University of Madras

Chepauk, Chennai 600 005

[Est. 1857, State University, NAAC 'A^{++}' Grade, CGPA 3.59, NIRF 2019 Rank: 20]

Website: www.unom.ac.in, Tel. 044-2539 9561

Postgraduate Programme
in
M.Sc. Information Technology

Curriculum and Syllabus
(with effect from the Academic Year 2023-24)

June 2023

Learning Outcome Based Curriculum Framework

Note: The Board of Studies is designed Learning Outcomes Based Curriculum Framework of Post Graduate Information Technology Programme prescribed by UGC

INDEX

REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	**M.Sc., Information Technology**
Programme Code	
Duration	**PG - Two Years**
Programme Outcomes (POs)	• The broad objective of the programme is to prepare students for challenging careers in academia and/or computing industry by providing healthy environment for teaching, learning and research in the core and applied areas of the discipline. • The programme aims to provide an understanding of advanced Information and Computing Technologies. • To keep a balance between fundamental concepts, core areas of information technology and specialized skills required to adapt to the needs of the dynamically evolving industry. • To be able to pursue quality research in the emerging areas of Information Technology. • The intent is on providing a strong foundation in theory along with a clear technology focus. • To learn and evaluate a range of computing technologies, systems and application services. • To design, analyze, develop and evaluate high-end systems. • To undertake challenging projects and work as active researchers. • To identify and learn about recent research and industry trends. • To equip the student with a basic knowledge of other domains, disciplines and skills, a social and environmental consciousness and a strong value base.
Programme Specific Outcomes (PSOs)	• Implement the concept of theory and technology with the design and analysis techniques for solving the complex problems in Information Technology. • Be curious towards learning new and emerging technologies and adapt quickly to changes. • Design, execute and evaluate computing projects in academia and industry using current technologies. • Know the contextual knowledge in information technology and communicate effectively with stakeholders and with the society at large for enhancing the quality of life. • Be honest in upholding the ethical principles and social responsibilities along with socio-economic innovations.

PROGRAMME OUTCOMES (PO) - PROGRAMME SPECIFIC OUTCOMES (PSO) MAPPING

PROGRAMME SPECIFIC OUTCOMES (PSO)					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
PSO1	**3**	**3**	**3**	**3**	**3**
PSO2	**3**	**3**	**3**	**3**	**3**
PSO3	**3**	**3**	**3**	**3**	**3**
PSO4	**3**	**3**	**3**	**3**	**3**
PSO5	**3**	**3**	**3**	**3**	**3**

Level of Correlation between PO's and PSO's
(Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix)

Assign the value
1 – Low
2 – Medium
3 – High
0 – No Correlation

METHODS OF EVALUATION		
Internal Evaluation	Continuous Internal Assessment Test	**25 Marks**
	Assignments / Snap Test / Quiz	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	**75 Marks**
Total		**100 Marks**

METHODS OF ASSESSMENT	
Remembering (K1)	● The lowest level of questions require student store call information from the course content ● Knowledge questions usually require students to identify information in the textbook.
Understanding (K2)	● Understanding of facts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. ● The questions go beyond simple recall and require students to combine data together
Application (K3)	● Students have to solve problems by using / applying a concept learned in the classroom. ● Students must use their knowledge to determine a exact response.
Analyze (K4)	● Analyzing the question is one that asks the students to break down some thing in to its component parts. ● Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations.
Evaluate (K5)	● Evaluation requires an individual to make judgment on something. ● Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem. ● Students are engaged in decision-making and problem–solving. ● Evaluation questions do not have single right answers.
Create (K6)	● The questions of this category challenge students to get engaged in creative and original thinking. ● Developing original ideas and problem solving skills

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
Semester - I						
438C1A: Core – I Theory Python Programming	4	5	3	25	75	100
438C1B: Core – II Theory Web development Using WordPress	4	5	3	25	75	100
438C1C: Core – III Practical Python Programming Practical	3	5	3	40	60	100
438C1D: Core – IV Practical Web development Using WordPress Practical	3	5	3	40	60	100
Elective – I Theory (Any one) 438E1A: Digital Computer Architecture 438E1B: Operating System 438E1C: Design and Analysis of Algorithms	3	5	3	25	75	100
Elective – II Theory (Any one) 438E1D: Software Engineering 438E1E: Object Oriented Analysis and Design 438E1F: Software Project Management	3	5	3	25	75	100
	20	**30**				

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
Semester - II						
438C2A: Core -V Theory C++and Data Structure	4	5	3	25	75	100
438C2B: Core – VI Theory Relational Data Base Management System	4	5	3	25	75	100
438C2C: Core – VII Practical Data Structure using C++Practical	4	5	3	40	60	100
438C2D: Core – VIII Practical Relational Data Base Management System Practical	3	4	3	40	60	100
Elective - III Theory (Any one) 438E2A: Data Science 438E2B: Net With C# Programming 438E2C: Biometric Techniques	3	5	3	25	75	100
Elective – IV Theory (Any one) 438E2D: Natural Language Processing 438E2E: Data Visualization 438E2F: Cloud Computing	3	4	3	25	75	100
438S2A: SEC-I - Fundamentals of Human Rights	2	2	3	25	75	100
	23	**30**				

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
Semester – III						
538C3A: Core IX Theory Web Technology and Advanced Java	4	4	3	25	75	100
538C3B: Core X Theory Machine Learning	4	4	3	25	75	100
538C3C: Core XI Theory Computer Networks	3	4	3	25	75	100
538C3D: Core XII Practical Web Technology and Advanced Java Practical	3	5	3	40	60	100
538C3E: Core XIII Practical Machine Learning Practical	3	5	3	40	60	100
Elective –V (Any one) 538E3A: Research Methodology 538E3B: Internet of Things 538E3C: Trends in Computing	3	4	3	25	75	100
538S3A: SEC–II-Linux and Shell Programming	2	4	3	25	75	100
538S3B: Internship Industrial Activity	2	-	-	-	100	100
	24	**30**				

Course	Number of Credits	Hours Per Week	Examination Duration (hrs)	Marks		
				I. A	ESE	Total
Semester - IV						
538C4A: Core - XIV Theory Computer Vision	4	5	3	25	75	100
538C4B: Core - XV Project with Viva voce	14	16		20	60+20	100
Elective – VI (Any one) 538E4A: Intelligent Systems 538E4B: Introduction to Robotics 538E4C: Virtual and Augmented Reality	3	5	3	25	75	100
Skill Enhancement/ Professional Competency Skill (Any one) 538S4A: UML Practical 538S4B: Documentation and Interview skills for Software Engineers	2	4	3	40	60	100
538V4A: Extension Activity	1					
	24	**30**				
Total Credits	**91**					

Component wise Credit Distribution

Credits	Sem I	Sem II	Sem III	Sem IV	Total
Part A	**14**	**15**	**17**	**18**	**64**
Part B **(i) Discipline– Centric/Generic Skill**	**6**	**6**	**5**	**3**	**20**
(ii) Soft Skill		**2**		**2**	**4**
(iii) Summer Internship / Industrial Training			**2**		2
Part C				**1**	**1**
Total	**20**	**23**	**24**	**24**	**91**

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Python Programming**		
Core–I - Theory	I Year & I Semester	Credit:4	438C1A

Objectives:

- To acquire programming skills in core Python and to develop databaseapplicationsin Python

Outcomes:

	Explainthebasicconceptsinpythonlanguage.	K1, K2
	Applythevariousdatatypesandidentifytheusageofcontrolstatements,loops,functionsand modules in python forprocessingthedata	K2, K3
	Analyzeandsolveproblemsusingbasicconstructsandtechniquesofpython.	K3, K4
	Assesstheapproachesusedinthedevelopmentof interactiveapplication.	K5, K6
	Tobuildrealtimeprogramsusingpython	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I : Core Python: Introduction - Python Basics: Comments - Statements and syntax - variable Assignment - Identifiers - Python objects : Built-in-types - Internal types - Standard Type operators - Standard type Built-in-functions. Numbers : Introduction to Numbers - Integers - Floating point numbers - Complex numbers - Operators - Built-in and factory functions – Conditionals and Loops -Sequences : Strings, Lists and Tuples

UNIT-II : Mapping and set types.- Functions and functional programming: Introduction - Calling functions - Creating functions - passing functions - Formal arguments - Variable - Length Arguments - Functional Programming - Variable Scope – Recursion

UNIT-III : Modules: Modules and Files – namespaces - Importing Modules - Features - Built-in functions. Object Oriented Programming: Introduction - Object Oriented Programming – Encapsulation Inheritance – Polymorphism - Errors and Exceptions: Introduction – Exceptions in Python.

UNIT-IV :GUI Programming: Introduction – Using Widgets: Core widgets- Generic widget properties – Labels – Buttons – Radio Buttons – Check Buttons – Text – Entry – List Boxes – Menus – Frame – Scroll Bars – Scale

UNIT-V: Database Programming: Connecting to a database using MongoDB - Creating Tables - INSERT-UPDATE - DELETE - READ operations.

Recommended Texts:

1. Wesley J. Chun, (2007), "Core Python Programming", Pearson Education, Second Edition – (Unit I,II,III).
2. Charles Dierbach, (2015), "Introduction to Computer Science Using Python A Computational Problem-Solving Focus", Wiley India Edition- (Unit III- Object Oriented Programming)
3. Martin C Brown, (2018), "The Complete Reference Python", McGraw Hill Education (India)Private Limited – (Unit IV)

Reference Books:

1. MarkLutz,(2013),"LearningPythonPowerfulObjectOrientedProgramming",O"reillyMedia,5 th Edition.
2. TimothyA.Budd,(2011),"ExploringPython",TataMCGrawHillEducationPrivateLimited,First Edition.
3. AllenDowney,JeffreyElkner,ChrisMeyers,(2012),"Howtothinklikeacomputerscientist :learningwithPython"

Web References:

1. http://interactivepython.org/courselib/static/pythonds
2. http://www.ibiblio.org/g2swap/byteofpython/read/
3. http://www.diveintopython3.net/
4. http://docs.python.org/3/tutorial/index.html

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	S	S	S	L	M
CO 2	S	L	S	M	S	L	M	M	S	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	S	M	M	S	L	S	M	S	S	S

S-Strong M-Medium L-Low

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M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Web Development Using Word Press**		
Core–II - Theory	I Year & I Semester	Credit:4	438C1B

Objectives:

- Theprimarycourseobjectiveofthispaperistolearnthefundamentalsofbasicweb concepts, HTML, DHTML, JavaScriptand Word Press

Outcomes:

1.	Identifythe tools whichwill besuitableforthe requirement ofthe webpage.	K1, K2
2.	ImplementJavascriptandStyleSheetseffectivelyintheWebPages	K2, K3
3.	Analyzethedifferenttoolsandbuilt-infunctionsavailabletobeappliedinthe webpage	K3
4.	RatethedesignandeffectivenessoftheWebPages created.	K4, K5
5.	Design andpublishawebsiteusingWordpress	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I :

Introduction to HTML - Lists - Adding Graphics to HTML Documents - Tables -Linking Documents - Frames- Developing HTML Forms

UNIT-II :

Dynamic HTML - Cascading Style Sheets - Use of SPAN Tag - External Style Sheets -Use of DIV Tag - Developing Websites

UNIT-III :

Introduction to JavaScript - JavaScript in Web Pages - Advantages - Writing JavaScript into HTML - Basic Programming Techniques - Operators and Expressions- JavaScript Programming Construct: Conditional Checking, Controlled Loops, Functions: Built-in Functions, User-Defined Functions - Placing Text in a Browser - Dialog Boxes.

UNIT-IV :

JavaScript Document Object Model: Introduction - Understanding Objects in HTML - Handling Events using JavaScript. Forms used by a Website: Form Object - Built-in Objects.

UNIT-V:

Word Press: Installation - Stetting and administration- Word press: Theming basics - Our First Word Press Website - Theme Foundation - Menu and navigation - Home page - Dynamic Sidebars and Widgets - Page - archive Page results - Testing and Launching

Recommended Texts:

1. IvanN.Bayross,(2005),WebEnabledCommercialApplicationsDevelopmentUsingHTML, DHTML,JavaScript,perlCGI,3rdEdition,BPBPublications.(Unit I,II,IIIandIV)
2. JesseFriedman,(2012),WebDesigner'sGuidetoWordPress:Plan,Theme,Build,Launch(VoicesThat Matter), 1stEdition , NewRiders. (Unit V)

Reference Books:

1. N.P.Gopalan,J.Akilandeswari,(2009),WebTechnology:ADeveloper"sPerspective,EasternEconomyEdition, PHILearningPrivateLimited.
2. Deitel&Deitel,(2000),InternetandWorldWideWebHowtoprogram,PrenticeHall.
3. JonDuckett,(2004),BeginningWebProgrammingwithHTML,XHTML,andCSS,WileyPublishing,Inc

Web References:

1. http://www.sergey.com/web_course/content.html
2. http://www.pageresource.com/jscript/index.html
3. http://www.peachpit.com/guides/content.aspx
4. https://www.tutorialspoint.com/wordpress/index.htm

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	S	S	S	L	M
CO 2	S	L	S	M	S	L	M	M	S	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	S	M	M	S	L	S	M	S	S	S

S-Strong M-Medium L-Low

Title of the Paper	**Python Programming Practical**		
Core–III - Practical	I Year & I Semester	Credit:3	438C1C

Objectives:

- This course gives practical experience in Python basics, Object Oriented programming like Classes, Inheritance, and Polymorphism, GUI Applications and Database connection.

