

**IIT Madras**  
ONLINE DEGREE

# Online BSc Degree and Diploma Program

## PROGRAMMING AND DATA SCIENCE

Batch 1: Starts January 2021

For latest updates, visit - [www.onlinedegree.iitm.ac.in](http://www.onlinedegree.iitm.ac.in)

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# Introduction

IIT Madras, India's top technical institute, welcomes you to the world's first online BSc Degree program in Programming and Data Science. For the first time, you can work towards an undergraduate degree / diploma from an IIT regardless of your age or location, and with a wide range of academic backgrounds.



“ IIT Madras is pioneering a completely online program to produce graduates who will be employable in the sector that presently has high demand - Programming and Data Science. The program uses an innovative combination of online learning and in-person assessment and is flexible and affordable. I believe the program will be a gamechanger in the field of education in India in the coming years and inspire other top-ranking institutions to launch many such online initiatives.

- Prof. Bhaskar Ramamurthi, Director, IIT Madras

## Why Programming & Data Science?

Decision making is increasingly becoming data driven within the commercial sector and the government. There is a large quantity of data readily available for this at present. Smart devices connected to the internet bring more input sources, apart from those generated by humans as they interact with services and one another. Data driven decision making involves the analysis of large volumes of data to identify patterns and build predictive models. This requires a combination of skills ranging from computing, statistics and mathematics, and is broadly labelled data science.

INCREASING DEMAND

BETTER JOB OPPORTUNITIES

UPSKILL

As formal academic programs in data science are only just emerging, there is a huge gap between the demand for data scientists and the supply of suitable qualified applicants in the job market. The throughput of traditional classroom programs is limited and will not be able to provide the numbers needed to meet the upcoming requirements. Online teaching has the potential to train much larger numbers, but delivering scale without diluting quality has proven to be a challenge until recently.

Our program therefore aims to create a thoroughly trained programmer, proficient in application development, data sciences and machine learning.



## About IIT Madras

Indian Institute of Technology Madras is one of the foremost institutes of national importance for higher technical education and research.

In 1956, the German Government offered technical assistance in establishing an institute of higher education in engineering in India. The first Indo-German agreement in Bonn, West Germany for the establishment of the Indian Institute of Technology at Madras was signed in 1959. The Institute with its campus in Chennai, previously known as Madras, was formally inaugurated in 1959 by Prof. Humayun Kabir, Union Minister for Scientific Research and Cultural Affairs.

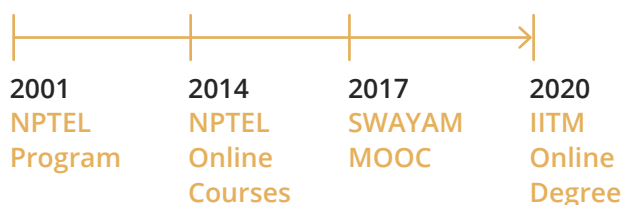
The Institute today has sixteen academic departments and several advanced research centres in various disciplines of engineering and pure sciences. A faculty of international repute, a brilliant student community, excellent technical & supporting staff and an effective administration have all contributed to the pre-eminent status of IIT Madras.

## Our Experience in Online Education

IITM is well-equipped to provide an online degree course. We have been ranked number 1 Engineering Institute for the past 5 years and we have been ranked number 1 Overall for the past 2 years by NIRF.

Furthermore, IITM began the NPTEL program, the country's first online content portal as an inter-IIT consortium project in 2001 and [npTEL.ac.in](http://npTEL.ac.in) is one of the largest online course portals in the world. In 2014, IITM also created NPTEL online courses - the country's first Massive Open Online Course (MOOC). Today, NPTEL is considered the largest MOOC provider in India.

MHRD launched the SWAYAM MOOC platform in 2017 and NPTEL has been the largest contributor to it. NPTEL also manages [swayam.gov.in](http://swayam.gov.in) - the national MOOCs portal, as well as the network of more than 3800 SWAYAM local chapter colleges. With IITM continuing to lead the NPTEL project, it makes them the perfect choice to offer an online degree program.



# Overall Structure

There are **THREE LEVELS** in our Online Degree program and to get a BSc Degree in Programming and Data Science from IIT Madras, a learner has to successfully complete all three levels.






