7	4
III	CORE	MINI PROJECT WITH VIVA VOCE-CASE STUDIES RELATED TO DBMS	EMCS5P	4
III	ELECTIVE	**DATA ANALYTICS USING R**	EECS52	3
IV	NAAN MUDHALVAN	OFFICE AUTOMATION		2
IV		INTERNSHIP / INDUSTRIAL TRAINING / FIELD VISIT/ KNOWLEDGE UPDATION ACTIVITIES	EIFK51	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

SOFTWARE ENGINEERING

Learning Objectives

- Gain basic knowledge of analysis and design of systems
- Ability to apply software engineering principles and techniques
- Model a reliable and cost-effective software system
- Ability to design an effective model of the system
- Perform Testing at various levels and produce an efficient system.

UNIT I

Introduction: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering.

Software Life Cycle Models: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.

UNIT II

Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS)

Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design

UNIT III

Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design.

User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.

UNIT IV

Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing.

Software Reliability and Quality Management: Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.

UNIT V

Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment.

Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.

Text Books

1. Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018

References Books

1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997
2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.
3. James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.

DATABASE MANAGEMENT SYSTEM

Learning Objectives

- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understood the concepts of data base management system, design simple Database models
- To learn and understand to write queries using SQL, PL/SQL.
- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understood the concepts of data base management system, design simple Database models

UNIT I

Database Concepts: Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction

UNIT II

Design Concepts: Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships - data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram

UNIT III

Normalization of Database Tables: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. **Introduction to SQL**: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.

UNIT IV

Advanced SQL: Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.

Sub Queries and Correlated Queries: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function

UNIT V

PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators.

Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements.

PL/SQL Cursors and Exceptions: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

Text Book

1. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
2. Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016

Reference Books

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan,―Database System Concepts‖, McGraw Hill International Publication ,VI Edition
2. Shio Kumar Singh , ―Database Systems ―,Pearson publications ,II Edition

Web Resources

1. Web resources from NDL Library, E-content from open-source libraries

IMAGE PROCESSING

Learning Objective

- To learn fundamentals of digital image processing.
- To learn about various 2D Image transformations
- To learn about various image enhancement processing methods and filters
- To learn about various classification of Image segmentation techniques
- To learn about various image compression techniques

UNIT I

Introduction & Fundamentals: Definition of image and Digital image processing - Examples of Digital image processing- Fundamental steps in Digital image processing- Components of image processing system- Image acquisition- A simple image model- Zooming and shrinking of digital image.

UNIT II

Image enhancement in spatial domain: Introduction- Mathematical analysis of enhancement in spatial domain- Basic gray level transformation- Histogram processing- Histogram equalization - Histogram matching- Image enhancement using arithmetic and logical operation- Basic transformation- Basics of spatial filtering- Image enhancement infrequency domain: One dimensional fourier transform and its inverse- Two dimensional fourier transform and its inverse- Basics of filtering in frequency domain- Homomorphic filtering.

UNIT III

Color image processing: Introduction- Advantages of Color image processing- Categories of Color image processing- Color fundamentals- Primary colors - Secondary colors- Primary and secondary colors for pigments- Characteristics that are used for differentiating different colors- Color models- conversion between color models- Pseudo color image processing- Color transformation- Color image smoothing and sharpening- Color segmentation.

UNIT IV

Image Compression: Introduction-Mathematical analysis- Types of data redundancies- Image compression model - Compression strategies- Morphological Image processing: Introduction- Basic concept of set theory- Logic operations involving binary images- Dilation and erosion- opening and closing.

UNIT V

Feature extraction and image segmentation: Introduction- Classification of features- Features of an image - Attributes of features- Complete process of feature extraction -

Image segmentation - Thresholding- Region based segmentation.

Text Book

1. Abhishak Yadav, Poonam Yadav, Digital Image Processing, University Science Press, New Delhi, 2009.
2. S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015
3. Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009

Reference Books

1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988
2. Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003
3. Pratt William K , Digital Image Processing: , John Wiley,4/e,2007

Web Resources

1. https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf
2. http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
3. https://dl.acm.org/doi/10.5555/559707
4. https://www.ijert.org/image-processing-using-web-2-0-2

PRACTICAL - IMAGE PROCESSING

Learning Objective

- To learn fundamentals of digital image processing.
- To learn about various 2D Image transformations
- To learn about various image enhancement processing methods and filters
- To learn about various classification of Image segmentation techniques
- To learn about various image compression techniques

LIST OF EXCERCISES

1. Perform 2D Linear Convolution, Circular Convolution between two 2D matrices.
2. Perform Discrete Fourier Transform(DFT), Discrete Cosine Transform(DCT) of 4x4 gray scale image
3. Perform Brightness enhancement, Contrast Manipulation, Image negative of an image.
4. Perform threshold operation on an image.
5. Perform Edge detection using different edge detectors.
6. Perform Dilation and Erosion operation.
7. Perform Opening and closing operations
8. Read a colour image and separate the image into red, blue and green planes.

Elective: Choose anyone - **Cloud Computing/ Data Analytics using R/ Natural Language Processing**

CLOUD COMPUTING

Course Objective

- Learning fundamental concepts and Technologies of Cloud Computing.
- Learning various cloud service types and their uses and pitfalls.
- To learn about Cloud Architecture and Application design.
- To know the various aspects of application design, benchmarking and security on the Cloud.
- To learn the various Case Studies in Cloud Computing.