Outcomes:

1.	Understandthesignificanceofcontrolstatements,loopsandfunctionsin creatingsimpleprograms.	K1, K2
2.	Applythecoredatastructuresavailableinpythontostore,processandsortthe data	K1, K2
3.	Analyzethe realtimeproblemusingsuitablepython concepts	K3, K4
4.	Assessthecomplexproblemsusingappropriateconceptsinpython	K4, K5
5.	Developtherealtimeapplicationsusingpythonprogramminglanguage.	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

1. PythonBasicprograms
2. ControlStructures
3. Lists
4. FunctionsandRecursions
5. Modules
6. StringProcessing
7. DictionariesandSets
8. ClassesandObjects
9. Polymorphism
10. Inheritance
11. GUIApplication
12. Workingwith Database

Recommended Texts:

1. Wesley J. Chun, (2007), "Core Python Programming", Pearson Education, Second Edition

Reference Books:

1. MarkLutz,(2013),"LearningPythonPowerfulObjectOrientedProgramming",O"reillyMedia,5 th Edition.
2. TimothyA.Budd,(2011),"ExploringPython",TataMCGrawHillEducationPrivateLimited,First Edition.
3. AllenDowney,JeffreyElkner,ChrisMeyers,(2012),"Howtothinklikeacomputerscientist :learningwithPython"

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1. http://interactivepython.org/courselib/static/pythonds
2. http://www.ibiblio.org/g2swap/byteofpython/read/
3. http://www.diveintopython3.net/
4. http://docs.python.org/3/tutorial/index.html

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	S	L	S	L	M
CO 2	S	L	S	M	S	L	M	M	S	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	1	S	M	S	L	S	M
CO 5	S	M	M	S	L	S	M	S	L	S

S-Strong M-Medium L-Low

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M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Web development Using Word Press Practical**		
Core–IV - Practical	I Year & I Semester	Credit:3	438C1D

Objectives:

- Theprimarycourseobjectiveofthispaperistolearnthefundamentalsofbasicweb concepts, HTML, DHTML, JavaScriptand Word Press

Outcomes:

1.	Identifythe tools whichwill besuitableforthe requirement ofthe webpage.	K1, K2
2.	ImplementJavascriptandStyleSheetseffectivelyintheWebPages	K2, K3
3.	Analyzethedifferenttoolsandbuilt-infunctionsavailabletobeappliedinthe webpage	K3
4.	RatethedesignandeffectivenessoftheWebPages created.	K4, K5
5.	Design andpublishawebsiteusingWordpress	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Java script-based Programs

1. Write a program outputs the squares, roots, cubes and complements of integers between 1 and 100.
2. Create a calculator.
3. Write a script to Sort numbers and strings
4. Create a program to generate a hit counter
5. Create a program to verify whether email address provided by user is valid or invalid.
6. Write a program to scroll the text on status bar.
7. The form consists of two multiple choice list and one single choice list
   a. the first multiple choice list display the major dishes available.
   b. the second Multiple choice list display the stocks available.
   c. The single choice list display the miscellaneous (Milkshakes, soft drinks, softy available etc.)
8. Write a sript to create a digital clock.
9. Create a web page using two image file which switch black and white one another as
10. the mouse pointer moves over the image. Use the On Mouse over and On Mouse
11. event, onDblclick handler
12. Build a WWW page with an image and 3 buttons., Pick three favorite graphics, Label
13. the buttons and make each one swap in the graphic you have chosen
14. Create a frameset that has two frames, side by side.

WordPress Exercises

1. Signing into WordPress
2. Team Members: Add New Team Member

3. Creating the Team Page: Edit a Team Member, Team Shortcode
4. Photo Gallery: Lightbox, Add New Gallery, Edit Gallery, Adding a Gallery to a Page, Recommended Photo Size
5. Video Gallery: Add a New Video Gallery, Edit Video Gallery, Add Video Gallery to a Web Page, Adding a Single YouTube Video to a Web Page
6. Project Portfolio: Add a Project, Edit a Project, Order Projects, The Research Projects Web Page, Project Categories & the Project Portfolio Shortcode
7. Highlight Box
8. Adding New Users: New Users: Creating an Account, Administrator: Adding Users
9. Columns Shortcode
10. Social Media Links in Footer

Recommended Texts:

1. IvanN.Bayross,(2005),WebEnabledCommercialApplicationsDevelopmentUsingHTML, DHTML,JavaScript,perlCGI,3rdEdition,BPBPublications.(Unit I,II,IIIandIV)
2. JesseFriedman,(2012),WebDesigner'sGuidetoWordPress:Plan,Theme,Build,Launch(VoicesThat Matter), 1stEdition , NewRiders. (Unit V)

Reference Books:

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2. Deitel&Deitel,(2000),InternetandWorldWideWebHowtoprogram,PrenticeHall.
3. JonDuckett,(2004),BeginningWebProgrammingwithHTML,XHTML,andCSS,WileyPublishing,Inc

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1. http://www.sergey.com/web_course/content.html
2. http://www.pageresource.com/jscript/index.html
3. http://www.peachpit.com/guides/content.aspx
4. https://www.tutorialspoint.com/wordpress/index.htm

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	S	S	S	L	M
CO 2	S	L	S	M	S	L	M	M	S	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	S	M	M	S	L	S	M	S	S	S

S-Strong M-Medium L-Low

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SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Digital Computer Architecture**		
Elective – I Theory	I Year & I Semester	Credit: 3	438E1A

Objectives:

- To provide a comprehensive introduction of the basic design of a computer and the interdependence and interoperation between the various components inside a computer

Outcomes:

1.	Demonstrate the fundamental concept of binary representation and codes, combinational circuits, Instruction formats, register operations and memory organization	K1, K2
2.	Explain the various types of flip flops, different types of microoperations, as well as the addressing modes in the instruction set	K2, K3
3.	Apply the various number conversion systems and simplification of equations using K-map	K3, K4
4.	Analyze the various design of combinational circuits and flip flops to design a computer	K5, K6
5.	Distinguish the major components of a computer including CPU, memory, I/O and storage	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I :

Data Representation - Data Types - Number Systems - Decimal and Alphanumeric Representation - Complements - (r-1)‟s complement - (r‟s) complement - Fixed- point Representation - Floating-point Representation - Binary Codes - Gray Codes - Decimal Codes - Alphanumeric Codes – Error Detection Codes

UNIT-II :

Digital Computers - Logic Gates - Boolean Algebra - K-Map Simplification - Combinational Circuits - Half Adder - Full Adder - SR, D, JK and T Flip Flops - Sequential Circuits - State Table - State Diagram - Digital Components: Integrated Circuits - Decoders - NAND Gate Decoder - Encoders - Multiplexers - Registers - Shift Registers - Binary Counters - Memory Unit

UNIT-III :

Register Transfer and Micro-operations: Register Transfer Language - Register Transfer - Bus and Memory Transfers - Arithmetic Micro-operations - Logic Micro-operations - Shift Micro-operations - Arithmetic Logic Shift Unit. Computer Organization and Programming: Instruction Codes - Computer Registers - Computer Instructions - Timing and Control - Instruction Cycle - Memory Reference Instructions - Input-Output and Interrupt

UNIT-IV :

Central Processing Unit: General Register Organization - Instruction Formats - Addressing Modes - Data Transfer and Manipulation - Program Control. I/O Organization: Peripheral Devices - I/O Interface - Asynchronous Data Transfer - Modes of Transfer - Priority Interrupt - DMA

UNIT-V:

Memory Organization and CPU: Memory Hierarchy - Main Memory - Auxiliary Memory - Associative Memory - Cache Memory - Virtual Memory - Memory Management Hardware

Recommended Texts:

1. M. Morris Mano, "Computer System Architecture", Prentice Hall of India, 2001

Reference Books:

1. John P. Hayes, "Computer Architecture and Organization", Tata McGraw Hill, 1996.
2. V C Hamatcher et al, "Computer Organization", Tata McGraw Hill, 1996.

Web References:

1. http://www.labri.fr/perso/strandh/Teaching/AMP/Common/Strandh-Tutorial/Dir.html
2. http://www.computer-pdf.com/architecture/
3. http://www.uotechnology.edu.iq/depcse/lectures/3/
4. http://www.csie.nuk.edu.tw/~kcf/course/ComputerArchitecture/
5. http://www.ecs.csun.edu/~cputnam/Comp546/Putnam/Cache%20Memory.pdf(UnitV : CacheMemory)

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	S	S	S	L	M
CO 2	S	L	S	M	S	L	M	M	S	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	S	M	M	S	L	S	M	S	S	S

S-Strong M-Medium L-Low

Title of the Paper	**Operating Systems**		
Elective – I Theory	I Year & I Semester	Credit: 3	438E1B

Objectives:

- To develop fundamental knowledge of Operating systems, to become familiar with CPU Scheduling, memory and file management concepts, to learn concepts and programming techniques of Linux

Outcomes:

1.	Outline the fundamental concepts of an OS and their respective functionality	K1, K2
2.	Demonstrate the importance of open-source operating system commands	K2, K3
3.	Identify and stimulate management activities of operating system	K3
4.	Analyze the various services provided by the operating system	K4, K5
5.	Interpret different problems related to process, scheduling, deadlock, memory and files	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Recommended Texts:

UNIT-I :

Introduction : Evolution of Operating System - Structure - Processes - The Process Concepts - Inter Process Communication - IPC Problems - Scheduling Levels - Preemptive Vs Non-Preemptive Scheduling - Scheduling Algorithms: First Come First Served - Shortest Job First - Shortest Remaining Time Next - Three Level Scheduling - Round Robin Scheduling - Priority Scheduling -Multiple Queues - Shortest Process Next - Guaranteed Scheduling - Lottery Scheduling - Fair-Share Scheduling - Thread Scheduling

UNIT-II :

Swapping - Virtual Memory - Page Replacement Algorithm - Segmentation

UNIT-III :

Deadlock - Examples of Deadlock - Detection - Recovery - Avoidance - Prevention – Semaphore -Shared Memory

UNIT-IV :

File System - Files - Directories - I/O Management - Disks - Disk Arm Scheduling Algorithm

UNIT-V:

Introduction to Linux: Introducing Shell Programming - Linux File Systems - Linux File system

calls - Implementation of Linux File systems - Linux Commands - Directory Oriented Commands - File Oriented Commands - Communication Oriented Commands- General Purpose Commands

Recommended Text

1. Andrew S. Tanenbaum, (2001), Modern Operating Systems, 2nd Edition, Prentice Hall of India.
2. B.Mohamed Ibrahim, (2005) Linux Practical Approach, FirewallMedia.

Reference Books

1. Silberchatz, Galvin, Gagne, (2003), Operating Systems Concepts, 6th Edition Wiley India Edition.
2. JhonGoerzen, (2002), Linux Programming Bible, 4th Edition, Wiley- dreamtech India (P) Ltd.

Website and e-Learning Source

1. https://www.webopedia.com/TERM/O/operating_system.html
2. https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf
3. http://iips.icci.edu.iq/images/exam/Abraham-Silberschatz-Operating-System-Concepts--- 9th2012.12.pdf
4. https://www.informatics.indiana.edu/rocha/academics/i101/pdfs/os_intro.pdf
5. https://www.youtube.com/watch?v=oJMYYMIGVMU

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	S	S	S	L	M
CO 2	S	L	S	M	S	L	M	M	S	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	S	M	M	S	L	S	M	S	S	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Design and Analysis of Algorithms**		
Elective – I Theory	I Year & I Semester	Credit: 3	438E1C

Objectives:

- Learn about simple problems and complexity of their solutions.
- To understand the role of algorithms in problem solving. Learn and understand the asymptotic analysis of algorithms.
- Learn and analyse various algorithm design methods through general principles and with selected set of example problems.
- Conceptualize and use these methods to solve complex real world problems particularly problems involved in industrial projects.
- Critically analyse and compare the algorithms for a set of selected example problems which are hard in nature with design approaches like greedy, dynamic programming and branch and bound etc

Outcomes:

1.	To define the term Algorithm in the context of problem solving. To make students	K1, K2
2.	Understand the design and analysis process of algorithms for simple problems.	K1, K2
3.	Understand various algorithm design methods, apply them for problem solving and	K3, K4
4.	Analyze the complexity for simple problems.	K4, K5
5.	Study algorithm design methods for complex problems and compare and analyze the	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Unit 1: Introduction - Definition of Algorithm – pseudocode conventions – recursive algorithms – time and space complexity – big-“oh” notation – exponentiation - practical complexities – randomized algorithms – repeated element – primality testing - Disjoint Sets- disjoint set operations, union and find algorithms,

Unit-2: Divide and Conquer: General Method - Finding maximum and minimum – merge sort - Quicksort, Selection, Strassen's matrix multiplication.

Unit 3: – Greedy Method: General Method – knapsack problem - Tree vertex splitting - minimum cost spanning trees - Job sequencing with deadlines – single source shortest paths. Dynamic Programming: General Method - multistage graphs – all pairs shortest paths — 0/1 knapsack .

Unit 4: Search techniques for graphs –DFS-BFS-connected components – Spanning trees– biconnected components. Back Tracking: General Method – 8-queens - Sum of subsets - Graph 12 Coloring – Hamiltonian cycles.

Unit 5: Branch and Bound: General Method - Job sequencing with deadlines – 0/1 knapsack problem - Traveling Salesperson problem. - Basic Concepts of NP-Hard and NP-Complete problems.