## 1. FOUNDATIONAL LEVEL

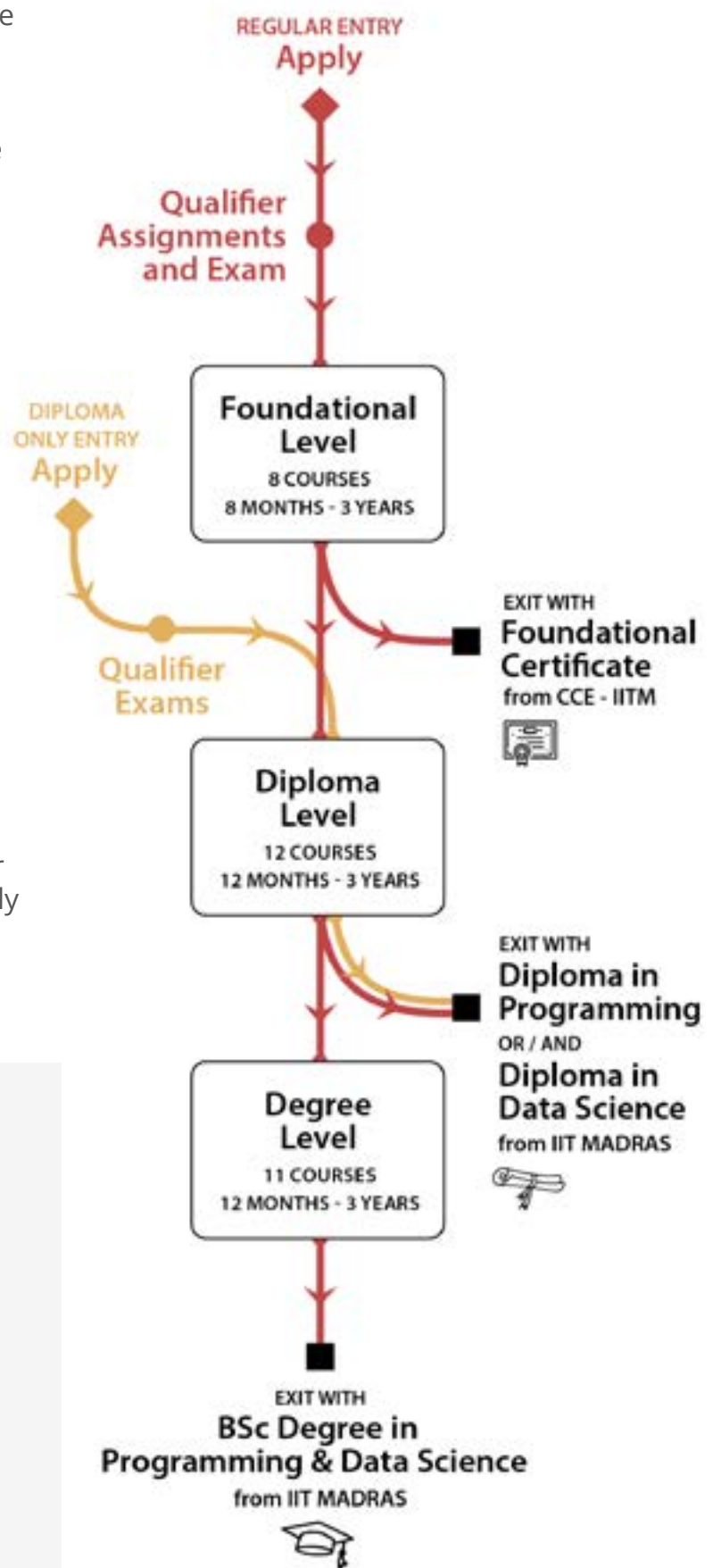
## 2. DIPLOMA LEVEL

## 3. DEGREE LEVEL

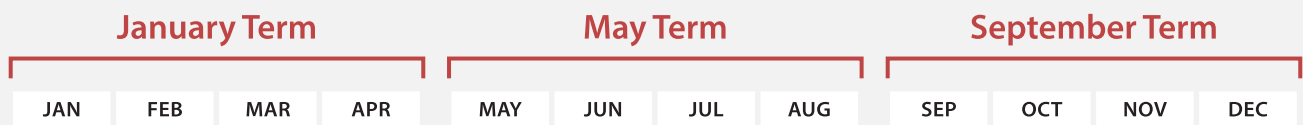
There is also the flexibility to exit at any level. Depending on the courses completed, the learner can receive Foundational Certificate from Centre for Continuing Education, IIT Madras or Diploma(s) from IIT Madras. (Pg 13 for **Admissions** related information)

