



# Centre for Outreach and Digital Education Indian Institute of Technology Madras



IIT Madras CODE offers Certificate Program on  
**Operations and Supply Chain  
Analytics for Strategic Decision Making**

 [code.iitm.ac.in](http://code.iitm.ac.in)

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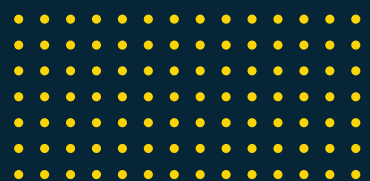
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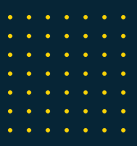
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# About the Course

Managers need to take critical and important decisions. These decisions need to be based on the information and data available. That makes data-driven decision-making skills the most critical in the organizations today. Decision Theory can aid managers build required framework to take optimal decisions. This theory encompasses important elements such as mathematical and empirical modelling. Today's world is characterized by uncertainty – uncertainty in the environment, in the data and hence in the results.

Hence, good understanding of uncertainty and its impact of the optimal decision making is critical. A good manager needs to be skilled in decision making under uncertainty. The program focuses on building these analytical skills (such as optimization, game theory, probability theory, statistical modelling, etc.).

Further, the program includes modules on applications of these analytical tools to day-to-day decisions that managers are required to take. For example, operations decisions such as inventory optimization, supply chain management, network design, logistics planning, services management can be analyzed mathematically. The same analytical tools are relevant in sectors such as healthcare management, agriculture, public policy, etc. The program includes cases from these industries.

## Learning outcome of this course:

Describe various methods of analytical modeling

Demonstrate the application of modeling to areas of supply chain management

Experiment with dynamic and stochastic nature of supply chain management

Formulate an operations and/or a supply chain problem as an analytical model and solve it using appropriate methodologies

Design an analytical decision-making tool for the supply chain configuration in specific industry and organization.



## Eligibility criteria

This program assumes basic understanding of mathematical and statistical concepts. Though there is no pre-requisite for any particular educational background, it is expected that the participants have interests in analytical model building and data-driven decision-making. The program focuses on building analytical foundations in the initial part of the program (module 1 and 2); and then takes a deep dive in various practical applications (in module 3). Hence, this program offers a comprehensive perspective on most of the operations and supply chain problems faced by industry today.

The program includes cases from these industries.

**Course fee: 1,00,000 + 18% GST**

## About IITM CODE

Established in 1986, the Centre for Continuing Education (CCE), now renamed as Center for Outreach and Digital Education (CODE), coordinates the out reach and online programs of IIT Madras. The centre's activities include coordinating the Web-enabled MTech programs; coordinating NPTEL and GIAN courses; coordinating IIT Madras' BS Degree programs; short-term skilling programs targeted towards Industry, Quality Improvement programs, meant for faculty in engineering institutions, support for conferences, book writing, etc. For more details, please refer: <https://code.iitm.ac.in/>

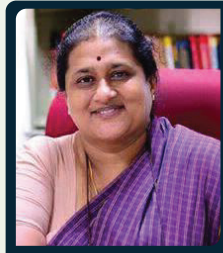
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**Prof. G. Srinivasan**  
Department of Management Studies,  
IIT Madras



**Prof. Usha Mohan**  
Department of Management Studies,  
IIT Madras



**Prof. Rahul Marathe**  
Department of Management Studies,  
IIT Madras

### About the Module

The module introduces the basic concepts such as optimization and game theory to the managers. These concepts are extensively used in subsequent modules. The module also introduces the fundamentals of probability and statistics. The entire module 2 (decision making under uncertainty) is based on these concepts. The difference between an optimal solution and an equilibrium is explained using a two-person game.

### Pre-requisites for the Module

Basic background in mathematics and logical thinking. Even though the basics of statistics are introduced in the module, a flair for empirical approaches will surely help.

### Learning Outcomes of the Module

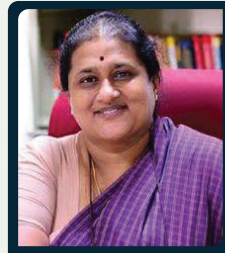
- Describe the basics of optimization
- Identify the decision variables, constraints and objectives of an optimization problem
- Solve basic problems in statistics
- Explain the concept of equilibrium in a multi agent setup.