Recommended Texts:

1) E. Horowitz, S. Sahni and S. Rajasekaran, 2008, Computer Algorithms, 2nd Edition, Universities Press, India.

Reference Books

1) G. Brassard and P. Bratley, 1997, Fundamentals of Algorithms, PHI, New Delhi.

2) A.V. Aho, J.E. Hopcroft, J.D. Ullmann, 1974, The Design and Analysis of Computer Algorithms, Addison Wesley, Boston.

3) S.E.Goodman and S.T.Hedetniemi, 1977, Introduction to the Design and Analysis of algorithms, Tata McGraw Hill Int. Edn, New Delhi.

E-learning resources

1) http://www.cise.ufl.edu/~raj/BOOK.html

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	S	L	S	L	M
CO 2	S	L	S	M	S	L	M	M	S	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	1	S	M	S	L	S	M
CO 5	S	M	M	S	L	S	M	S	L	S

S-Strong M-Medium L-Low

Title of the Paper	**Software Engineering**		
Elective – II Theory	I Year & I Semester	Credit: 3	438E1D

Objectives:

- This paper familiarizes the students with the knowledge of basic Software engineering methods and practices and gives hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Outcomes:

1.	Recognize the software process models including the specification, design, implementation, and testing for a software project	K1, K2
2.	Use recent and advanced tools necessary for software project development, testing, management and reuse	K1, K2
3.	Compare and contrast various design, testing and quality issues	K3, K4
4.	Prioritize the requirements and risk accordingly that meet user expected performance, maintenance and quality	K4, K5
5.	Design software projects with well-defined architecture, modules, components and interfaces	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Introduction: A Generic View of Process - Process Models: The Waterfall Model-Incremental Model-Evolutionary Model-Specialized Model-The Unified Process-Agile Process - Agile process Models

Exercise:
Choose any one project and do the following exercises for the chosen project
a. Student Result Management System
b. Library management system
c. Online course reservation system
d. Railway reservation system
e. Recruitment system
f. Stock Maintenance System
Write the Problem Statement for a suggested system of relevance

UNIT-II:

System Engineering: System Engineering Hierarchy - System Modeling - Requirements Engineering: Tasks- Initiating The Process-Eliciting Requirements-Developing Use Cases-Negotiating Requirements-Validating Requirements - Building the Analysis Models: Data modeling concepts - Scenario based - Flow oriented - Class based Modeling
Exercise:
Preparation of Software Requirement Specification Document

UNIT-III:

Design Engineering: Design Concepts - Design Models - Pattern Based Design - Architectural Design - Component Level Design: Component - Class Based and Conventional Components Design - User Interface Design: Analysis and Design

Exercise:

Draw DFD and Use Case diagram for the chosen project using any CASE tools

UNIT-IV:

Testing Strategies: Software Testing - Strategies: Conventional - Object Oriented - Validation Testing - System Testing: Recovery - Security - Stress - Performance - Testing Tactics: Testing Fundamentals- Black Box - White Box - Basis Path-Control Structure

Exercise:

Develop test cases and perform various testing using any one of the testing tools

UNIT-V:

Estimation: Software project Estimation - Empirical Estimation models - Risk management : Software Risks - Risk Identification - Risk Projection - Risk Mitigation, Monitoring and Management - Quality Management: Quality Concepts - Quality Assurance - SoftwareReliability-
QualityStandards.Case Study :Devops Tools

Exercise:

Perform Estimation of effort using FP Estimation for chosen system and prepare Gantt Chart/PERT Chart for the same.

Recommended Text

Roger Pressman.S., "Software Engineering: A Practitioner's Approach", 6th Edition, Mcgraw Hill, 2005

Reference Books

1. Richard Failey, “Software Engineering Concepts”, Tata McGraw-Hill,2004.
2. P. Fleeger, "Software Engineering", Prentice Hall,1999.
3. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli, "Fundamentals ofSoftware Engineering", Prentice Hall Of India1991.
4. Sommerville, "Software Engineering” 5th Edition: Addison Wesley,1996.

Website and e-Learning Source

1. http://productdevelop.blogspot.in/2011/03/what-are-formal-technical-reviews-ftr.html
2. http://basicqafundamentals.blogspot.in/2011/03/difference-between-alpha-testing-beta.html
3. https://www.wiziq.com/tutorials/software-engineering
4. http://www.jkinfoline.com/software-engineering.html
5. http://www.freetutes.com/systemanalysis/

6. http://www.softwaretestingstuff.com/2007/09/white-box-testing.html (Unit IV : White Box Testing)

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	L	S	S	L	M
CO 2	S	L	S	L	S	L	M	M	M	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	M	M	S	L	S	M	S	S	S	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Object Oriented Analysis and Design**		
Elective – II Theory	I Year & I Semester	Credit: 3	438E1E

Objectives:

- The primary objective is to understand the principles & requirements and apply the UML (Unified Modeling Language) and tools for OOA and Design.

Outcomes:

1.	Recognize the concepts and principles of object-oriented analysis, design and Testing	K1,K2
2.	Demonstrate the importance of system development process using various approaches and choose the relevant technique for a system in each phases of SDLC	K3,K4
3.	Differentiate various object-oriented analysis, design and testing methods and models.	K4,K5
4.	Assess various analysis, design and testing strategies appropriate to build high- performance object-oriented system	K5,K6
5.	Design Object oriented systems using object modeling techniques and analyze them for correctness and quality	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Object Basics: Object- oriented Philosophy – Object – Object State, Behaviours and Methods. Encapsulation and Information Hiding – Class Hierarchy – Polymorphism, Aggregation, Object Containment, Meta Classes.

UNIT-II:

Object Oriented Methodologies: Rumbaugh Object Model, Booch Methodology- Jacobson Methodology, Patterns, Frameworks and Unified Approach.

UNIT-III:

Object Oriented Analysis: Business Object Analysis– Use Case Driven Approach – Use Case Model. Object Analysis – Noun Phrase Approach – CRC – Identifying Object Relationships and Methods.

UNIT-IV:

Object Oriented Design: The Design Process – Design Axioms – Corollaries – Design Patterns – Designing Classes. Software Quality: Tests- Testing Strategies – Test Cases – Test Plan – Continuous Testing – Mier‟s Debugging Principles.

UNIT-V:

UML and Programming: Introduction – State and Dynamic Models – UML Diagrams – Class Diagrams – Use Case Diagrams- UML Dynamic Modeling.

Recommended Text

1. Ali Brahami, Object Oriented Systems Development, Tata-McGraw Hill, New Delhi.

Reference Books

1. Martin Fowler, Kendall Scott, UML Distilled- Applying the Standard Object Modeling Language, AdditionWesley.
2. Grady Booch, (1994), Object-oriented Analysis and Design with applications, 2nd Edition, AdditionWesley.

Website and e-Learning Source

1. http://www.slideshare.net/helghareeb/object-oriented-analysis-and-design-12164752
2. http://www.uml-diagrams.org/uml-object-oriented-concepts.html
3. http://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
4. https://www.mppmu.mpg.de/english/kluth_oo_intro.pdf
5. http://www.agilemodeling.com/artifacts/useCaseDiagram.htm (Unit V: Use CaseDiagrams)

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	S	M	S	M	S	M	M	M	S
CO2	M	S	M	S	S	S	M	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	M	S	S	S	S	S	S	S	S	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Software Project Management**		
Elective – II Theory	I Year & I Semester	Credit: 3	438E1F

Objectives:

- The primary objective is to define and highlight importance of software project management and to become familiarize in formulating software management metrics & strategy in managing projects

Outcomes:

1.	Understanding of project management fundamentals such as project planning, risk management and quality assurance	K1,K2
2.	Choose the appropriate scheduling and testing techniques to build a quality product	K2,K3
3.	Apply different cost estimation techniques and quality measures for software development	K4
4.	Differentiate various software development models and methodologies, planning activities and scheduling methods	K5,K6
5.	Asses the importance of software project documentation and identify the methods to create project documentation, including requirements documents, design documents, and project plans	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.

UNIT-II:

Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.

UNIT-III:

Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.

UNIT-IV:

Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM -

Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling

UNIT-V:

Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study

Recommended Text

1. Robert T. Futrell, Donald F. Shafer, Linda I. Safer, "Quality Software Project Management", Pearson Education Asia 2002

Reference Books

1. Pankaj Jalote, "Software Project Management in Practice", Addison Wesley 2002.
2. Hughes, "Software Project Management", Tata McGraw Hill 2004, 3rd Edition.

Website and e-Learning Source

1. https://highered.mheducation.com/sites/0077109899/information-center-view/
2. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
3. https://www.smartsheet.com/content/software-project-management
4. https://www.philadelphia.edu.jo/academics/lalqoran/uploads/SPM_Chapter_1-%202016%204.ppt
5. https://cs.gmu.edu/~kdobolyi/cs421/projectmanagement.ppt

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**C++ and Data Structure**		
Core -V Theory	I Year & II Semester	Credit: 4	438C2A

Objectives:

- To teach Object oriented concepts, C++ language. Classes & Objects, Inheritance, Polymorphism. Templates, Streams, Files.
- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures

Outcomes:

1.	Effective use ofObject Oriented concepts, C++ language.	K1, K2
2.	Learn and analyze various problems using C++ program.	K2, K3
3.	Learn to choose appropriate data structure as applied to specified problem definition.	K3, K4
4.	Learn to handle operations like searching, insertion, deletion, traversing mechanism.	K4, K5
5.	Able to use linear and non-linear data structures like stacks, queues, and linked list.	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Unit 1: Introduction to C++; Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Expressions and Control Structures in C++; Pointers - Functions in C++ - Main Function - Function Prototyping - Parameters Passing in Functions - Values Return by Functions - Inline Functions - Friend and Virtual Functions

Unit-2: Classes and Objects; Constructors and Destructors; and Operator Overloading and Type Conversions - Type of Constructors - Function overloading. Inheritance : Single Inheritance - Multilevel Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance. Pointers, Virtual Functions and Polymorphism; Managing Console I/O operations.

Unit 3: Working with Files: Classes for File Stream Operations - Opening and Closing a File - End-of-File Deduction - File Pointers - Updating a File - Error Handling during File Operations - Command-line Arguments. Data Structures: Definition of a Data structure - primitive and composite Data Types, Asymptotic notations, Arrays, Operations on Arrays, Order lists.

Unit-4: Stacks - Applications of Stack - Infix to Postfix Conversion, Recursion, Maze Problems - Queues- Operations on Queues, Queue Applications, Circular Queue. Singly Linked List- Operations, Application - Representation of a Polynomial, Polynomial Addition; Doubly Linked List - Operations, Applications.

Unit-5: Trees and Graphs: Binary Trees - Conversion of Forest to Binary Tree, Operations - Tree Traversals; Graph - Definition, Types of Graphs, Hashing Tables and Hashing Functions, Traversal - Shortest Path; Dijkstra's Algorithm.

Recommended Texts :

1. E.Horowitz, S.Sahni and Mehta, 1999, Fundamentals of Data Structures in C++, Galgotia.
2. Herbert Schildt, 1999, C++ - The complete Reference, Third Edition, Tata McGraw –Hill.

Reference Books:

1. GregoryL.Heileman, 1996, Data Structures , Algorithms and Object Oriented Programming – Mc-Graw Hill International Editions.
2. A.V.Aho, J.D. Ullman, J.E. Hopcraft: Data Structures and Algorithms-Adisson Wesley Pub.

E-learning resources:

1) https://nptel.ac.in/courses/106105151
2) https://onlinecourses.nptel.ac.in/noc21_cs02/preview
3) https://nptel.ac.in/courses/106101208
4) https://nptel.ac.in/courses/106102064
5) https://nptel.ac.in/courses/106106127

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	M	S	S	M	L	M	L	S
CO2	S	M	S	L	M	L	M	L	M	S
CO3	S	S	L	M	S	S	L	M	L	M
CO4	M	L	S	M	M	L	S	L	M	S
CO5	S	S	M	S	L	M	L	M	S	L

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Relational Database Management System**		
Core -VI Theory	I Year & II Semester	Credit: 4	438C2B

Objectives:

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

Outcomes:

1.	Classify the modern and futuristic database applications based on size and complexity	K1, K2
2.	Map ER model to Relational model to perform database design effectively	K2, K3
3.	Write queries using normalization criteria and optimize queries	K3, K4
4.	Compare and contrast various indexing strategies in different database systems	K4, K5
5.	Appraise how advanced databases differ from traditional databases.	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT I: RELATIONAL DATABASES: Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II: DATABASE DESIGN: Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III: TRANSACTIONS: Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV: IMPLEMENTATION TECHNIQUES RAID: – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using 6 Heuristics and Cost Estimation.

UNIT V: ADVANCED TOPICS: Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, ObjectRelational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.

2. RamezElmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.

2. Raghu Ramakrishnan, ―Database Management Systems‖, Fourth Edition, McGrawHill College Publications, 2015.

3. G.K.Gupta,"Database Management Systems‖, Tata McGraw Hill, 2011. Mapping with Programme Outcomes:

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	L	S	M	L	M	L	L
CO2	S	M	S	S	S	M	M	L	M	L
CO3	S	S	L	M	S	S	L	M	L	M
CO4	M	L	S	M	M	L	S	L	M	S
CO5	S	S	M	S	L	M	M	L	M	L

S-Strong M-Medium L-Low

Title of the Paper	**Data Structures using C++ Practical**		
Core -VII Practical	I Year & II Semester	Credit: 4	438C2C

Objectives:

- The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures

Outcomes:

1.	Be able to design and analyze the time and space efficiency of the data structure	K1
2.	Be capable to identity the appropriate data structure for given problem	K2
3.	Have practical knowledge on the applications of data structures	K3, K4
4.	Distinguish Different types of algorithms	K4, K5
5.	Choose right algorithm at right situation	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

For the implementation of the following problems, the students are advised to use allpossible object-oriented features. The implementation based on structured concepts will notaccepted.