We are currently formulating a **Diploma Only Entry** (Pg 13) option for those who are interested in doing only Diploma Level courses and exiting with one or both Diploma(s) from IIT Madras.

-  **Total Courses: 31**  
116 credits
-  **Completion time: 3 - 6 years**  
based on preferred pace & performance
-  **Fees: Based on courses registered**  
\*Refer **Fee Structure** (Pg 9).
-  **Online Courses & Assignments**  
12 weeks of coursework for each course
-  **Quizzes and Exams**  
3 Quizzes and one End Term Exam for each course - in person and invigilated.



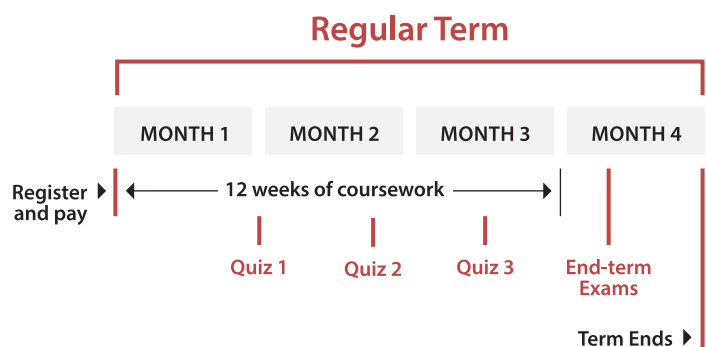
# Term Structure



- Every year is divided into three terms - January Term, May Term and September Term.
- In a term, a learner may register for a course only if they have already successfully completed the prerequisites for that course.
- The learner may be allowed to register for upto 4 courses in a term depending on their performance in the previous exam(s).
- Before progressing to the next level, the learner has to clear all the courses in the current level.
- A learner has to clear all Foundational level courses successfully, before registering for any Diploma Level courses. Similarly, learners have to clear Diploma Level courses successfully before registering for any Degree Level courses.

# Course Structure

- The duration of the core courses in Foundational, Diploma and Degree Level is 12 weeks and the courses carry 4 credits each. The Skill Enhancement courses and Electives in Degree Level have varying credits and may be of different duration.
- The fee for each term depends on the total credits one registers for in that term. Refer [Fee Structure](#) (Pg 9).
- The recorded video content released every week will comprise a series of lectures, sample problems and step by step instructions on how to solve them.
- The duration of each video would be 15 to 30 minutes amounting to a total of about 2 - 3 hours of video content each week in each course.
- Weekly assignment(s), which will be released along with the videos, will have to be completed and submitted online in the specified period of time.



- There will be 3 quizzes for each course, one each at the end of weeks 4, 7 and 10. Each course further culminates in an End Term Exam. All the quizzes and the end term exams have to be completed by the learner, in person, at designated exam centres, held under invigilation.
- All in-person, invigilated quizzes and exams will be scheduled for weekends, subject to availability of dates with exam partner.

# Assessments

There are 3 types of assessments for each course - online weekly assignments, monthly in-person invigilated quizzes and an in-person invigilated end term exam.

## Online Assignments

- A 12-week course will have at least one assignment every week.
- Each assignment has to be submitted online within the specified due date.
- From the 12 weekly assignment scores for a course, a learner's best 8 scores will be considered to calculate the Average Assignment Score.
- If the Average Assignment Score for a course is less than 40/100, the learner will not be eligible to write the end term exam for that course.

## Three Quizzes

### IN PERSON, INVIGILATED

There will be 3 quizzes for each course, one each at the end of Weeks 4, 7 and 10. Every quiz will be based on content covered up to that point in the course. These quizzes have to be attempted in person, in the specified **exam city** (Pg 9).

