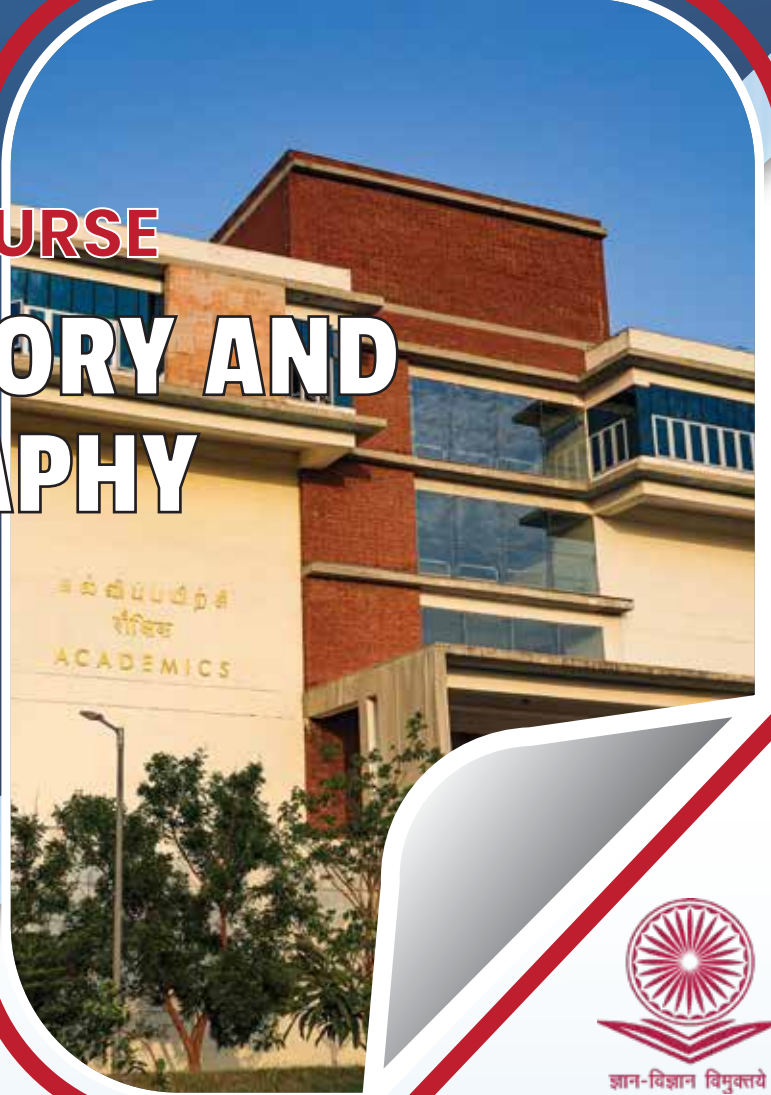




# REFRESHER COURSE

# GRAPH THEORY AND CRYPTOGRAPHY



**MMTTC**  
**IIITDM Kancheepuram**

**Online**

**19<sup>th</sup> to 31<sup>st</sup> March 2025**

## ABOUT THE PROGRAMME:

- This refresher course is designed to provide researchers and educators with the essential knowledge, resources, and teaching strategies needed to effectively teach the core concepts of graph theory and cryptography. Graph theory is a critical field within computer science and mathematics, with applications across diverse domains, including communication theory, artificial intelligence, engineering design optimization, and scientific simulations. It is also integral to monitoring and controlling manufacturing processes. Graph algorithms, such as the Eisner or Chu-Liu/Edmonds algorithms, are utilized to efficiently parse sentences and extract syntactic information, which plays a key role in natural language processing (NLP) systems, including AI applications like ChatGPT.
- Cryptography has significant real-world applications, particularly in securing communications and data transmission. It is essential for online banking, e-commerce, and secure messaging, and also contributes to coding theory by ensuring error detection and correction in digital communication.
- This course provides researchers and educators with an opportunity to refine their instructional methods, foster greater student engagement, and deepen their understanding of graph theory and cryptography. Participants will learn to create dynamic learning experiences that inspire mathematical excellence. Through interactive lectures, hands-on exercises, and collaborative discussions, participants will gain valuable insights and practical techniques for exploring and teaching these subjects effectively.

## BRIEF OBJECTIVES OF THE COURSE

- ◆ The course will cover the basics of (i) number theory concepts necessary for cryptography and (ii) graph theory such as graph representation, graph traversal, and graph algorithms.
- ◆ It will give a brief introduction to (i) symmetric and asymmetric cryptosystems, (ii) public key cryptography, (iii) information theory and (iv) the complexity of algorithms.
- ◆ The course will give interesting and fascinating topics on (i) factorization problems, (ii) discrete Logarithms, (ii) graph algorithms used in natural language processing (NLP), and (iii) applications of graph parameters in facility location problems.

## TOPICS TO BE COVERED

- Basics of number theory and cryptography.
- Diffie-Hellman Key exchange, ElGamal public key cryptosystem.
- The RSA public key cryptosystem and cryptanalysis.
- Elliptic curve public key cryptosystems and cryptanalysis.
- Digital signatures.
- Probability and information theory.
- Basics of graph theory and algorithms.
- Graph traversal algorithms, shortest path algorithms, and their applications.
- Maximum/minimum spanning tree algorithms such as (i) Chu-Liu/Edmonds algorithm, (ii) Prim's algorithm, and (iii) Kruskal's algorithm. We discuss their applications as well.
- Time and space complexity including NP-completeness and approximation algorithms.
- Theory of graph colouring, domination, and their applications in matrix compression and facility location problems.



Registration Fees:  
**NIL**

## REGISTRATION:

- ⇒ Register and login as a participant in [mmc.ugc.ac.in](http://mmc.ugc.ac.in).
- ⇒ In the dashboard click on "Apply for Other Programmes".
- ⇒ Select Apply for "Refresher Course" (Graph Theory and Cryptography and) from the dropdown select the Programme Name and Center Name as "Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram (19/03/2025 -31/03/2025)".
- ⇒ Choose the title from the dropdown menu and enter the remaining personal information including year of joining, total years of experience etc.
- ⇒ Upload the NOC on Institute/College/University letterhead as per the format provided [here](#).
- ⇒ Click on Submit to complete the registration process.

## RESOURCE PERSONS :

The course content will be delivered from a pool of resource persons leading prestigious academic institutions, research labs and industry.

### Coordinators:

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