1. Implementation of Arrays (Single and Multi-Dimensional)
2. Polynomial Object and necessary overloaded operators.
3. Singly Linked Lists.
4. Circular Linked Lists.
5. Doubly Linked Lists.
6. Implementation of Stack (using Arrays and Pointers)
7. Implementation of Queue (Using Arrays and Pointers)
8. Implementation of Circular Queue (using Arrays and Pointers)
9. Evaluation of Expressions.
10. Binary Tree implementations and Traversals.
11. Binary Search Trees.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.

2. RamezElmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.

2. Raghu Ramakrishnan, ―Database Management Systems‖, Fourth Edition, McGrawHill College Publications, 2015.

3. G.K.Gupta,"Database Management Systems‖, Tata McGraw Hill, 2011. Mapping with Programme Outcomes:

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	L	S	M	L	M	L	L
CO2	S	M	M	L	M	L	M	L	M	S
CO3	S	S	L	M	S	S	L	M	L	M
CO4	M	L	S	M	M	L	S	L	M	S
CO5	S	S	M	S	L	M	L	M	M	L

S-Strong M-Medium L-Low

Title of the Paper	**Relational Database Management System Practical**		
Core -VIII Practical	I Year & II Semester	Credit:3	438C2D

Objectives:

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front end tool
- To understand design and implementation of typical database applications

Outcomes:

1.	Use typical data definitions and manipulation commands.	K1
2.	Design applications to test Nested and Join Queries	K2, K3
3.	Implement simple applications that use Views	K4
4.	Implement applications that require a Front-end Tool	K4, K5
5.	Critically analyze the use of Tables, Views, Functions and Procedures	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting,updating and retrieving Tables and Transaction Control statements

2. Database Querying – Simple queries, Nested queries, Sub queries and Joins

3. Views, Sequences, Synonyms 4. Database Programming: Implicit and Explicit Cursors

5. Procedures and Functions

6. Triggers

7. Exception Handling

8. Database Design using ER modeling, normalization and Implementation for anyapplication

9. Database Connectivity with Front End Tools

10. Case Study using real life database applications.

    i. Library Information Processing.

    ii. Students Mark sheet processing using images.

    iii. Bank Transactions (SB).

    iv. Pay roll processing.

    v. Inventory

    vi. Purchase order processing.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.

2. RamezElmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.

2. Raghu Ramakrishnan, ―Database Management Systems‖, Fourth Edition, McGrawHill College Publications, 2015.

3. G.K.Gupta,"Database Management Systems‖, Tata McGraw Hill, 2011. Mapping with Programme Outcomes:

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	M	S	S	M	L	M	L	S
CO2	S	M	S	L	M	L	M	L	M	S
CO3	S	S	L	M	S	S	L	M	L	M
CO4	M	L	S	M	M	L	S	L	M	S
CO5	S	S	M	S	L	M	L	M	S	L

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Data Science**		
Elective - III Theory	I Year & II Semester	Credit:3	438E2A

Objectives:

- To Understandthebasicsof datascienceandperformdataanalysis,Dataminingtasks &techniques

Outcomes:

1.	Outlinethebasicsindata science	K1, K2
2.	Identifysuitabletechniqueforthe givenproblem	K2, K3
3.	Analyse andformulatingdatafortheproblemunderconsideration	K4, K5
4.	Interpret and demonstrate theknowledgeofdataanalysistechniquesindecisionmaking	K5, K6
5.	Developthemodel usingdataminingandcomputingtechniques	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Introduction: Data Mining – Kinds of Data and Patterns to be Mined – Technologies used – Kinds of Applications are Targeted - Major Issues –Data objects and Attribute types – Basic statistical Descriptions of Data – Data Visualization - **Data Preprocessing:** Data Cleaning – Data Integration - Data Reduction - Data Transformation

UNIT-II:

Classification: Basic concepts - Decision Tree Induction: Working of Decision Tree - Building Decision Tree - Methods for Expressing Attribute Test Conditions - Measures for Selecting the Best Split - Algorithm for Decision Tree Induction – Classification: Alternative Techniques: Rule - Based Classifier– Nearest Neighbour Classifier - Bayesian Classifiers.

UNIT-III:

Association Analysis: Basic Concepts - Frequent Itemset Generation - Rule Generation - Compact Representation of Frequent Item sets –FP Growth Algorithm

UNIT-IV:

Cluster Analysis: Introduction-Desired Features of Cluster Analysis -Types of Data- Computing Distance - Types of Cluster Analysis Methods - Partitioning Methods - Hierarchical Methods – Density - Based Methods - Cluster Analysis Software

UNIT-V:

Web Data Mining: Introduction - Web terminology and characteristics - Locality and Hierarchy in the web- Web Content Mining - Web Usage Mining - Web Structure Mining – Web Mining-software

Recommended Text

1. Vipin Kumar - Michael Steinbach - Pang - Ning Tan - (2006) - Introduction to Data Mining - Pearson Education. (Unit II: Chapters 4 & 5; Unit III: Chapter 6)
2. Jiawei Han and Micheline Kamber - (2012) - Data Mining Concepts and Techniques - Third Edition - Morgan Kaufmann. (Unit I : Chapters 1, 2 &3;)
3. G.K. Gupta, "Introduction to Data mining with case studies", 2nd Edition, PHI Private limited, New Delhi, 2011. (Unit IV: Chapter 4, Unit V: Chapters 5)

Reference Books

1. Bhavani M. Thuraisingham - Data Mining: Technologies - techniques - tools and trends - CRC Press
2. Yanchang Zhao (2012 - 2013) - R and Data Mining: Examples and Case Studies - Elsevier.
3. Robert I. Kabacoff (2011) - R in Action Data analysis and graphics with R - Manning Publications.
4. Samir Madhavan, "Mastering Python for Data Science", Packet Publishing, 2015.

Website and e-Learning Source

1. http://www.thearling.com/text/dmwhite/dmwhite.htm
2. http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=AD0770256
3. https://www.datamentor.io/r - programming#tutorial
4. http://www.csis.pace.edu/~ctappert/cs816-15fall/books/2015DataScience&BigDataAnalytics.pdf
5. http://www.rdatamining.com/
6. https://www.analyticsvidhya.com/blog/2016/02/complete - tutorial - learn - data - science - scratch/
7. https://www.tutorialspoint.com/data_mining/dm_classification_prediction.htm (Classification)

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Net With C# Programming**		
Elective - III Theory	I Year & II Semester	Credit:3	438E2B

Objectives:

- TounderstandthebasicsstructureofC# programmingandthe components of Active Server Pages which provide sufficient knowledge to work with SQLServerusingMicrosoft ADO.NET

Outcomes:

1.	OutlinethefeaturesofC#andASP.NETconceptstounderstandtherealtime applications	K1, K2
2.	IdentifythesalientpropertiesofC#programmingconceptsandASP.NET Application	K1, K2
3.	Listthevariousstagesinvolvedincreatinga webform	K2, K3
4.	Selecttheappropriatewebcontrols todevelopthewebforms	K4, K5
5.	Constructadatabasedrivenwebapplicationswiththefacilitatedwebservices.	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

The C# Language : Basics- Variables and Data Types - Variable Operations - Object BasedManipulation-Conditionallogic-Loops-Methods-Types,ObjectsandNamespaces-Delegates.

UNIT-II:

ASP.Net4.5Essentials: Introductionto.NET:Benefitsof.NETFramework-**Overviewof .NET Framework 4.5 :** Common Language Runtime - Common Type System - Metadata andAssemblies-Introductiontovisualstudio2012IDE:ExploringVisualStudio2012IDE-**ASP.NET 4.5 Overview:** ASP.NET Life cycle: Life cycle of an ASP.Net web page-**DevelopingaWebApplication:**FileTypesinASP.NET4.5-ExploringASP.NETwebpages-UnderstandingASP.NET4.5Directives-**ApplicationstructureandState:**TheGlobal.asaxApplication File- Using states: Application State- Session State-View State-Cookies- PostbackandCross-pageposting.

UNIT-III:

Web Forms: Standard controls: Label control-Button Control-TextBox Control-Literal Control-PlaceHolderControl-HiddenFieldControl-Navigationcontrols:TreeView,MenuandSiteMapPath-Validationcontrols-**Richcontrols**:CalendarControls-AdRotatorcontrol.

UNIT-IV:

LINQ Queries : Standard Query operators: Filtering operators- Projection operators-Sortingoperators-Groupingoperators-setoperators-Aggregateoperators-LambdaExpressions-**Working with Login controls:** Login control- Password Recovery control - Create User Wizardcontrol-ChangePassword control

UNIT-V:

ADO.NETFundamentals: ConfiguringyourDatabase-ADO.NETBasics-DirectDataAccess - DisconnectedDataAccess-**DataBinding:**DataBindingwithADO.NET-DataSourceControls-**TheDataControls:**TheGridView-FormattingtheGridView-SelectingaGridViewRow-Editing,Sortingand PagingtheGridView-Crystal Report

Recommended Text

1. Kogent(2013),ASP.NET4.5BlackBook–DreamtechPress,New Delhi (Unit2,3,4)
2. MatthewMacDonald(2010),BeginningASP.NET4 inC#,Apress.(Unit1,5)

Reference Books

1.Greg Buczek(2002), ASP.NET Developer‟s guide, Tata McGraw Hill Publications.
2.Jesse Liberty, (2002), Programming C#, 3.0, O‟Reilly Press.
3.J.Sharp, (2009), Microsoft Visual C# 2008 Step by Step, PHI Learning Private Ltd.
4.Christian Nagel et al., (2007), Professional C# 2005 with .NET 3.0, Wiley India.
5.Herbert Schildt,(2010), C# 4.0 The Complete Reference, Tata McGraw Hill Publications

Website and e-Learning Source

1. www.homeandlearn.co.uk/csharp/csharp.html
2. http://msdn.microsoft.com/en-us/library//aa645596.aspx
3. http://www.csharpkey.com/csharp/
4. http://www.w3schools.com/aspnet/default.asp
5. http://www.maconstateit.net/tutorials/ASPNET20/default.htm
6. http://csharp-station.com/Tutorial/AdoDotNet/Lesson01(UnitV:ADO.NETFundamentals)
7. http://www.c-sharpcorner.com/UploadFile/009464/use-crystal-report-in-Asp-Net-using-C-Sharp/

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	*S*	S
CO2	S	S	S	S	S	S	S	S	*S*	L
CO3	S	S	M	S	S	S	S	S	*S*	M
CO4	M	S	M	M	S	S	S	S	S	M
CO5	S	M	M	S	M	L	L	L	L	M

S-Strong M-Medium L-Low

Title of the Paper	**Biometric Techniques**		
Elective - III Theory	I Year & II Semester	Credit:3	438E2C

Objectives:

- To understand various physiological and behavioural biometrics and its applications

Outcomes:

1.	Outline the existing theories, methods and interpretations in thefield ofbiometrics	K1, K2
2.	Identify the deployment areas, competing technologies, strength and weakness of various Physiological and Behavioral Biometrics	K1, K2
3.	Analyze various Application areas, Biometric security issues andBiometric standards	K2, K3
4.	Assess the methods relevant for design, development and operation of biometric access control systems	K2, K4
5.	Determine identification /verification systems to validate the user identityand technological uplifts in biometrics compared to traditionalsecuring mechanisms	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Introduction: Biometric Fundamentals - Biometrics Vs Traditional Techniques - Benefits of Biometrics in Identification Systems - Key Biometric Terms and Processes: Verification, Identification and Biometric Matching - Accuracy in Biometric Systems: False Match Rate, False Non-Match Rate, Failure to Enroll Rate, DerivedMetrics

UNIT-II:

Physiological Biometrics: Finger Scan: Components-How it works-Competing Technologies-Deployments-Strengths and Weaknesses. Facial Scan: Components- How it Works-Competing Technologies-Deployments-Strengths and Weaknesses

UNIT-III:

Other Physiological Biometrics: Iris Scan: Components- How it Works-Competing Technologies-Deployments-Strengths and Weaknesses. Voice Scan: How it Works-Competing Technologies-Deployments-Strengths and Weaknesses. Other Physiological Biometrics: Hand Scan and Retina Scan

UNIT-IV:

Behavioural Biometrics: Signature Scan and Keystroke Scan: How it Works-Competing Technologies-Deployments-Strengths and Weaknesses. Esoteric Biometrics: Vein Pattern- Facial

Thermography-DNA- Sweat Pores- Hand Grip- Finger Nail Bed- Body Odor- Ear-Gait- Skin Luminescence- Brain Wave Pattern- Foot Print and Foot Dynamics

UNIT-V:

Biometric Applications: Categorizing Biometric Applications - Application Areas: Criminal and Citizen Identification, Surveillance, PC/Network Access, E-Commerce/Telephony and Retail/ATM - Costs to Deploy -Issues in Deployment- Biometric Standards

Recommended Text

1. Samir Nanavati, Michael Thieme, Raj Nanavati,(2003),Biometrics - Identity Verification in a Networked World, Wiley-dreamtech India Pvt Ltd, NewDelhi
2. John D. Woodward, Nicholas M. Orlans, Peter T. Higgins, Biometrics: the ultimate reference, DreamtechPress

Reference Books

Anil K Jain, Patrick Flynn, Arun A Ross, (2008), Handbook of Biometrics, Springer

Website and e-Learning Source

1. http://www.sans.org/reading-room/whitepapers/authentication/biometric-scanning/
2. http://www.biometrics.gov/documents/biointro.pdf
3. http://www.cse.unr.edu/~bebis/CS790Q/Lect/IntroBiometrics.pdf
4. http://www.planetbiometrics.com/creo_files/upload/article-files/btamvol1update.pdf
5. http://www.biometrics.gov/documents/biointro.pdf (Unit V: BiometricApplications)

Mapping with Programme Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Natural Language Processing**		
Elective - IV Theory	I Year & II Semester	Credit:3	438E2D

Objectives:

- To learn the fundamentals of natural language processing and to understand the role of CFG, semantics of sentences and pragmatics

Outcomes:

1.	Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language	K1, K2
2.	Identify various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parsing and semantic analysis	K2, K3
3.	Classify the text into an organized group using a set of handicraft linguistic rules with appropriate NLP processes and algorithms	K3, K4
4.	Analyze the system with various language analysis methods and interpret the results	K5
5.	Assess NLP systems, identify and suggest solutions for the shortcomings	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Introduction: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT-II:

Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rulebased, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models

UNIT-III:

Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures

UNIT-IV:

Semantics and Pragmatics: Requirements for representation, FirstOrder Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods

UNIT-V:

Discourse Analysis and Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC)

Recommended Text

1. Daniel Jurafsky, James H. Martin;Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech; Pearson Publication; 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python , First Edition, OReilly Media, 2009.