- Each quiz will be conducted in a single session and will consist of sections of 45 minutes duration for every course chosen.
- It is mandatory to appear for at least one out of the three quizzes to be eligible to write the end term exam.
- The best two out of the three quiz scores will be considered to calculate the Average Quiz Score (Q) out of 100.
- 40% of Q will be used to calculate Total Course Score T and course grade.

## End Term Exam

### IN PERSON, INVIGILATED

- At the end of a term, there will be an end term exam of 3 hours duration for each course.
- To be eligible to write the End Term Exam, a learner's average assignment score should be  $\geq 40/100$  AND they should have appeared for at least one out of the three quizzes.
- This exam score (out of 100) is called End Term Score (E) which accounts for 60% of the Total Course Score (T).

## Pass Criteria for Each Course


- Total Course Score (T) = 40% of Average quiz score (Q) + 60% of End Term Score (E)
- A learner is deemed to have passed a course only if the below mentioned two conditions are met:
  - Total Course Score (T)  $\geq$  50/100 AND
  - End Term exam score (E)  $\geq$  40/100
- These criteria are the same for all learners participating in the course.
- An absolute grading system, as described in the below table, will be followed:

Condition satisfied by 'T' - Total Course Score (Out Of 100) and 'E' - End Semester Score (Out Of 60)	Letter Grade
(T $\geq$ 90) AND (E $\geq$ 24)	S
(90 > T $\geq$ 80) AND (E $\geq$ 24)	A
(80 > T $\geq$ 70) AND (E $\geq$ 24)	B
(70 > T $\geq$ 60) AND (E $\geq$ 24)	C
(60 > T $\geq$ 50) AND (E $\geq$ 24)	D
(T < 50) OR (E < 24) OR Average assignment score <40/100 OR No quiz attended	U (Fail)

## Learners Who Do Not Pass a Course

- For any learner, if Total Course Score (T) < 50/100 or average assignment score < 40/100 or no quiz attended, they have to repeat the entire course. This includes submission of assignments and redoing all the subsequent quizzes and end term exam. Fees for repeating the course is the same as the course fees.
- If Total Course Score (T)  $\geq$  50/100 but End Term Score (E) < 40/100, the learner has 2 options:
  - Attend only the end term exam whenever it is conducted in the subsequent term. The fee to repeat an end term exam will be ₹1000 for foundational and ₹2000 for diploma / degree level courses.
  - They can repeat the entire course by paying the full course fees and completing all assignments, invigilated quizzes and the end term exam.

## Exam Cities

- The Invigilated Quizzes and End Term exams are scheduled to be conducted in a limited number of cities across India. Learners can select 3 options among the cities, and they will be expected to attend the exam in the City / Centre that has been allotted to them. The allotted city will be from these 3 options.
- The list of exam cities where invigilated exams will be scheduled may change later depending on the location of majority of our learners. Here is the link to view the current [exam cities](#) .



# Fee Structure

- For details about application fees, check [Application Process](#) (Pg 14) section.
- **Each term, pay only for the courses you register for!**
  - Foundational Level - ₹4000 per course.
  - Skill Enhancement courses in Diploma / Degree Level - ₹5,000 per course.
  - All other courses in Diploma / Degree Level - ₹10,000 per course.
- Fee waivers depend on category of learner and family income:

	Family Income > 5LPA		Family Income > 1LPA and <=5LPA		Family Income <=1LPA	
	Applicable Fees	Certificates Required	Applicable Fees	Certificates Required	Applicable Fees	Certificates Required
<b>General</b>	Full Fee	-	50% waiver	EWS + Family Income	75% waiver	EWS + Family Income
<b>OBC</b>	Full Fee	-	50%waiver	OBC-NCL + Family Income	75% waiver	OBC-NCL + Family Income
<b>SC / ST</b>	50% waiver	SC / ST	50% waiver	SC / ST	75% waiver	SC / ST + Family Income
<b>PwD</b>	50% waiver	PwD	50% waiver	PwD	75% waiver	PwD + Family Income
<b>SC / ST + PwD</b>	75% waiver	SC / ST + PwD	75% waiver	SC / ST + PwD	75% waiver	SC / ST + PwD

