UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Digital Image Processing**		
Core–XIV - Theory	II Year & IV Semester	Credit: 4	536C4A

Objectives:

To become familiar with digital image fundamentals
To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
To learn concepts of degradation function and restoration techniques.
To study the image segmentation and representation techniques.
To become familiar with image compression and recognition methods

Outcomes:

1.	Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.	K1, K2
2.	Operate on images using the techniques of smoothing, sharpening and enhancement.	K2, K3
3.	Perform the restoration concepts and filtering techniques.	K4, K5
4.	Demonstrate the segmentation, features extraction, compression and recognition methods for color models.	K5
5.	Compress images and use tools for image recognition.	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT I DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II IMAGE ENHANCEMENT: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

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UNIT IV IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Recommended Texts:

1. Rafael C. Gonzalez, Richard E. Woods; Digital Image Processing; Pearson, Fourth Edition;2018.
2. Anil K. Jain; Fundamentals of Digital Image Processing; Pearson;2015.

Reference Books:

1. Kenneth R. Castleman, Digital Image Processing ‘, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,; Digital Image Processing using MATLAB ; Pearson Education, Inc., 2011.
3. D E. Dudgeon and RM. Mersereau; Multidimensional Digital Signal Processing; Prentice Hall; 1990.
4. William K. Pratt; Digital Image Processing ; John Wiley; 2002
5. Milan Sonka et al; Image processing, analysis and machine vision; Brookes/Cole, Vikas Publishing House; 2nd edition; 1999.

Web References:

1. https://www.youtube.com/watch?v=DSGHkvQBMbs&list=PLuv3GM6-gsE08DuaC6pFUvFaDZ7EnWGX8

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

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M.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Project with Viva Voce**		
Core–XV - Project	II Year & IV Semester	Credit: 14	536C4B

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

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M.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Block chain Technology**		
Elective –VI - Theory	II Year & IV Semester	Credit:3	536E4B

Objectives:

- Understand the fundamentals of block chain and cryptocurrency.
- Understand the influence and role of block chain in various other fields.
- Learn security features and its significance.
- Identify problems & challenges posed by Block Chain.

Outcomes:

1.	Demonstrate block chain technology and crypto currency	K1, K2
2.	Understand the mining mechanism in block chain	K2
3.	Apply and identify security measures, and various types of services that allow people to trade and transact with bitcoins	K3, K4
4.	Apply and analyze Block chain in health care industry	K5 ,K6
5.	Analyze security, privacy, and efficiency of a given Blockchain system	K5, K6
K1-Remember;K2-Understand;K3-Apply;K4-Analyze;K5-Evaluate; K6-Create		

UNIT I: Introduction to Blockchain - The big picture of the industry – size, growth, structure, players. Bitcoin versus Cryptocurrencies versus Blockchain - Distributed Ledger Technology (DLT). Strategic analysis of the space – Blockchain platforms, regulators, application providers. The major application: currency, identity, chain of custody.

UNIT II: Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Blockchain 1.0, 2.0 and 3.0 – transition, advancements and features. Privacy, Security issues in Blockchain.

UNIT III.Cryptocurrency - History, Distributed Ledger, Bitcoin protocols -Symmetric-key cryptography - Public-key cryptography - Digital Signatures -High and Low trust societies - Types of Trust model: Peer-to-Peer, Leviathan, and Intermediary. Application of Cryptography to Blockchain

UNIT IV: CryptocurrencyRegulation-Stakeholders,RootsofBitcoin,Legalviews-exchangeof cryptocurrency-BlackMarket-GlobalEconomy.Cyrptoeconomics– assets,supplyanddemand,inflationanddeflation – Regulation.

UNIT V: Opportunities and challenges in Block Chain – Application of block chain: Industry 4.0 – machinetomachinecommunication –Datamanagementinindustry4.0–futureprospects.Block chain in Health 4.0 - Blockchain properties - Healthcare Costs - Healthcare Quality - Healthcare Value - Challenges for using blockchain for healthcare data

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Text Books

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press (July 19, 2016).
2. Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”

Reference Books

1. Satoshi Nakamoto, “Bitcoin: A Peer-to-Peer Electronic Cash System”
2. Rodrigoda Rosa Righi, Antonio Marcos Alberti, Madhusudan Singh, “Blockchain Technology for Industry 4.0” Springer 2020.

Related Online Contents

1. https://www.javatpoint.com/blockchain-tutorial

2. https://www.tutorialspoint.com/blockchain/index.htm

3. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs01/

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	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

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