Reference Books

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java ,O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

Website and e-Learning Source

1. http://www.cse.iitb.ac.in/~pb/papers/nlp-iitb.pdf
2. https://www.nitk.ac.in/faculty/dr-sarika-jain
3. https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/what-is-natural-language-processing-nlp
4. https://www.sas.com/en_us/insights/analytics/what-is-natural-language-processing-nlp.html
5. https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	M	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S-Strong M-Medium L-Low

Title of the Paper	**Data Visualization**		
Elective - IV Theory	I Year & II Semester	Credit:3	438E2E

Objectives:

- Explore how to design and create data visualizations based on data available data modelling, data processing (such as aggregation and filtering)
- Mapping data attributes to graphical attributes
- To learn to evaluate the effectiveness of visualization designs, and think critically about each design decision
- To create their own data visualizations, and learn to use Python visualization tools.

Outcomes:

1.	Design and create data visualizations.	K1, K2
2.	Conduct exploratory data analysis using visualization.	K2, K3
3.	Craft visual presentations of data for effective communication.	K3, K4
4.	Use knowledge of perception and cognition to evaluate visualization design alternatives.	K4, K5
5.	Design and evaluate color palettes for visualization based on principles of perception.	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Unit I: INTRODUCTION TABLEAU

Introduction to Tableau: Advantages of Tableau Analytics Platform, Data Preparation Tableau workspace, Working with measures and dimensions. Data types - Data collection - Setting up a Data Connector - Selecting Data Tables – Joins – Unions - Data extracts and live connections - Editing the model's metadata.

Unit II: CREATING BASIC DATA VISUALIZATIONS

Creating Charts - Chart types -Bar Charts, Legends, Filters and Hierarchies - Line Charts - Highlight Tables - Heat Maps - Bullet Charts - Cumulative Sums with Waterfall Charts.

Unit III: CREATING ADVANCED DATA VISUALIZATIONS

Aggregate Functions - Calculated Fields - Aggregations in Calculated Fields - Text Operator - Data fields - Logical functions – Parameters - Types of calculations - Quick Table calculations - Level of detailed expression

Unit IV: CREATING MAPS

Creating Symbol Maps - Filled Maps - Density Maps - Map Layers - Maps embedded with Pie Charts.

Unit V: CREATING INTERACTIVE DASHBOARDS

Creating a Dashboard - Dashboard Title - Navigation Buttons - Dashboard Actions - Templates for visualizing Cloud data**.**

Learning Resources:

TEXT BOOK:

1. Claus O. Wilke, "Fundamentals of Data Visualization", O'Reilly, 2019.

REFERENCE BOOK:

1. Alexander Loth, "Visual Analytics with Tableau", Wiley, 2019.
2. Davy Cielen, Arno D. B. Meysman and Mohamed Ali, "Introducing Data Science",Manning Publications, 2016.
3. D J Patil, Hilary Mason & Mike Loukides, Ethics and Data Science, O' Reilly, 2018.

WEB REFERENCES:

1. https://www.tableau.com/sites/default/files/media/designinggreat-visualizations.pdf
2. https://flowingdata.com/2017/01/24/one-dataset-visualized-25-ways/
3. https://www.tableau.com/learn/tutorials/ondemand/gettingstarted?playlist=554268&signin=4bec05bc7a876b95af7722b08fff9224
4. https://public.tableau.com/en-us/s/resources

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	M	M	L	S	L	L
CO2	S	M	S	M	S	S	M	L	M	L
CO3	M	S	S	S	M	S	L	M	L	M
CO4	S	L	M	M	S	L	L	M	M	S
CO5	S	S	M	S	L	M	M	L	M	L

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Cloud Computing**		
Elective - IV Theory	I Year & II Semester	Credit:3	438E2F

Objectives:

- Gain knowledge on cloud computing, cloud services, architectures and applications.
- Enable the students to learn the basics of cloud computing with real time usage
- How to store and share, in and from cloud?

Outcomes:

1.	Understand the concepts of Cloud and its services	K1,K2
2.	Collaborate Cloud for Event & Project Management	K3,K4
3.	Analyze on cloud in Word Processing, Spread Sheets, Mail, Calendar, Database	K4,K5
4.	Analyze cloud in social networks	K5,K6
5.	Explore cloud storage and sharing	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT I:INTRODUCTION Cloud Computing Introduction, From, Collaboration to cloud, Working of cloud computing, pros and cons, benefits, developing cloud computing services, Cloud service development, discovering cloud services.

UNIT II:CLOUD COMPUTING FOR EVERYONE Centralizing email communications, cloud computing for community, collaborating on schedules, collaborating on group projects and events, cloud computing for corporation, mapping, schedules, managing projects, presenting on road.

UNIT III:USING CLOUD SERVICES Collaborating on calendars, Schedules and task management, exploring on line scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, spreadsheets, and databases.

UNIT IV:OUTSIDETHECLOUD Evaluating webmail services, evaluating instant messaging, Evaluating web conference tools, creating groups on social networks, Evaluating onlinegroupware, collaborating via blog sand wikis.

UNIT V:STORING AND SHARING Understanding cloud storage, evaluating on line file storage, exploring on-line book-marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web based desktops.

Text Books

Michael Miller, “Cloud Computing”, Pearson Education, New Delhi, 2009.

ReferenceBooks

Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata McGraw Hill Education Private Limited, 2009**.**

Related Online Contents

[MOOC,SWAYAM,NPTEL,Websitesetc.]
https://nptel.ac.in/courses/106/105/106105167/
https://www.tutorialspoint.com/cloud_computing/index.htm
https://www.javatpoint.com/cloud-computing-tutorial

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	S	M	S	M	S	M	M	M	S
CO2	M	S	M	S	S	S	M	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	M	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Title of the Paper	**Fundamentals of Human Rights**		
NME - I	I Year & II Semester	Credit:2	438S2A

Unit I: Introduction:

Meaning and Definitions of Human Rights – Characteristics and Importance of Human Rights – Evolution of Human Rights – Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights – International Covenants – Violations of Human Rights in the Contemporary Era.

Unit II:

Human Rights in India: Development of Human Rights in India – Constituent Assembly and Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.

Unit III:

Rights of Marginalized and other Disadvantaged People: Rights of Women – Rights of Children – Rights of Differently Abled – Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities – – Rights of Prisoners – Rights of Persons Living with HIVAIDS – Rights of LGBT.

Unit IV:

Human Rights Movements: Peasant Movements (Tebhaga and Telangana) – Scheduled Caste Movements (Mahar and Ad-Dharmi) – Scheduled Tribes Movements (Santhal and Munda) – Environmental Movements (Chipko and Narmada BachaoAndolan) – Social Reform Movements (Vaikom and Self Respect).

Unit V:

Redressal Mechanisms: Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions – National Commission for SCs – National Commission for STs – National Commission for Women – National Commission for Minorities – Characteristics and Objectives of Human Rights Education.

References

1. SudarshanamGankidi, Human Rights in India: Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
2. SatvinderJuss, Human Rights in India, Routledge, New Delhi, 2020.
3. Namita Gupta, Social Justice and Human Rights in India, Rawat Publications, Jaipur, 2021.
4. Mark Frezo, The Sociology of Human Rights, John Willy & Sons, U.K. 2014.
5. Chiranjivi J. Nirmal, Human Rights in India: Historical, Social and Political Perspectives, Oxford University Press, New York, 2000.
6. Dr. S. Mehartaj Begum, Human Rights in India: Issues and perspectives, APH Publishing Corporation, New Delhi, 2010.
7. Asha Kiran, The History of Human Rights, Mangalam Publications, Delhi, 2011.
8. Bani Borgohain, Human Rights, Kanishka Publishers & Distributors, New Delhi-2, 2007.
9. Jayant Chudhary, A Textbook of Human Rights, Wisdom Press, New Delhi, 2011.

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	M	S	S	S	S	M	S	S
CO2	S	S	S	M	S	S	S	S	S	S	M	S
CO3	S	M	S	S	M	S	M	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S	M	S
CO5	S	S	S	S	S	S	S	S	S	M	M	S

S – Strong, M – Medium, L - Low

Title of the Paper	**Web Technology and Advanced Java**		
Core - IX Theory	II Year & III Semester	Credit: 4	538C3A

Course Objectives

- To provide knowledge and abilities to develop web sites for the internet
- To provide basic design principles to present ideas, information, products, and services on websites
- To induce basic programming principles to the construction of websites
- To grasp the concepts on Java Beans, servlets, JSP
- To comprehend the connection between Relational Database and Java.

Course Outcomes

1.	Design user interactions on web pages	K1, K2
2.	Develop back-end website applications	K1, K2
3.	Develop adaptive content for multiple devices (cell phone, tablets, etc.) Ensure cross-platform optimization for mobile phones	K2, K3
4.	Application of java beans, Servlets, JSP for designing Web based applications	K4, K5
5.	Usage of JDBC connectivity and implementation of the concept to get desired results from database	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Unit – I: Introduction to Dynamic Web Content-Three-tier architecture-architecture for client-server applications-Introduction to HTML5-Structural Elements-Paving the Way for Web Applications:HTML5 forms-The HTML5 Canvas-Audio and VideoIntroduction to CSS-Advanced CSS with CSS3-.

Unit – II: Accessing CSS from JavaScript Exploring JavaScript-Expressions and Control Flow in JavaScript-JavaScript Functions, Objects, and Arrays - HTML DOM – Modules – Forms – Includes – AJAX – Views – Scopes – Services -Dependency Injection - Custom Directives

Unit – III: Introduction to CGI - Understanding Environment Variables - Disadvantages and Limitations of CGI - Servlet as an improved CGI - Servlet Fundamentals / API - What is a Web-Container - Servlet Life Cycle / Architecture - HTTP GET and POST Request Methods - Processing Html Forms - Init Parameters - State Management - Using HTTP Session - Cookies session tracking

Unit- IV: Java Beans: Introduction - Advantages of Beans – Introspection - The JavaBeans API - A Bean - JSP Architecture - JSP Standard / Implicit Objects - Request - Response - Out - config - Application - Session - Page - Page Context - exception - JSP Page Implementation

Class - JSP Basics & Syntax - JSP Directive Tags - Page Directive - Include Directive - Taglib Directive - JSP Action Tags- Forward Action Tag- Include Action Tag- JSP Script related Tags- Scriptlet Tag- Expression Tag- Declaration Tag - Using Java Beans from JSP - UseBeanTag - setProperty Tag- getProperty Tag

Unit – V

Network Programming: Working with URLs- Working with Sockets - Remote Method Invocation. Introduction to Database Management Systems - Tables, Rows, and Columns - Introduction to the SQL SELECT Statement - Inserting Rows - Updating and Deleting Existing Rows - Creating and Deleting Tables - Creating a New Database with JDBC - Scrollable Result Sets.

Text Books:

1. Java 6 Programming, Black Book, Dreamtech
2. Java Server Programming, Java EE6 (J2EE 1.6), Black Book, Dreamtech
3. Advanced Java Technology, By M.T. Savaliya, Dreamtech

Reference books :

1. Herbert Schildt, "Java the Complete Reference", 10th edition, McGraw Hill Publishing Company Ltd, New Delhi, 2017.

2. Tony Goddis, "Starting out with Java from Control Structures Through Objects" 6th Edition, Pearson Education Limited, 2016

3. Herbert Schildt, Dale Skrien, "Java Fundamentals – A Comprehensive Introduction", TMGH Publishing Company Ltd, New Delhi, 2013

4. John Dean, Raymond Dean, "Introduction to Programming with JAVA – A Problem Solving Approach", TMGH Publishing Company Ltd, New Delhi,2012.