### Applications of the Module

The analytical tools covered in this module are the most commonly used methods to solve basic analytical problems. Without a clear understanding of these tools and theory supporting these tools, it is difficult to appreciate nuances of the future concepts. These tools are the building blocks for any analytical model used in industry. It is strongly encouraged that the participants make themselves familiar with these tools and have a firm grasp of the implementation challenges.



**Prof. G. Srinivasan**  
Department of Management Studies,  
IIT Madras



**Prof. Usha Mohan**  
Department of Management Studies,  
IIT Madras



**Prof. Rahul Marathe**  
Department of Management Studies,  
IIT Madras

### About the Module

Two main challenges in any industry or an organization are decision making over time, and under uncertainty. Time dimension and uncertainty in decision making are the focus of this module. The various tools appropriate for incorporating time and uncertainty are discussed in this module. The necessary theoretical understanding is also built in, with the focus remaining on the application driven approach. Tools like simulation are discussed and their applications explained.

### Pre-requisites for the Module

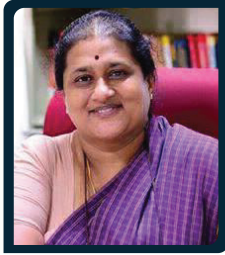
Fundamentals of optimization, statistics and probability. The participants should have solved basic formulations in optimization (linear, non-linear and integer programming). It is also expected that the participants are familiar with probability theory (probability distributions, descriptive and inferential statistics).

### Learning Outcomes of the Module

- Define the nature of uncertainty and apply the same in the analytical models
- Recognize the time based decision making and provision for the same
- Select appropriate probabilistic constraints in the formulations
- Built simulation model and analyze them theoretically

### Applications of the Module

We live in a VUCA - (Volatility, Uncertainty, Complexity and Ambiguity) - world. Every organization and industry, and even our personal lives are governed by uncertainty. Similarly, the longevity of our decisions need to be analyzed carefully – taking a decision for a situation further in time may be a complex process. Therefore, every manager must master the tools that help us consider the time dimension of our decisions. Similarly, volatility in the environment needs to be modeled – in the form of variables and constraints – in our model. The biggest takeaway from this module will be appreciating the importance of building robust models – that can stand the test of time and volatility.



**Prof. Usha Mohan**  
Department of Management Studies,  
IIT Madras



**Prof. G. Srinivasan**  
Department of Management Studies,  
IIT Madras



**Prof. Rahul Marathe**  
Department of Management Studies,  
IIT Madras

### About the Module

The analytical tools of optimization, game theory, statistics and simulation are theoretically flexible and generic so that they can be employed in a variety of situations, organizations, industries and economies. In this module, we demonstrate the applications of these analytical tools in various areas of decision making. We take cases from diverse industries such as manufacturing, services, airline, logistics and build analytical models that can support strategic decision making. The focus of this module is to prepare the participants to build analytical models on their own, by learning from these cases.

### Pre-requisites for the Module

It is expected that the participants are familiar with various analytical modeling tools (optimization, probability, game theory). They should have applied analytical models to some scenarios before coming to this module. They should have a functional understanding of the theoretical underpinning and limitations of the analytical tools so that appropriate tools can be applied correctly to a given situation. Module 1 and 2 of this program are designed so that the participants can build the required background for this module. However, the participants with the requisite skills can register for this module directly.

### Learning Outcomes of the Module

- Organize the domain specific elements in the analytical model
- Compare the models discussed in the module with your situation and make necessary changes
- Apply the building blocks discussed in the module to your organization and industry
- Critique various models for their applications across industries
- Appreciate the generality of the tools discussed and make the tools specific to your needs
- Build models that fit your situations.

### Applications of the Module

One of the most important skills as an analyst is to be able to convert business situations into mathematical models; and also to draw insightful conclusions from the mathematical models in the business language. This module discusses analytical models applied to various industries and encourages the participants to find suitable applications of the tools in their industries and organizations. The situations modeled in the module may not match exactly with the situations faced by the managers, but the objective of the module is to prepare the managers to be ready to build analytical models for rational strategic decision making in any situation, any function, any organization, and any industry.



### **Contact Us**

Centre for Outreach and Digital Education (CODE)

3rd Floor, IC & SR Building, IIT Madras, Chennai - 600 036.

Call : +91 (44) 2257 4900, +91 (44) 2257 4904 (Mon - Fri 9am - 6pm)

**For any queries write to us:**

✉ [anupama@nptel.iitm.ac.in](mailto:anupama@nptel.iitm.ac.in) | ✉ [jayabala@nptel.iitm.ac.in](mailto:jayabala@nptel.iitm.ac.in)