- The term family income for the purpose of availing fee waivers includes the income of the candidate, the income of his/her parents and spouse, also the income of his/her siblings and children below the age of 18 years.
- OBC-NCL / EWS / Family Income certificates need to be obtained in the prescribed format. Only those who clear Qualifier Exam and wish to avail fee waiver based on family income need to submit the Family Income certificate. *(Note that Family Income certificate is valid only for one year and will need to be submitted afresh each year to continue availing corresponding fee waiver.)*

[Format for OBC-NCL certificate](#)

[Format for EWS certificate](#)

[Format for Family Income certificate](#)

**Tentative Fee for Each Term**, depending on your end Goal and possible paths to reach the goal:

[Foundational Certificate](#)

[Diploma in Programming](#) | [Diploma in Data Science](#) | [Both Diplomas](#)

[BSc in Programming and Data Science](#)

\*Note: If a learner does not pass a course in the term they registered for it - refer section about [Learners who do not pass a course](#) for details on whether they will need to repeat entire course or only repeat the end term exam. Fee to repeat an entire course will be the same as the full course fee. Fee to only repeat the end term exam is ₹1000 for foundational level courses and ₹2000 for diploma / degree level courses.

# Foundational Level

The Foundational Level comprises courses in Mathematics, Statistics, Basics of Programming and Python, and English. These courses have been chosen to ensure that the learner who passes these successfully is well prepared to proceed to the Diploma Level courses.



**8 courses**

32 credits



**1 - 3 years**

10 hrs/course/week



**₹32,000\***

\*Refer [Fee Structure](#) (Pg 9).

## Requirements for registration

The learner should apply for and clear the [Qualifier Process](#) (Pg 14).

## Options on successful completion

Learners have the following two options when they successfully complete all 8 Foundational Level courses:

- Exit: The learner may exit with a **Foundational Certificate from Centre for Continuing Education, IIT Madras**.
- Proceed to next level: The learner can join the [Diploma Level](#) (Pg 10).

## Courses in Foundational Level

Mathematics for Data Science I

Mathematics for Data Science II

Computational Thinking

Programming in Python

Statistics for Data Science I

Statistics for Data Science II

English I

English II

# Diploma Level

There are two sections in the Diploma Level with courses for Diploma in Programming and courses for Diploma in Data Science. Each of these diplomas comprise 5 core courses and 1 skill enhancement course. These Diploma Level courses assume that the learner is well-versed with fundamentals.



**6 + 6 courses**

22 + 22 credits



**1 - 3 years**

10 hrs/course/week



**₹55,000\* + ₹55,000\***

\*Refer [Fee Structure](#) (Pg 9).

## Requirements for registration

The learner should have cleared all 8 [Foundational Level](#) (Pg 10) courses or should have joined via [Diploma Only Entry](#) (Pg 13).

## Options on successful completion

Learners have the following options based on the courses completed in this level:

- They may exit with a **Diploma in Programming from IIT Madras.**
- They may exit with a **Diploma in Data Science from IIT Madras.**
- They may exit with both Diplomas from IIT Madras.
- The learner can join the **Degree Level** (Pg 11) if they have completed all 12 Diploma Level courses AND have not entered the program via Diploma Only Entry option.

## Diploma in Programming


The Diploma in Programming lays a sturdy foundation in Databases and Programming concepts with Data Structures and Algorithms. The learner goes on to apply these in the building of a web application by the end of the diploma.


### Courses for Diploma in Programming


Database Management Systems

Programming, Data Structures and Algorithms using Python

Programming Concepts using Java

 **6 courses**  
22 credits

 **1 - 2 years**  
10 hrs/course/week

 **₹55,000\***  
\*Refer **Fee Structure** (Pg 9).

Modern Application Development I

Modern Application Development II

Skill Enhancement I

## Diploma in Data Science


The Diploma in Data Science exposes the learner to the holistic approach of gathering, analysing, and interpreting data for a variety of problems. The courses on Business Data lays down the context and the need for the data, while the Machine Learning courses equip the learner to use and analyse this data towards impactful conclusions.