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	*S*	S	M	*S*
CO2	S	S	S	S	S	S	S	S	*S*	L	M	*S*
CO3	S	S	M	S	S	S	S	S	*S*	M	M	*S*
CO4	M	S	M	M	S	S	S	S	S	M	S	S
CO5	S	M	M	S	M	L	L	L	L	M	M	L

S- Strong; M-Medium; L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Machine Learning**		
Core–X - Theory	II Year & III Semester	Credit: 4	538C3B

Objectives:

- To provide mathematical base for Machine learning
- To provide theoretical knowledge on setting hypothesis for pattern recognition.
- To impart Knowledge of machine learning techniques for data handling
- To provide the skill to evaluate the performance of algorithms and to provide solution for various real-world applications.
- To impart the knowledge of identifying similarities and differences in various patterns of data

Outcomes:

1.	Recognize the characteristics of machine learning strategies. Apply various supervised learning methods to appropriate problems.	K1, K2
2.	Identify and integrate more than one technique to enhance the performance of learning.	K2, K3
3.	Analyze the co-occurrence of data to find interesting frequent patterns.	K3, K4
4.	Preprocess the data before applying to any real-world problem and can evaluate its performance.	K4, K5
5.	Create probabilistic and unsupervised learning models for handling unknown pattern.	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Unit I: BASIC MATHEMATICS FOR MACHINE LEARNING: Regression Correlation and Regression, types of correlation – Pearson's, Spearman's correlations –Ordinary Least Squares, Fitting a regression line, logistic regression, Rank Correlation Partial and Multiple correlation-Multiple regression, multicollinearity. Gradient descent methods, Newton method, interior point methods, active set, proximity methods, accelerated gradient methods, coordinate descent, cutting planes, stochastic gradient descent. Discriminant analysis, Principal component analysis, Factor analysis, k means.

Unit II: INTRODUCTION TO MACHINE LEARNING: Introduction, Examples of various Learning Paradigms, Perspectives and Issues, Version Spaces, Finite and Infinite Hypothesis Spaces, PAC Learning, VC Dimension.

Unit III: SUPERVISED LEARNING ALGORITHMS Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees (CART), Regression: Linear Regression, Multiple Linear Regression, Logistic Regression. Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Nonlinear, Kernel Functions, K-Nearest Neighbors

Unit IV: ENSEMBLE LEARNING: Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: RandomForest Trees, Boosting: Adaboost, Stacking:

UNSUPERVISED LEARNING: Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self Organizing Map, Expectation Maximization, Gaussian Mixture Models, Principal Component Analysis (PCA), Locally Linear Embedding (LLE), Factor Analysis

Unit V: PROBABILISTIC LEARNING: Bayesian Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks, Mining Frequent Patterns: MACHINE LEARNING IN PRACTICE: Design, Analysis and Evaluation of Machine Learning Experiments, Other Issues: Handling imbalanced data sets

Recommended Texts:

1. EthemAlpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
2. MehryarMohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012.

Reference Books:

1. Tom Mitchell, "Machine Learning", McGraw Hill, 3 rd Edition,1997.
2. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014.
3. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", 2 nd Edition, CRC Press, 2015.
4. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
5. Jiawei Han and MichelineKambers and Jian Pei, "Data Mining –Concepts and Techniques", 3 rdEdition,Morgan Kaufman Publications, 2012.
6. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, "Mathematics for Machine Learning", Cambridge University Press, 2019.

Web References:

1. https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	S	M	S	M	L	M	S	L	L
CO 2	S	M	S	L	S	L	M	L	M	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	S	L	M	S	L	L	M	S	M	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Computer Networks**		
Core - XI Theory	II Year & III Semester	Credit: 3	538C3C

Objectives:

- To understand the importance of networking and the basic model followed in network design and to understand necessary approaches and techniques to build protection mechanisms in order to secure computer networks

Outcomes:

1.	Outline the concepts and fundamentals of data communication and computer networks	K1, K2
2.	Identify the usage and importance of layered model, network security and web security	K2, K3
3.	Classify the techniques based on required application	K3, K4
4.	Analyze the significant applications of protocols and layers used in data communication and networking	K4, K5
5.	Explain the functionality of various techniques and algorithms that works at different layers	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Uses of Computer Networks – Network Hardware – Line Configuration – Topology – Transmission Modes – **Reference Models:** OSI Reference Model – TCP/IP Reference Model – **Physical Layer:** Guided Transmission Media – Wireless Transmission – Communication Satellites – **Public Switched Telephone Network**: Local Loop – Multiplexing – Switching

UNIT-II:

Data Link Layer: Design Issues - Error Detection and Correction - **Network Layer :**Design Issues – **Routing Algorithms** : Shortest Path Routing – Distance Vector Routing – Link State Routing – Broadcast Routing – Multicast Routing – Congestion Control

UNIT-III:

Network Layer in the Internet: IP Addresses –**Transport Layer:** Elements of Transport Protocols: Addressing – Connection Establishment – Connection Release – **Application Layer:** Domain Name System – **Email:** Architecture andServices

UNIT-IV:

Network Security: Introduction to Cryptography - Symmetric - Key Cryptography - Asymmetric- key Cryptography – Security Services: Message Confidentiality - Message

Integrity - Message Authentication - Digital Signature - Entity Authentication – **Security in the Internet:** IPSecurity - SSL/TLS: SSL services - SSL Protocols -Firewalls

UNIT-V:

Security for Wireless Networks: Introduction – Protecting the wireless networks – Physical Security – Authentication and access control- **Smartphone Security:** Security Threats - Steps to smartphone security –**Websites and Web application Security:** Definition – Available Technologies - Threats - Strategies.

Case Study: To study recent Wi -Fi and Smartphone technologies

1. http://wndw.net/pdf/wndw3-en/ch09-security-for-wireless-networks.pdf (Unit V- Wireless NetworksSecurity)
2. https://www.fcc.gov/sites/default/files/smartphone_master_document.pdf (Unit V- Steps to smartphonesecurity)
3. https://www.csoonline.com/article/3241727/mobile-security/6-mobile-security-threats-you- should-take-seriously-in-2019.html (Unit V – SmartPhone SecurityThreats)
4. https://kgk.uni-obuda.hu/sites/default/files/12_Kadena.pdf (Unit V – SmartPhone SecurityThreats)
5. https://www.goodfirms.co/glossary/web-security/ (Unit V – Web Security)

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	L	S	M	L	M	L	L
CO2	S	S	M	L	M	L	M	L	M	S
CO3	S	S	L	M	S	S	L	M	L	M
CO4	M	L	S	M	M	L	S	L	M	S
CO5	S	S	L	S	L	M	L	M	M	L

S-Strong M-Medium L-Low

Title of the Paper	**Web Technology and Advanced Java Practical**		
Core – XII Practical	II Year & III Semester	Credit: 3	538C3D

COURSE OBJECTIVES:

- Learn how to create a program in java beans.
- Learn how to connect relational database to Java
- Develop the program using concepts servlets and JSP

Course Outcomes

1.	Implement Remote method invocations.	K1, K2
2.	Apply servlet in web applications	K2, K3
3.	Develop Servlets for creating Web based applications using JDBC.	K3, K4
4.	Develop JSP for creating Web based applications using JDBC.	K5
5.	Test java beans and session tracking	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

List of Experiments:

Use CSS where ever applicable

1. Create a simple calculator application that demonstrates the use of RMI. You are not required to create GUI.
2. Create Servlet That Prints Hello World.
3. Create Servlet That Prints Today's Date
4. Create Servlet for login page, if the username and password is correct then prints message "Hello username" else a message" login failed".
5. Create Servlet that uses cookies to store the number of times a user has visited the servlet.
6. Create a Servlet for demo of KBC game.
7. There will be continuous two or three pages with different MCQs. Each correct answer
8. carries Rs. 10000. At the end as per user's selection of answers total prize he won should be declared. User should not be allowed to backtrack.
9. Create a Servlet filter that calculates server's response time and add it to response when giving it back to client.
10. Create a jsp that prints hello world.

11. Create jsp that prints current date and time.
12. Create a jsp that add and subtract two numbers.
13. Create a jsp for login module.
14. Create a web page that prints 1 to 10 using JSTL
15. Create a custom JSP tag that prints current date and time. Use this tag into JSP page.

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	S	S	S	M	M
CO3	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Machine Learning Practical**		
Core–XIII - Practical	II Year & III Semester	Credit:3	538C3E

Objectives:

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.
- The programs can be implemented in either JAVA or Python.
- For Problems 1 to 6 and 10, programs are to be developed without using the builtin classes or APIs of Java/Python.
- Data sets can be taken from standard repositories

(https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Outcomes:

1.	Understand the implementation procedures for the machine learning algorithms.	K1, K2
2.	Design Java/Python programs for various Learning algorithms.	K2, K3
3.	Apply appropriate data sets to the Machine Learning algorithms.	K3, K4
4.	Identify and apply Machine Learning algorithms to solve real world problems.	K4, K5
5.	be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Recommended Texts:

1. Dr. Kamlesh Namdev, LAP LAMBERT ; Lab manual of Machine Learning: Machine Learning Practicals in Python; Academic Publishing; 2021

Reference Books:

1. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido Released October 2016 Publisher(s): O'Reilly Media, Inc. ISBN: 9781449369415

Web References:

1. https://www.youtube.com/watch?v=RnFGwxJwx-0

Mapping with Programme Outcomes:

Mapping with Programmers outcomes*										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	L	S	M	L	M	L	L
CO2	S	M	S	S	S	M	M	L	M	L
CO3	M	S	M	M	S	S	L	L	L	M
CO4	S	L	M	M	M	L	M	L	M	S
CO5	S	S	M	S	L	M	M	L	M	L

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Research Methodology**		
Elective – V Theory	II Year & III Semester	Credit: 3	538E3A

Objectives:

- To impart knowledge and skills required for research problem formulation, analysis, solutions, technical paper writing and drafting and filing patents

Outcomes:

1.	Understanding of research, IPR and patent fundamentals	K1, K2
2.	Identify the issues involved in research, IPR and patent filing	K2, K3
3.	Apply suitable instrumentation and sampling techniques for the research studies and recognize the framework for protecting IPR and process for obtaining patents	K4
4.	Analyze data, and interpret research findings using appropriate methods and importance of IPR and patent protection in promoting research and development	K4, K5
5.	Design and develop research reports, research proposals, academic papers and patents	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Research Methodology: Objectives and motivation of research - Types of research - Research approaches - Significance of research -Researchmethodsversesmethodology-Researchandscientificmethod-Importanceofresearchmethodology - Research process - Approaches of investigation of solutions for research problem, data collection, analysis,interpretation, necessaryinstrumentations- Criteria of good research.Definingthe researchproblem:Definitionof researchproblem- Problemformulation- Necessity of defining the problem - Technique involved in definingaproblem.

UNIT-II:

Literature Survey and Data Collection: Importance of literature survey - Sources of information - Assessment of quality of journals and articles -Information through internet. Effective literature studies approaches, analysis, plagiarism, and research ethics.Data-Preparing,Exploring,examining anddisplaying.

UNIT-III:

Research Analysis and Design: Meaning of research design - Need of research design - Different research designs - Basic principles ofexperimental design - Developing a research plan - Design of experimental set-up - Use of standards and codes.Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights andfindingsusingwrittenreportsandoralpresentation.

UNIT-IV:

Intellectual Property Rights: Nature of Intellectual Property: Patents, Designs, Trade and Copyright- Process of Patenting and Development:technological research, innovation, patenting, development- Role of WIPO and WTO in IPR establishments,RightofProperty,CommonrulesofIPRpractices,TypesandFeaturesofIPRAgreement,Trademark,Functions ofUNESCOinIPRmaintenance.

UNIT-V:

Patent Rights: Scope of Patent Rights- Licensing and transfer of technology- Patent information and databases-Geographical Indications -New Developments in IPR: Administration of Patent System, IPR of BiologicalSystems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs -Licenses, Licensing ofrelatedpatents,patentagents,Registrationofpatentagents.

Recommended Text

R.Ganesan,"ResearchMethodologyforEngineers",MIPPublishers,Chennai,2011.
CatherineJ.Holland,"Intellectualproperty:Patents,Trademarks,Copyrights,TradeSecrets",EntrepreneurPress,2007.

Reference Books

PeterS.Menell,MarkA.Lemley,RobertP.Merges,"IntellectualPropertyin theNewTechnological"Vol.IPerspectives,2021.
LauraR.Ford,"TheIntellectualPropertyofNations:SociologicalandHistoricalPerspectivesona
RatanKhananabis andSuvasisSaha,"ResearchMethodology",UniversitiesPress,Hyderabad,2015.
DavidHunt,LongNguyen,MatthewRodgers,"Patentsearching:tools&techniques",Wiley,2007.
RanjitKumar,2ndEdition,"ResearchMethodology:AStepbyStepGuideforbeginners"2010

Website and e-Learning Source

https://www.coursera.org/courses?query=research%20methodology
https://www.researchgate.net/topic/Research-Methodology
https://www.wto.org/english/tratop_e/trips_e/intel1_e.htm
https://www.isical.ac.in/~palash/research-methodology/RM-lec9.pdf
https://mrcet.com/downloads/digital_notes/CSE/Mtech/I%20Year/RESEARCH%20METHODLOGY.pdf

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	M	S	M	S	L	M	L	L
CO2	S	M	M	S	M	M	S	L	M	L
CO3	L	M	S	L	M	S	M	L	S	M
CO4	S	L	L	M	M	L	L	S	M	S
CO5	M	S	M	L	S	M	M	L	M	L

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Internet of Things**		
Elective – V Theory	II Year & III Semester	Credit: 3	538E3B

Objectives:

- AboutInternetofThingswherevariouscommunicatingentitiesarecontrolledandmanaged for decision making in the application domain.
- Enable students to learn the Architecture of IoT and IoT Technologies
- Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NodeMCU using Arduino IDE.

