

# 12-day program Refreshers Course on Heat and Mass Transfer - Basic and Advanced



**MMTTC  
IIITDM  
Kancheepuram**

**Date:  
10<sup>th</sup> March 2025 to  
22<sup>nd</sup> March 2025  
Online**

**Registration Fees:  
NIL**

## **Introduction to the program**

Heat and mass transfer are fundamental subjects in engineering, playing a crucial role in various industries such as energy, aerospace, manufacturing, and biomedical sciences. For young faculty members preparing to teach these subjects, a strong grasp of both basic and advanced concepts, along with effective teaching and assessment strategies, is essential. This refresher course is designed to enhance their understanding of key topics, including conduction, convection, radiation, and mass diffusion, while also introducing advanced areas like phase change phenomena, computational modeling, and emerging thermal technologies. Beyond theoretical knowledge, this program equips educators with structured lesson planning, active learning techniques, and assessment methodologies to create engaging and effective learning environments. Faculty will gain insights into modern pedagogical tools, such as simulations, computational tools (e.g., MATLAB, CFD), and virtual labs, enabling them to bridge the gap between theory and real-world applications. Additionally, the course emphasizes assessment strategies, including conceptual problem-solving, project-based learning, and rubric-based evaluations, ensuring that students develop both analytical and application-oriented skills. Through industry-based examples and research-oriented discussions, faculty will be better prepared to guide students in academic and professional pursuits. By the end of the course, participants will be well-equipped to deliver high-quality instruction, integrate interdisciplinary applications, and inspire the next generation of engineers and researchers in heat and mass transfer. This program serves as a comprehensive foundation for faculty development, ensuring that they can confidently teach, assess, and mentor students while keeping up with advancements in the field.

# 1

## Structuring Course Content and Lesson Planning

- ✎ This program will help faculty understand the logical flow of HMT topics, from fundamental principles (conduction, convection, radiation, and mass diffusion) to advanced applications (computational methods, phase change phenomena, and thermal system optimization).
- ✎ It will guide them in breaking down complex topics into smaller, more digestible modules to match students' learning levels.

# 2

## Effective Teaching Strategies

- ✎ The program introduces active learning techniques such as case studies, real-world problem-solving, flipped classrooms, and simulations to make lectures more interactive.
- ✎ Faculty will explore teaching aids like visualizations, experimental demonstrations, and computational tools (e.g., MATLAB, ANSYS, CFD) to enhance conceptual clarity.
- ✎ The use of multidisciplinary examples (e.g., heat exchangers in power plants, cooling techniques in electronics, biomedical heat transfer) will be emphasized to connect theory with real-world applications.

# 3

## Assessment and Student Evaluation Techniques

- ✎ The program will cover various assessment methodologies, including:
  - **Formative assessments:** Quizzes, class discussions, problem-solving assignments to provide ongoing feedback.
  - **Summative assessments:** Mid-term and final exams, project-based evaluations to measure conceptual understanding.
  - **Rubrics and grading strategies:** to ensure fairness and consistency in evaluating student performance.
- ✎ Faculty will also learn how to design open-ended questions, conceptual problems, and numerical case studies to test students' critical thinking and application skills rather than just theoretical memorization.

# 4

## Integrating Technology and Modern Pedagogical Tools

- ✎ The program will introduce faculty to e-learning platforms, virtual labs, and simulation-based learning to enhance online and hybrid teaching models.
- ✎ They will explore how to use data analytics to track student performance and identify areas needing improvement.
- ✎ Exposure to AI-powered tools for personalized learning experiences will be provided to make the subject more engaging for students.

# 5

## Industry-Relevant Curriculum and Research Opportunities

- ✎ The course will help faculty integrate industry-based problems and case studies into their teaching to enhance employability skills in students.
- ✎ Faculty will also gain insights into current research trends in heat and mass transfer, enabling them to guide students in projects, internships, and research initiatives.

## How This Program Will Help Young Faculty in Teaching and Assessment

This refresher program is designed to equip young faculty members with the necessary knowledge, skills, and strategies to effectively teach and assess the subject of Heat and Mass Transfer (HMT) at both basic and advanced levels. It provides a structured framework to help educators design their curriculum, deliver engaging lectures, implement assessment techniques, and ensure student learning outcomes are met.

In a nutshell, by the end of this program, young faculty members will be equipped with a strong conceptual foundation, innovative teaching techniques, and effective assessment strategies to deliver high-quality education in Heat and Mass Transfer. This will enable them to create engaging learning environments, improve student understanding, and ensure better academic outcomes, ultimately shaping the next generation of engineers and researchers.

### Course Content

- › Fundamentals of Fluid Mechanics
- › Conduction - Basic and Advanced
- › Basic Convection
- › Radiation - Basic and advanced
- › Mass Transfer - Basic and advanced
- › Forced Convection
- › Natural Convection
- › Boiling and Condensation
- › Design of Heat Exchangers
- › Inverse Heat Transfer
- › Microscale heat and mass transfer



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### 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” (Heat and Mass Transfer -Basic and Advanced) from the dropdown select the Programme Name and Center Name as “Indian Information of Information Technology, Design and Manufacturing, Kancheepuram (10/03/2025 -22/03/2025)”
- › 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.
- › Assessment will be there. Certificate and grade will be given accordingly.

### Coordinators:

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