### Courses for Diploma in Data Science


Machine Learning Foundations

Machine Learning Theory

Machine Learning Practice

 **6 courses**  
22 credits

 **1 - 2 years**  
10 hrs/course/week

 **₹55,000\***  
\*Refer **Fee Structure** (Pg 9).

Business Data Management

Business Analytics


Skill Enhancement II


# Degree Level

The Degree Level has courses that complete the requirements for the BSc degree.

## Requirements for registration

The learner should have come in via **Regular Entry** (Pg 14), cleared all 8 **Foundational Level** (Pg 11) courses and all 12 **Diploma Level** (Pg 11) courses.

 **11 courses**  
40 credits

 **1 - 3 years**  
10 hrs/course/week

 **₹1,00,000\***  
\*Refer **Fee Structure** (Pg 9).

**Exit:** Once the learner successfully completes 40 credits from Degree Level courses, they can exit with a **BSc Degree in Programming & Data Science from IIT Madras.**

## Credit Requirements

Learners have to complete a total of 40 credits at the degree level:

4 credits from mandatory course titled “Strategies for Professional Growth”

4 credits from 2 Skill Enhancement Courses of 2 credits each. These are to be completed on NPTEL and the credits transferred to this degree program.

8 credits from 2 Core Courses of 4 credits each. There are 3 pairs of core course options to pick from.

24 credits from Elective Courses - 6 courses of 4 credits each or more courses of lesser credits.

## Core Courses

Learner has to do a pair of core courses where each course is of 4 credits. Following are the options for Core Courses:

### Core Course Option I

Operating Systems

Computer Architecture

### Core Course Option II

Software Testing

Software Engineering

### Core Course Option III

AI: Search Methods for Problem Solving

Deep Learning

## Elective Courses

A total of 24 credits need to be obtained from Elective Courses. Listed below are 9 courses of 4 credits each, including the 3 pairs of core courses. Excluding the 2 courses that the learner has already picked as core courses, he / she can opt for the elective courses in the following two ways:

a. Obtain all 24 credits by picking 6 of the remaining 7 courses listed below. OR

b. Obtain upto 12 credits from NPTEL (accepted courses list will be provided soon) and obtain remaining credits by picking from a subset of the 7 courses below.

Operating Systems

Computer Architecture

Topics in Application Development

Software Testing

Software Engineering

Topics in Machine Learning

AI: Search Methods for Problem Solving

Deep Learning

Topics in Data Science

# Important Dates

Applications Closed (Regular Entry)	- 15 September 2020
Weekly release of Term 1 Qualifier courses content starts	- 5 October 2020
Qualifier Exam Hall Ticket (only for those who get minimum required marks in Assignments)	- 2 November 2020
Qualifier Exam (only for those with Hall Ticket)*	- 22 November, 2020*
Qualifier Exam Results	- 7 December, 2020
Registration for Term 1 (only for those who clear Qualifier Exam)	- 7 to 27 December, 2020
Foundational Level Batch 1 starts	- 4 January, 2021

\*Dates for in-person exams are subject to government restrictions prevalent at that time.

## Two Admission Paths

### 1. Regular Entry

Anyone joining the program via Regular Entry will join at the Foundational Level.

The Foundational Level courses allow for interested applicants with a variety of educational backgrounds to learn the basics (Math, Statistics, Computational Thinking, Python programming and English) which help them take up the Diploma Level and then the Degree Level courses.

There are three exit options for those who enter the program via Regular Entry:

**Exit 1.** Foundational Level certificate from Centre for Continuing Education, IIT Madras.

**Exit 2.** Diploma in Programming AND/OR Diploma in Data Science from IIT Madras


**Exit 3.** BSc Degree in Programming and Data Science from IIT Madras

View [Regular Entry](#) (Pg 14) for details on Eligibility, Application Process, Qualifier Process, Qualifier Exam and Passing Criteria.

### 2. Diploma Only Entry

The Diploma Only Entry is primarily aimed at working professionals or learners who already possess the fundamentals taught in Foundational Level courses and wish to exit with one or two Diplomas (Diploma in Programming AND/OR Diploma in Data Science) from IIT Madras.

Learners entering via Diploma Only Entry can only do Diploma Level courses and cannot proceed to the Degree Level courses.