Outcomes:

1.	Understand about IoT, its Architecture and its Applications	K1,K2
2.	Understand basic electronics used in IoT &its role	K2,K3
3.	Develop applications with using Arduino IDE	K4
4.	Analyze about sensors and actuators	K5,K6
5.	Design IoT in real time applications using today's internet &wireless technologies	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT I: Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT– Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT

UNIT II: Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.

UNIT III: Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.

UNIT IV: Sensors and Actuators: Analog and Digital Sensors–Interfacing temperature sensor, ultrasoundSensor and infrared (IR)sensor with Arduino– Interfacing LED and Buzzer with Arduino.

UNIT V: Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak).

Text Books

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-OnApproach",2014. ISBN: 978-0996025515

2. Boris Adryan, Dominik Obermaier, Paul Fremantle, "The Technical Foundations of IoT", Artech Houser Publishers, 2017

Reference Books

1. Michael Margolis, "ArduinoCookbook",O"Reilly,2011
2. Marco Schwartz, "InternetofThingswithESP8266", Packt Publishing, 2016.
3. DhivyaBala, "ESP8266:StepbyStepTutorialforESP8266IoT, ArduinoNODEMCU Dev. Kit", 2018.

Related Online Contents

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Title of the Paper	**Trends in Computing**		
Elective – V Theory	II Year & III Semester	Credit: 3	538E3C

Objectives:

- To understand the concepts and infrastructure of cloud computing and its business applications.
- To understand the scope, design and model of gridcomputing
- Knowledge about the reduction of energy use, waste, and other environmental impactsof Information Technologysystems.

Outcomes:

1.	Outline the history, applications, benefits and limitations of Cloud, Grid and Green computing	K1, K2
2.	Describe the cloud infrastructure services, virtualization and determine how applications can be developed using cloud services	K2, K3
3.	Identify cloud storage providers, software components of grid, technologies applied in building a green system and various key sustainability in Green IT Trends	K4, K5
4.	Analyse the migrations and security concerns of cloud, different grid models, resources and also identify how the distributed computing environments can be built from lower level services	K5, K6
5.	Assess the business cases of cloud, and also various laws, approaches and protocols for regulating green IT	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Cloud Computing: Basics: Overview – Applications – Intranets and the Cloud – First Movers in the Cloud – Organization and Cloud Computing: Benefits – Limitations – Security Concerns- The Business Case for Going to the Cloud: Cloud Computing Services -DeletingDatacenter.

UNIT-II:

Hardware and Infrastructure: Clients – Security – Network –Services- Accessing the Cloud: Platforms - Cloud Storage: Overview – Cloud Storage Providers.

UNIT-III:

Developing Applications: Google – Microsoft - Local Cloud and Thin Clients: Virtualization – Server Solutions – Thin Clients – Migrating to the Cloud.

UNIT-IV:

Grid Computing: Introduction - Benefits – Grid Terms and Concepts: Types of Resources – Jobs and Applications –Scheduling, Reservation and Scavenging – Grid Software Components – Grid user role: User Perspective – Administrator Perspective - Design: Building gridarchitecture - Models – Topologies – Phases andActivities.

UNIT-V:

Green Computing: Introduction - History of Green Computing - Regulations and Industry Initiative - The Demons behind Green Computing - Approaches to Green Computing - Role of IT vendors - Green Computing Tips - Future isGreen.

Recommended Text

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing - A practical Approach" , McGraw Hill,2010.
2. Bart Jacob, Michael Brown, Kentaro Fukui, and NiharTrivedi, "Introduction to Grid Computing" ,IBM Redbook,2005.

Reference Books

1. George Reese, "Cloud Application Architectures: Building Applications and Infrastructures in the cloud", O"Reilly Media Inc.,2009.
2. Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, "Cloud Computing for Dummies ", Wiley India Pvt Ltd,2009.
3. J. Velete, Anthony T. Velete, Robert Elsenpeter, "Green IT – Reduce Your Information System"sEnvironmentalImpactWhileAddingtotheBottomLine",McGraw-Hill,2008.
4. Bud E. Smith ," Green Computing: Tools and Techniques for Saving Energy, Money, and Resources", Auerbach Publications ,2013.

Website and e-Learning Source

1. http://www.siteground.com/tutorials/cloud/cloud_computing_infrastructure.htm
2. http://thecloudtutorial.com/
3. http://studymafia.org/wp-content/uploads/2015/11/CSE-Green-Computing-Report.pdf
4. http://www.znu.ac.ir/data/members/dastjerdi_mohammad/Book11.pdf (Unit IV)
5. http://www.cs.kent.edu/~farrell/grid06/lectures/grid01.pdf (UnitV)

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	S	S	S	S	M
CO2	S	S	S	M	S	S	S	S	S	S
CO3	S	M	S	S	M	S	M	S	S	M
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	S	S	M

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Linux and Shell Programming**		
NME - II	II Year & III Semester	Credit:2	538S3A

Objectives:

- To teach principles of operating system including File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking Commands, Basic Linux commands, Scripts and filters.
- To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
- To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's).
- To facilitate students in understanding Inter process communication.
- To facilitate students in understanding semaphore and shared memory.

Outcomes:

1.	Ability to use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.	K1, K2
2.	Ability to write Shell Programming using Linux commands.	K2, K3
3.	Ability to design and write application to manipulate internal kernel level Linux File System.	K3, K4
4.	Ability to develop IPC-API's that can be used to control various processes for synchronization.	K4, K5
5.	Ability to develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT – I

INTRODUCTION TO LINUX AND LINUX UTILITIES: A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

UNIT - II

Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization. Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT - III

Grep: Operation, grep Family, Searching for File Content. Sed:Scripts, Operation, Addresses, commands, Applications, grep and sed. UNIX FILE STRUCTURE: Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and device drivers. File Management:File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT – IV

PROCESS AND SIGNALS: Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks.

UNIT - V

INTER PROCESS COMMUNICATION: Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands. INTRODUCTION TO SOCKETS: Socket, socket connections - socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications.

TEXT BOOKS:

1. W. Richard. Stevens (2005), Advanced Programming in the UNIX Environment, 3rd edition, Pearson Education, New Delhi, India.
2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson

REFERENCES:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX Network Programming, W.R. Stevens, PHI. UNIX for Programmers and Users, 3rd Edition, Graham Glass, King Ables, Pearson Education

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Computer Vision**		
Core - XIV Theory	II Year & IV Semester	Credit:4	538C4A

Objectives:

- Understanding the Basics of Computer Vision.
- Acquiring skills to develop computer vision-based applications. To introduce students the fundamentals of image formation
- To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition
- To develop an appreciation for various issues in the design of computer vision and object recognition systems
- To provide the student with programming experience from implementing computer vision and object recognition applications

Outcomes:

1.	Ability to understand the computer vision pipeline. Ability to build solutions using computer vision algorithms.	K1, K2
2.	Identify basic concepts, terminology, theories, models and methods in the field of computer vision	K2, K3
3.	Describe known principles of human visual system	K4
4.	Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition	K4, K5
5.	Suggest a design of a computer vision system for a specific problem	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Unit I: Cameras - Pinhole Cameras - Cameras with Lenses - The Human Eye - Sensing Geometric Camera Models - Elements of Analytical Euclidean Geometry - Camera Parameters & Perspective projection - Affine Cameras and Affine Projection equations

Unit II: Geometric Camera Calibration - Least squares parameter estimation - A Linear Approach to Camera Calibration - Taking Radial Distortion into Account - Analytical Photogrammetry - Radiometry - Light in Space - Light at Surfaces -

Unit III: Sources, Shadows and shading - Qualitative Radiometry - Sources and Their Effects - Local Shading Model - Color- The Physics of Color - Human Color Perception - Representing Color - Surface Color from Image Color

Unit IV: Linear filters - Convolution - Shift Invariant Linear Systems - Spatial Frequency and Fourier Transforms- Sampling and Aliasing - Scale and Image Pyramids

Unit V: Edge detection - Noise - Detecting Edges - Texture - Representing Texture - Analysis (and Synthesis) Using Oriented Pyramids - Synthesizing Textures for Rendering - Shape from Texture for Planes

Recommended Texts:

1. D. Forsyth and J. Ponce; Computer Vision - A modern approach; Pearson India;2015

Reference Books:

1. Richard Szeliksy "Computer Vision: Algorithms and Applications" (http://szeliski.org/Book/)
2. Haralick& Shapiro, "Computer and Robot Vision", Vol II
3. G_erardMedioni and Sing Bing Kang "Emerging topics in computer vision" 4. Emanuele Trucco and AllessandroVerri "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
5. Olivier Faugeras, "Three-Dimensional Computer Vision", The MIT Press, 1993

Web References:

1. https://www.youtube.com/watch?v=3LaVxEX3F0o&list=PLwdnzlV3ogoVsma5G mBSsgJM6gHv1QoAo

Mapping with Programme Outcomes:

CO1	M	S	M	S	M	S	L	M	L	L
CO2	S	M	M	S	M	M	S	L	M	L
CO3	L	M	S	L	M	S	M	L	S	M
CO4	S	L	L	M	M	L	L	S	M	S
CO5	M	S	M	L	S	M	M	L	M	L

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Project with Viva voce**		
Core–XV - Project	II Year & IV Semester	Credit: 14	538C4B

Objectives:

- To make the project an extended piece of individual work.
- To work on a topic that interests the student
- To have regular meetings with their supervisor and/or external project provider to discussprogress
- To produce dissertations that contain some element of original work.
- To encourage and reward individual inventiveness and application of effort

Outcomes:

1.	Plan, schedule, monitor and control their own work;	K1,K2
2.	Defend their ideas in discussions and presentations;	K2,K3
3.	Use libraries and other information resources;	K4,K5
4.	Apply tools and techniques from taught courses	K5
5.	Communicate their findings through a written report.	K5,K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Project: The project work is to be carried out either in a software industry or in an academic institution for the entire semester and the report of work done is to be submitted to the University.

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	M	S	S	M	L	M	L	S
CO2	S	M	S	L	M	L	M	L	M	S
CO3	S	S	L	M	S	S	L	M	L	M
CO4	M	L	S	M	M	L	S	L	M	S
CO5	S	S	M	S	L	M	L	M	S	L

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Intelligent Systems**		
Elective–VI	II Year & IV Semester	Credit: 3	538E4A

Objectives:

- To acquire knowledge on various intelligent system techniques and methodologies and to have enriched knowledge on Knowledge representation, problem solving, and learning methods in solving particular engineering problems.

Outcomes:

1.	Outline the applicability, strength and weakness of artificial intelligence in solving computational problems	K1, K2
2.	Demonstrate the role of knowledge representation, problem solving and learning in Intelligent-system engineering	K2, K3
3.	Identify the characteristics of AI, Knowledge representation, Experts systems and its variants with ANN and robotics.	K3, K4
4.	Analyze a comprehensive background in both software and hardware to work with the future of robotics and adaptive systems	K4, K5
5.	Assess the scientific background through various real time examples	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Artificial Intelligence: AI problems-AI technique-**Problem Search:**-Production Systems – Problem Characteristics – Production system characteristics- **Heuristic Search techniques**: Generate and Test – Hill Climbing – Constraint Satisfaction, Means-end analysis

UNIT-II:

Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations –-Frame problem –. **Using Predicate Logic**: Representing simple facts in logic - Representing Instance and ISA relationships – Computable functions and predicates – Resolution

UNIT-III:

Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge. **Knowledge representation summary**: Syntactic and Semantic spectrum of representation-Logic and slot – and-filler structures-Other representational techniques

UNIT-IV:

Rule-based expert systems: Introduction- Rules as a knowledge representation technique-players- Structure- Forward chaining and backward chaining inference techniques- **Fuzzy expert systems**: Introduction- Fuzzy sets- Linguistic variables and hedges- Operations - Fuzzy rules- - Building a fuzzy expert system

UNIT-V:

Artificial neural networks: Neuron- perceptron- Multilayer neural networks- - The Hopfield network- **Robotics**: Introduction-Robot hardware-Perception-Moving-Robotic software architecture.

Recommended Text

1. Elaine rich and Kelvin Knight, "Artificial Intelligence ", Tata McGraw hill Publication, 3ndEdition, 2009. [Unit -I,II,III]
   UnitI : Chapters 1, 2, 3
   Unit II : Chapters 4, 5
   Unit III : Chapters 6, 11
2. Artificial Intelligence: A Guide to Intelligent Systems, 3rd edition, Michael Negnevitsky, Addison Wesley, 2011.[Unit IV-Chapter 1,2,4,V-Chapter6]
3. Artificial Intelligence a modern Approach "– Stuart Russell & Peter Norvig, 3rd Edition Pearson Education[Unit V-Chapter25-Robotics]

Reference Books

1. "Artificial Intelligence a modern Approach "– Stuart Russell & Peter Norvig, 3rdEdition, PearsonEducation.
2. "Artificial Intelligence ", George F Luger , 4thEdition , Pearsons Education Publ,2002.
3. "Foundations of Artificial Intelligent And Expert Systems", V S Janaki Raman, KSarukesi, P Gopalakrishnan, Macmillan IndiaLimited

Website and e-Learning Source

1. https://www.techopedia.com/definition/190/artificial-intelligence-ai
2. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligent_systems.htm
3. https://data-flair.training/blogs/heuristic-search-ai/
4. http://teaching.csse.uwa.edu.au/units/CITS7212/Lectures/Students/Fuzzy.pdf

http://engineering.nyu.edu/mechatronics/smart/pdf/Intro2Robotics.pdf

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	S	M	S	M	L	M	S	L	L
CO 2	S	M	S	L	S	L	M	L	M	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	S	L	M	S	L	L	M	S	M	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Introduction To Robotics**		
Elective–VI	II Year & IV Semester	Credit: 3	538E4B

Objectives:

- To introduce students to fundamental components, functionality of Robotic systems and to provide knowledge in the design and development challenges in the field of robotics.

