

## **Master's and Micro degree Programmes with Data Science specialization**

**Objective:** To produce world class data scientists in diverse domains. An avenue for a graduate of any discipline to earn MSc in Computer Science with a special training for making career in the domain of his / her liking by employing innovations and applications that are based on data science and artificial intelligence. This Programme is a quality assured alternative for the employed learners who generally prefer the Distance learning.

**Intake:** As the Programme shall be offered in blended MOOC model, there shall not be any limit on the intake; To begin with we plan to offer admissions to top 1000 scorers in the admission entrance test [Ref. Annexure I].

**Duration:** 2 years, i.e., 4 semester, a specialized Programme including a rigorous training, a capstone project and one semester internships with WIAI or any such AI industry.

**Eligibility:** Anybody having passed XII or higher standard examination with minimum 50% score can appear for the national level entrance examination and take admission if gets through. The admissions to Master's degree (MSc in Computer Science, specialization data science) shall be open to the graduates of this University or its equivalents.

The candidates who qualify the entrance test and not having completed their graduation could take admission to micro degrees (Certificates) and are allowed to accumulate credits by qualifying discrete Courses of this Programme by following the pre-requisite structure. The credits earned by such candidates shall be recognized and transferred by this University and be utilized by the candidates wherever applicable.

The candidates who qualify the entrance test and have taken admission in any of the Programmes of This University including a Master's Degree Programme, can accumulate up to half of the credits of this Programme while completing the other Programme and secure Master's in Computer Science with specialization in Data Science by earning the remaining credits in one year any time after his / her graduation.

The admission procedure to this Programme shall be opened twice a year, i.e., in the months July and December. The on-line applications for the entrance examination for the academic year starting in the Second half of 2018 are available till 18<sup>th</sup> July 2018. Please visit: [www.mahapariksha.gov.in](http://www.mahapariksha.gov.in) and <http://udcs.mu.ac.in/>

Since the Programme will be offered in the blended MOOC model the students taking admission to this Programme would be eligible to take admission simultaneously in some other Programme of This or any other University subject to the Dual degree facilities at the respective Institutions.

**Mode of dissemination of knowledge:** Each Course shall be equivalent of 6 credits, the teaching-learning spreads over 16 weeks, ideally each week a student is expected to study 6 videos, each of 15-20 minutes, each ending with an activity that calls for the similar amount of time, attends 2 hours of tutoring and 2 hours of practical offered in a flipped classroom and, contributes to forum discussions on 2 threads by spending half an hour on each thread.

**Evaluation model:** For each Course a student has to secure minimum 16% of the total marks through a Semester-end examination that would carry 40% weight in the total evaluation; the 60% weight would be for the students' attendance and submissions in response to the video-based learning and flipped classroom activities, call it continuous internal evaluation

(CIE). In order to qualify a Course a student has to earn minimum 40% of the total marks in the same; There shall not be minimum passing requirement for the students score in CIE. However, a failed student can choose to improve CIE score once by paying only examination fees and by submitting all the assignments and term-work as prescribed by the on-going term. The students failed in the second attempt have to pay 30% of the tuition fees in addition to the examination fees, i.e., to avail the Course-ware of the year they will wish to appear for the CIE.

Subject to the availability of the Programme / Course in the University, there shall be no limit on the number of attempts a student takes to qualify the same. A syllabus will be valid only for a year and shall be kept up-to-date by generating a refinement almost every year. The repeaters have to follow the syllabus and assignments that are available at the time they wish to appear for the examination.

The Semester examinations shall be conducted in the months December and May.

**Fees:**

Fees for the Entrance Examination shall be Rs 500/- per student per attempt;

If admitted to the Courses from the first three semesters then a student has to pay Tuition fee Rs 4000 / - and Examination fee Rs 1000 / - per Course plus, Convocation and other fees like Gymkhana, insurance etc., as prescribed by UoM.

Fees for the Fourth semester will be 10K that includes the Departmental support for mentoring the students and processing fees that may require to publish or file patents of their work etc.

The people interested in attending a few of the Courses of the whole Programme in order to seek micro-degree (Certification) in each Course they complete are welcome to do.

**A performance based incentive:** A candidate scoring 50% or more shall be awarded up to 50% discount in the fees in his / her further studies towards the completion of This Programme. The proposed discount pattern based upon a student's score is given in the Table below.

% score	Discount: % of fee paid
50 – 59	10
60 – 74	20
75 – 84	30
85 – 94	40
94 and above	50

**Highlights of the Syllabus:** Tentatively 75% content is focused to the core data science and 25% is from the interdisciplinary fields of its applications. Theory and practice have been given equal weights. The scope of the Research methodology Course involves mentoring students for a research and an industrial project start from problem formulation phase to publishing the research and securing its IPR. A student alone or in a group is expected to publish his / her work carried out during this Programme, in a good impact factor journal or

file a patent or make its outcome available under Open Source licences etc. The syllabus emphasizes the project based learning.