We have plans to open applications for Diploma Only Entry in May / June 2021. All details related to Diploma Only Entry will be provided soon on [our website](#) .

# Mandatory Requirements

- Access to good internet connection as well as a laptop/desktop device will be a key requirement to learn effectively.
- Learner should be able to travel to assigned exam centres for quizzes and exams, each term.

## Regular Entry

### Eligibility to Apply

#### Eligibility for those who cleared class 12 or equivalent in 2018 or earlier:


1. The candidate must have studied Mathematics and English in class 10.
2. They should have cleared class 12 or equivalent in 2018 or earlier.

#### Eligibility for those who cleared class 12 or equivalent in 2019 or 2020:

1. The candidate must have studied Mathematics and English in class 10.
2. They should have cleared class 12 or equivalent in 2019 or 2020.
3. The candidate should be:
  - (i) currently enrolled / previously enrolled in any Bachelor's Degree program in campus mode OR
  - (ii) completed 1 year Diploma (campus mode only) OR
  - (iii) completed CA Inter

*Note that applicants who cleared class 12 or equivalent in 2019 or 2020 may apply for the qualfier process with eligibility criteria 1 & 2 alone, but will be required to fulfil criterion 3 to join the foundational courses after clearing the qualifying exam.*

### Application Process

- Anyone who is eligible may apply by filling in the application form, uploading required documents and paying the application fee. Check out [Application Process](#)  section on our website for the latest updates and to start applying.
- Application fee - ₹3,000 (For applicants belonging to PwD ( $\geq 40\%$  disability) / SC / ST category - ₹1,500; For applicants belonging to PwD ( $\geq 40\%$  disability) and also SC / ST category - ₹750)

### Qualifier Process

- All applicants will have to go through a Qualifier Process, like a trial month, wherein they will get access to 4 weeks of content for the four foundational level courses - English I, Mathematics for Data Science I, Statistics for Data Science I and Computational Thinking.
- Video content of 2 - 3 hours duration will be released for each course on a weekly basis. Along with the content, the first three weeks will also include an assignment for each course that need to be completed and submitted online within the given deadline.
- Average assignment score in each course will be calculated. Only those who get minimum required average assignment scores in all four courses will be allowed to write the Qualifier Exam (refer next page).

	Minimum Average Assignment Score required in each course
General Learner	40%
SC / ST / PwD with 40% disability	30%
PwD with 40% disability & SC / ST	30%
OBC-NCL / EWS	35%

## Qualifier Exam and Passing Criteria

- Only learners who get minimum required average assignment scores in all four courses will be eligible for the in-person invigilated Qualifier Exam conducted at the end of 4 weeks of coursework. Only these candidates will receive hall tickets.
- The Qualifier Exam is of 3 hours duration and covers all 4 subjects with 45 minutes allotted per course.
- To pass the Qualifier Exam, the learner has to get a minimum Total Qualifier Exam Score and a minimum Qualifier Exam Score in each course individually. Refer table below.
- Only those who pass the Qualifier Exam will be eligible to register for Foundational Level courses.

	Minimum required Qualifier Exam Score in each course	Minimum required Total Qualifier Exam Score
General Learner	40%	50%
SC / ST / PwD with 40% disability	30%	40%
PwD with 40% disability & SC / ST	30%	40%
OBC-NCL / EWS	35%	45%

Note: Relaxations in pass criteria indicated for various categories of learners, is applicable ONLY for the qualifier process. There will be no relaxations in terms of grades / pass criteria once registered into the program.

- Though everyone who passes the Qualifier Exam will be allowed to register for Foundational Level, there will be limitations on the number of courses a learner will be allowed to register for in the first two terms based on the Total Qualifier Exam Score (S).

Total Qualifier Exam Score (S)	Number of courses allowed to register for in first two terms
Minimum required $\leq S < 50\%$	up to 2 courses
$50\% \leq S < 70\%$	up to 3 courses
$S \geq 70\%$	up to 4 course

- Maximum number of courses a learner will be allowed to register for in later terms will depend similarly on the average of course scores in the previous two terms.

## Contact Us

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7850-999966 (Mon-Fri 9am-6pm)

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