UNIT I

Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications: Cloud computing for health care, Energy systems, Government, Education. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – Map Reduce – Identity and Access Management – Service Level Agreements – Billing.

UNIT II

Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network

UNIT III

Analytics Services: Amazon Elastic Map Reduce - Google Map Reduce Service - Google Big Query - Windows Azure HD Insight Deployment and Management Services: Amazon Elastic Bean stack - Amazon Cloud Formation Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: Cloud Stack – Eucalyptus – Open Stack Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance

UNIT IV

Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), REST ful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).

UNIT V

Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing. Case Studies: Cloud Computing for Healthcare – Cloud Computing for Education.

Text Book

1. Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018

Reference Books

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2013.
2. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.
3. David Crookes, Cloud Computing in Easy Steps, Tata McGraw Hill, 2015.
4. Dr. Kumar Saurabh, Cloud Computing, Wiley India, Second Edition 2012.

Web Resources

1. https://en.wikipedia.org/wiki/Cloud_computing
2. https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7
3. https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

DATA ANALYTICS USING R

Course Objective

- To understand the problem solving approaches
- To learn the basic programming constructs in R Programming
- To learn the basic programming constructs in R Programming
- To use R Programming data structures - lists, tuples, and dictionaries.
- To do input/output with files in R Programming.

UNIT I

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data

Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model

UNIT II

CONTROL STRUCTURES AND VECTORS -Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

UNIT III

LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations

UNIT IV

FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING .

UNIT V

OBJECT-ORIENTED PROGRAMMING S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

Text Book

1. Roger D. Peng,‖ R Programming for Data Science ―, 2012
2. Norman Matloff,‖The Art of R Programming- A Tour of Statistical Software Design‖, 2011

Reference Books

1. Garrett Grolemund, Hadley Wickham,‖ Hands-On Programming with R: Write Your Own Functions and Simulations‖ , 1st Edition, 2014
2. Venables ,W.N.,andRipley,‖S programming—, Springer, 2000.

Web Resources

1. https://www.simplilearn.com

NATURAL LANGUAGE PROCESSING

Learning Objectives

- To understand approaches to syntax and semantics in NLP.
- To learn natural language processing and to learn how to apply basic algorithms in this field.
- To understand approaches to discourse, generation, dialogue and summarization within NLP.
- To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.
- To understand current methods for statistical approaches to machine translation.

UNIT I

Introduction : Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics – Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.

UNIT II

Word level and Syntactic Analysis: Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.

UNIT III

Semantic analysis and Discourse Processing: Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.

UNIT IV

Natural Language Generation: Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine

Translation. Characteristics of Indian Languages- Machine Translation Approaches- Translation involving Indian Languages.

UNIT V

Information retrieval and lexical resources: Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame Net Stemmers- POS Tagger- Research Corpora SSAS.

Textbooks

1. Daniel Jurafsky, James H. Martin, ―Speech & language processing‖, Pearson publications.
2. Allen, James. Natural language understanding. Pearson, 1995.

Reference Books

1. Pierre M. Nugues, ―An Introduction to Language Processing with Perl and Prolog‖,Springer

Web Resources

1. https://en.wikipedia.org/wiki/Natural_language_processing
2. https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP

Mini Project

Individual or group of maximum three members- Project report should be submitted for external evaluation.

Internal 50 marks

External 50 marks

Mini Project - Students will take a specific problem with a front-end and back-end (involving Database Management Systems) for the mini project and solve it and submit a report. Further each student will participate in regular project review with project guide/faculty.

MINI PROJECT with viva voce

Develop E-commerce platform where a customer can register and buy a product Bus/Train Reservation system Store/Insurance Management system Courier service system Library Management system etc with your own interest of database and language

Learning Objectives

- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understood the concepts of data base management system, design simple Database models

- To learn and understand to write queries
- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understood the concepts of data base management system, design simple Database models

Web Resources

1. Web resources from NDL Library, E-content from open-source libraries

Internship: The students should submit certificate of attendance from the industry along with report for evaluation. Industrial visit/Field Visit/ Knowledge updation activity: A report should be submitted for evaluation. SEMESTER VI

OFFICE AUTOMATION

Learning Objectives: (for teachers: what they have to do in the class/ lab/ field)

- The major objective in introducing the Computer Skills course is to impart trainingforstudentsinMicrosoftOfficewhichhasdifferentcomponentslike MS Word, MS Excel and Powerpoint.
- The course is highly practice oriented rather than regular classroom teaching.
- To acquire knowledge on editor, spreadsheet and presentation software.

UNIT I

Introductory concepts: Memory unit–CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS–UNIX–Windows. Introduction to Programming Languages.

UNIT II

Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing–Preview, options, merge.

UNIT III

Spreadsheets: Excel– opening, entering text and data, formatting, navigating; Formulas –entering, handling and copying; Charts– creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.

UNIT IV

Database Concepts: The concept of database management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS;

Developing menu drive applications in query language(MS–Access).

UNIT V

Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition– Animation effects ,audio inclusion, timers.

Recommended Texts

1. PeterNorton,"IntroductiontoComputers"–TataMcGraw-Hill.

Reference Books

1. Jennifer Ackerman Kettel,GuyHat-
2. Davis,CurtSimmons,"Microsoft2003",TataMcGraw-Hill.

Web resources

1. Web content from NDL/ SWAYAM or open source web resource