**The recommended curriculum:**

<p><b>Semester I</b></p> <p><u>DS 101</u>          UI: Essentials of Algorithms and Data structures; Introduction to Programming paradigms – Functional, Imperative and Object Oriented          UII: Software Engineering – Trends and techniques</p> <p><u>DS 102</u>          UI: Databases and Datawarehousing; Data preparation          UII: Data Science using R, Excel, Python, SQL, Tableau</p> <p><u>DS 103</u>          UI: Descriptive and Inferential statistics, Data visualization          UII: Exploratory data analytics, Hypothesis testing</p>	<p><b>Semester II</b></p> <p><u>DS 201</u>          UI: Introduction to Artificial intelligence, conventional techniques and Logic programming          UII: Introduction to Machine learning, regression, classification (ANN, SVM and Decision tree) and clustering</p> <p><u>DS 202</u>          UI: Concepts in Soft and Evolutionary computing – GA and other nature inspired search algorithms          UII: Fuzy, Rough and Granular computing</p> <p><u>DS 203</u>          UI: Big data, parallel algorithms, Association rule mining, time series analysis          UII: Managing Big data with Hadoop and SPARK</p>
<p><b>Semester III</b></p> <p><u>DS301</u>          UI: Introduction to Research Methodology, Literature survey and referencing, Problem formulation, Data preparation          UII: Design and implementation of experiment</p> <p><u>DS302</u>          UI: writing and publishing results          UII: IPR, patent, copyright and Free knowledge sources</p> <p><u>DS303</u>          A mentored Capstone Project in a team of 2-4 (~100 hours efforts by each student)</p>	<p><b>Semester IV</b></p> <p>A semester long internship with an Institution that works in the domain of AI for social good (~400 hours efforts by each student)</p>

- For each of the papers in Semester I, II and III, UIII will be Case study and Unit IV will be Practical implementation

- DS104, 204 and 304: Interdisciplinary studies from the domain selected for Capstone project; to be completed preferably through MOOC or with a mentoring institution independently. University may require to give an ancillary affiliation to the Institutions those would like to enrol our students for these Courses. The choice of the interdisciplinary domain is totally at the discretion of the students. It can be Science, Social science, Commerce and Management, Languages or Fine arts or anything that the student likes to works in.
- Passing at least one of the first three Courses of the previous Semester is necessary in order to take admission to the semester two or three; Passing minimum two of the \*04 is necessary in order to submit the Capstone project.
- The First Semester Courses follow pre-requisite of qualifying the entrance test. DS 101 and 102 together form a pre-requisite for DS 201 that is the pre-requisite for DS 202; DS 301 could be opted by by-passing the entrance test examination and by providing a recommendation of a designated research mentor. Such students will have to pay Rs 500/- admission fees in addition to the Tuition fee and the Examination fee.
- The Capstone project and a Semester long internship is only for the students who opt for the Master's degree and not for the ones who opt Micro-degrees. However the Master's and Micro degree students may plan to appear for NPTEL-IITM certification exams simultaneously.
- Considering the nature and requirement of the Programme it has been proposed that there will be Teaching-learning in blended MOOC model from August to November and January to April in the respective Semesters. The Semester-end examinations shall start on the Second Saturday of December and April. Per Course there shall be one Paper that is to be attempted in two hours. The number of questions may vary depending upon the nature of its content.
- In addition to this mandatory requirement a student in the interest of enhancing his / her CV can opt up to 2 audit Courses (each equivalent of 6 credits in F2F model) while completing this Programme.

**Tentative Schedule of Semester End Examination:**

Time	2 <sup>nd</sup> Sat	Sun	Mon	Tue	Wed	Thr	Fri	Sat
10 to 12	101	201	102	202	103	203	104	204
3 to 5	301	-	302	-	303	-	304	-

Generally the result will be published on the forth Saturday of the same month.

## Annexure I

<b>Syllabus for Entrance Examination</b> (5 Questions in English and 10 in each of the other 5)	
1	<b>Section name – English</b> Three questions to test English comprehension of class XII level, Two questions to test the vocabulary knowledge / an appropriate usage of a word / correct forms of words
2.	<b>Section name- General knowledge</b> Questions on History, Culture, Literature, Civics & Politics, Sports, Environmental science, Technology, Behavioural science & Psychology, knowledge of current affair from news broadcast
3.	<b>Section Name- Logic</b> Analogy, Sequence, Blood relations. Predicate and Propositional logic
4.	<b>Section name-Mathematics</b> Matrices and Determinants, Lattice theory and linear algebra, Differentiation and integration, 2-D and 3-D geometry, Numerical methods
5.	<b>Section name-Statistics</b> Elementary statistics: Aggregation and measure of central tendency, Probability and Random numbers, Discrete and continuous probability distributions, Hypothesis testing, Operations research
6	<b>Section name-Computer Science</b> Algorithms and data structures, Operating environments and operating systems, Programming and software engineering, Finite state machines and Artificial intelligence, Networking and databases