Outcomes:

1.	Outline the anatomy, specifications and applicability of Robotic system	K1
2.	Demonstrate the role of kinematics and dynamic behavior of robots with programming techniques	K2
3.	Identify the characteristics and functionality of robots in various sectors.	K3,K4
4.	Analyze the various functionality of robotic systems with respect to software and hardware components	K4,K5
5.	Assess the scientific background of robotic systems through various real time examples	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I:

Introduction-Definition of Automation-Mechanization Vs Automation-Advantages-Goals-Social Issues-Types-Current Emphasis in Automation-Issues in automation in Factory Operations-Strategies of Automation

UNIT-II:

Introduction -History of Robots- Definition- Laws of Robotics-Characteristics-Components-Comparison of the Human and the Robot Manipulator-Robot Wrist and End of Arm Tools-Robot Terminology-Robotic Joints-Classification-Selection-Workcell-Robotics and Machine Vision-Applications

UNIT-III:

Robot Components: **Sensors**: Exteroceptors Sensors -Tactile Sensors -Proximity Sensors-Range Sensors-Machine Vision Sensors-Velocity Sensors-Proprioceptors-Robots with sensors-- **End Effectors**: Grippers-selection of grippers-Gripping mechanism- tools-Types of Grippers-**Drives**: Pneumatic, Hydraulic, Electric Actuators

UNIT-IV:

Transformations: Introduction to Manipulator Kinematics -Homogeneous Transformations-Robot Kinematics-Manipulator Path Control-Robot Dynamics- **Robot Programming Techniques**: Online programming- Lead-through Programming-Offline Programming-Task Level Programming-Motion Programming-Robot Programming Languages-Robot languages and its types

UNIT-V:

Applications of Robots: Robot Capabilities-Application of Robots-Manufacturing Applications-

Material handling applications **Robotics and Artificial Intelligence:** Vision-Voice communication-Planning-Modelling-Adaptive control-Error monitoring and recovery-Autonomy and intelligence in robots-Expert systems in robotics

Recommended Text

1. Gupta.A.K, Arora. S. K., Industrial Automation and Robotics, Mercury Learning and Information, 2017(Unit I,II ,III,IV,V)
2. Mikell P Groover, "Industrial Robotics", Mc GrawHill, 2012.(Unit III: Drives :Fundamentals of Robot technology -Robot Drive systems, Unit IV: Transformations)
3. D.J.Todd, "Fundamentals of Robot Technology", An Introduction to Industrial Robots, Teleoperators and Robot Vehicles, Wiley,1986.(Unit V:Robotics and Artificial Intelligence)

Reference Books

1. Thomas. K. Rufuss, "Robotics and Automation Handbook", CRC Press, 2018
2. Ghoyal.K., Deepak Bhandari, "Automation and Robotics", S.K.Kataria& Sons Publishers, 2012.
3. John.J. Craig, "Introduction to Robotics: Mechanics and Control", Pearson, 2018.
4. Gonzalez, Fu Lee, Robotics: Control, Sensing, Vision and Intelligence, Wiley, 1998

Website and e-Learning Source

1. https://builtin.com/robotics
2. https://www.elprocus.com/robot-sensor/
3. https://sp-automation.co.uk/the-top-seven-types-of-robots/
4. https://robots.ieee.org/learn/types-of-robots/
5. https://www.intel.in/content/www/in/en/robotics/types-and-applicationsMapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	S	M	M	S	M	L	S	S	L	M
CO 2	S	M	S	L	S	L	M	L	M	S
CO 3	M	S	L	M	M	S	L	S	L	S
CO 4	L	S	S	L	S	M	S	L	S	M
CO 5	S	L	M	S	L	L	M	S	M	S

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Virtual And Augmented Reality**		
Elective–VI	II Year & IV Semester	Credit: 3	538E4C

Objectives:

- To provide knowledge on basic principles of virtual & augmented reality and have the ability to use its technology as a platform for real-world applications.

Outcomes:

1.	Outline the basic terminologies, techniques and applications of VR and AR	K1, K2
2.	Describe different architectures and principles of VR and AR systems	K2, K3
3.	Use suitable hardware and software technologies for different varieties of virtual and augmented reality applications	K3, K4
4.	Analyze and explain the behavior of VR and AR technology relates to human perception and cognition	K4, K5
5.	Assess the importance of VR/AR content and interactions to implement for the real-world problem	K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT-I :

Virtual Reality: The Three I's of VR – History – Early commercial VR Technology – Components of a VR System –**Input Devices:** Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces

UNIT-II :

Output Devices: Graphics Displays – Sound Displays – Haptic Feedback - **Computer Architecture for VR:** The Rendering Pipeline- PC Graphics Architecture - **VR Programming:** Toolkits and Scene Graphs – Traditional and Emerging Applications of VR

UNIT-III :

Augmented Reality: Introduction – **Augmented Reality Concepts:** Working Principle of AR – Concepts related to AR- Ingredients of an Augmented Reality Experience

UNIT-IV :

Augmented Reality Hardware– Augmented Reality Software– Software to create content for AR Application – Tools and Technologies

UNIT-V:

Augmented Reality Content: Introduction- Creating Content for Visual, Audio, and other senses – Interaction in AR - **Mobile Augmented Reality:** Introduction – Augmented Reality Applications Areas- Collaborative Augmented Reality

Recommended Text

1. Grigore C. Burdea and Philippe Coiffet, "Virtual Reality Technology", Wiley Student Edition, Second Edition (Unit I: Chapter 1,2 & Unit II: Chapter 3,4,6,8 & 9)
2. Alan B. Craig(2013), "Understanding Augmented Reality: Concepts and Applications"(Unit III: Chapter 1, 2, Unit IV : Chapter 3, 4 & Unit V: Chapter 5,6,8)
3. Jon Peddie (2017), "Augmented Reality: Where We Will All Live", Springer, Ist Edition (Unit IV: Chapter 7 (Tools & Technologies)

Reference Books

1. Alan Craig & William R. Sherman & Jeffrey D. Will, Morgan Kaufmann(2009), "Developing Virtual Reality Applications: Foundations of Effective Design", Elsevier(Morgan Kaufmann Publishers)
2. Paul Mealy (2018), "Virtual and Augmented Reality",Wiley
3. Bruno Arnaldi & Pascal Guitton & Guillaume Moreau(2018), "Virtual Reality and Augmented Reality: Myths and Realities", Wiley

Website and e-Learning Source

1. Manivannan, M., (2018), "Virtual Reality Engineering," IIT Madras, https://nptel.ac.in/courses/121106013
2. Dube, A., (2020), "Augmented Reality - Fundamentals and Development," NPTEL Special Lecture Series, https://www.youtube.com/watch?v=MGuSTAqlZ9Q
3. http://msl.cs.uiuc.edu/vr/
4. http://www.britannica.com/technology/virtual reality/Living-in -virtual-worlds
5. https://mobidev.biz/blog/augmented-reality-development-guideMapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	L	S	M	L	M	L	L
CO2	S	M	S	S	S	M	M	L	M	L
CO3	M	S	M	M	S	S	L	L	L	M
CO4	S	L	M	M	M	L	M	L	M	S
CO5	S	S	M	S	L	M	M	L	M	L

S-Strong M-Medium L-Low

UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**UML Practical**		
Skill Enhancement/ Professional Competency Skill	II Year & IV Semester	Credit:2	538S4A

Objectives:

- To capture the requirements specification for an intended software system
- To draw the UML diagrams for the given specification
- To map the design properly to code
- To test the software system thoroughly for all scenarios
- To improve the design by applying appropriate design patterns.

Outcomes:

1.	Identify use cases and develop the Use Case model.	K1
2.	Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.	K2
3.	Using the identified scenarios, find the interaction between objects and represent them	K3, K4
4.	Using UML Sequence and Collaboration Diagrams and Draw relevant State Chart and Activity Diagrams for the same system.	K5, K6
5.	Implement the modified system and test it for various scenarios	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

SUGGESTED DOMAINS:

1. Passport automation system.
2. Book bank
3. Exam registration
4. Stock maintenance system.
5. Online course reservation system
6. Airline/Railway reservation system
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference management system
13. BPO management system
14. Library management system
15. Student information system

Title of the Paper	**Documentation and Interview skills for Software Engineers**		
Skill Enhancement/ Professional Competency Skill	II Year & IV Semester	Credit:2	538S4B

Objectives:

- Ensure that you understand what the job involves, and that you have the necessary skills
- Make sure you do want to work for the company
- Check that the philosophy/values of the company match your personal requirements
- Find out more about the job, training, career structure etc.

Outcomes:

1.	Understand the purpose of interviews	K1
2.	Be aware of the processes involved in different types of interviews	K2
3.	Know how to prepare for interview	K3, K4
4.	Be clear about the importance of self-presentation	K5, K6
5.	Be clear about the importance of documentation	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

Unit 1: Job Interviews: The Gateway to the Job Market

Types of Interviews - Groundwork Before the Interview - Abide by the Dress Code - Importance of Body Language in Interviews - Need for Proper Articulation - **Probable Interview Questions**: Tell Us about Yourself - Would You Call Yourself a Team Player? - **Few Tricky Questions and Possible Answers:**Why Should We Employ You? - Do You Have Off ers from Other Companies? - What Salary are You Expecting? - How Much do You ink You are Worth? - What Kind of a Culture are You Comfortable with? - What is More Important to You—Salary or Growth Opportunities? - What do You Know about Our Company? - Tell Us about Your Strengths and Weaknesses - Where do You See Yourself in 5 or 10 Years? - What are Your Plans for Higher Studies? - When Leading a Team, How

Will You Motivate Your Team Members and Resolve Any Differences between them? - What Has Been the Biggest Challenge You Have Faced, and How Did You Handle It? - What Do You ink are the Essential Qualities of a Good Employee? - You Claim to be Computer-savvy. Can You Mention Any Innovative Way to Enhance the Sales of the Company Using Your Computer Knowledge and Skills? — Concluding an Interview - Telephonic or Video Interview—A Growing Trend - Disadvantages of Telephonic or Video Interview - **A Mock Interview:** Why did the Interview Team Select Vikram? - Why did the Interview Team not Select Chandra and Amit?

Unit 2:Body Language: Reveals Your Inner Self and Personality

Emotions Displayed by Body Language: Aggressive - Submissive - Attentive - Nervous - Upset - Bored - Relaxed - Power - Defensive—Handshake—The Most Common Body Language—Eyes— A Powerful Reflection of One's Inner Self —Entry to My Space— Personal Zones May

Vary: Intimate Zone - Personal Zone - Social Zone - Public Zone - Typical Body Language when Zones are Intruded — Body Language Exhibited During Different Professional Interactions - Interview - Manager's Discussions with a Subordinate Employee - Discussions with Supervisor - Presentation to a Large Audience - Group Discussions - Video-conference

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Unit 3: Enhance Your Writing Skill to Create an Impression

Fifteen Principles to Increase Clarity of Communication - Use Short, Simple and Clear Words - Use Short Sentences - Do not Cram Di erent Points into One Sentence - Using Compact Substitutes for Wordy Phrases - Remove Redundant Words and Expressions - Avoid Use of Mixed Metaphors - Avoid Hackneyed and Stilted Phrases - Avoid Verbosity in the Use of Common Prepositions - Do not Twist the Word Order - Present Similar Ideas in a Sentence with Same Structural and Grammatical Form - Make Positive Statements Without Being Hesitant or Non-committal - e Statements Without Being Hesitant or Non committal - Avoid Pompous Words and Phrases - Use Active Instead of Passive Voice - Ensure Correct Spelling and Grammar in the Text - Substitute Easily-understood Words for Words Imported from Other Fields - Edit-Edit-Edit - The Reader's Perspective - Clarity of Thought - Clarity of Text - Example of Poorly and Well-written Texts

Unit 4: Fog Index: Provides Guidance for Proper Writing

Fog Index or Clarity Index -Examples of Passages with High and LowFog Index - Infogineering Clarity Rating - Flesch Kincaid Reading Ease Index - Other Readability Indices - Checking Grammar, Spelling and Voice - Clarity of Verbal Communication - Case 1 - Case 2

Recommended Texts:

1. Personality Development and SOFT SKILLS, BARUN K. MITRA, Oxford University Press

Reference Books:

1. **C**ommunicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

Web References:

1. http://www.mindtools.com
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

Mapping with Programme Outcomes:

CO1	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO2	L	L	M	S	M	S	L	S	S	M
CO3	S	M	L	M	L	L	M	S	M	S
CO4	M	S	S	L	M	S	L	M	S	M
CO5	S	L	S	M	S	L	L	M	M	S

S-Strong M-Medium L-Low