Efi Arazi School of Computer Science
Interdisciplinary Center (IDC) Herzliya

# M.Sc. Program in Machine Learning and Data Science

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A great deal of effort has been expended in preparing this handbook, in order to ensure that its content is complete and accurate. However, changes and alterations to the information are possible. The IDC Herzliya Academic Authorities may cancel, alter or add courses and/or specialization programs, and generate changes in the times of lectures or in the assigned lecturer. Such changes will be published over the course of the year by various means, such as the online handbook on the IDC Herzliya website, and will apply to all IDC Herzliya students, including students of the Raphael Recanati International School, unless specified otherwise.

## Introduction

IDC's Efi Arazi School of Computer Science has built an innovative and intensive M.Sc. program aimed at providing deep theoretical and practical understanding of data science, machine learning and big-data technologies to students with a strong quantitative background and education.

The program will endow the students with knowledge, as well as skills and tools, in central fields such as machine learning, algorithms, databases, and statistical inference. Students will attend frontal lectures, seminars, and produce projects of different scales providing them hands-on experience in the data-science and machine learning domains. The conducive learning environment at the Efi Arazi School of Computer Science provides a community and team-up opportunities for students, scientists and researchers from the entire scientific spectrum.

Upon completing our M.Sc. program in data science, our graduates will have gained a strong background in the science and the technology that form the basis to the growing activity in data analysis, data collection and processing and related usage. They will also have acquired expertise in programming for data science using Python, including skills in using programing in statistical analysis and advanced machine learning. Additionally, they will have acquired deeper specialization in data science based on the elective courses of the program: infrastructure courses, big-data and databases, neural networks and deep learning, statistics, optimization, scientific computing, modern bioinformatics and environmental informatics, computer graphics and vision, numerical analysis, and biomedical data science.

The curriculum of the M.Sc. Program in Machine Learning and Data Science includes:

- 5 Mandatory core courses (16 credits)
- 1 Mandatory Applied Data Science Elective (3 credits)
- 1 Mandatory project (5 credits)
- 4 Elective courses (12 credits)

- 3 Preparatory CS courses - only for non-CS graduates

Overall, the M.Sc. students are required to complete 36 credits.

# Program of Studies

## Mandatory core courses –Year 1

| Course No. | Course Name | Lecture Hours | Recitation Hours | Total Credit Points | Final Course Assignment |
|---|---|---|---|---|---|
| **Fall Semester Courses** | | | | | |
| 3620 | Probability and statistics for data science and machine learning.<br>Prof. Zohar Yakhini | 3 | 1 | 4 | Exam |
| **Spring Semester Courses** | | | | | |
| 3141 | Introduction to Machine Learning<br>Prof. Zohar Yakhini | 3 | 1 | 3 | Exam |
| 3605 | Introduction to Data Science and Big Data<br>TBD | 3 | | 3 | Exam |

## Mandatory Applied Data Science Elective (3 credits)

The students will select one of the following applied "Data Science" elective as a mandatory core course:

| Course No. | Course Name | Lecture Hours | Total Credit Points | Final Course Assignment |
|---|---|---|---|---|
| **Fall Semester Courses** | | | | |
| 3575 | Probabilistic Models for Data Analysis<br>Dr. Ilan Gronau | 3 | 3 | Exam |
| 3591 | Cognitive Computing<br>Dr. Elishai Ezra Tsur | 3 | 3 | Exam |
| 3604 | Data Streaming Algorithms and Online Learning<br>Dr. Aviv Yehezkel | 3 | 3 | Submitted work |
| **Spring Semester Courses** | | | | |
| 3158 | Scientific Computing with Python<br>Dr. Yoav Ram | 3 | 3 | Submitted work |
| 3031 | Cloud computing<br>Mr. Dan Amiga | 3 | 3 | Exam |
| 3606 | Topics in Data Mining and Genomics<br>TBD | 3 | 3 | Exam |
| 3523 | Natural Language Processing<br>Dr. Kfir Bar | 3 | 3 | Exam |

## Elective courses (12 credits)

Students must select 4 elective courses out of the following list of courses, together with the applied data science list above. Many of these courses are already given as part of the school's

master program courses. Student can take 1-2 electives during their first year of study and 2-3 electives during their second year, for a total of 4 elective courses.

| Course No. | Course Name | Lecture Hours | Total Credit Points | Final Course Assignment |
|---|---|---|---|---|
| **Fall Semester Courses** | | | | |
| 3124 | Software Engineering using Design Patterns<br>Mr. Guy Ronen | 3 | 3 | Middle Semester Exam (date will be published ) |
| 3152 | Computer Music<br>Dr. Revital Holender | 3 | 3 | Submitted work |
| 3615 | Blockchain, Consensus, and Cryptography<br>Dr. Elette Boyle | 3 | 3 | Submitted work |
| 3581 | Advanced Data Structures<br>Prof. Shay Mozes | 3 | 3 | Exam |
| 3169 | Artificial intelligence and Moral<br>Dr. Udi Boker | 3 | 3 | Submitted work |
| **Spring Semester Courses** | | | | |
| 3589 | Automata and Games<br>Dr. Udi Boker | 3 | 3 | Exam |
| 3128 | Build your own computer<br>Dr. Daniel Seidner | 3 | 3 | Exam |
| 3168 | Mobile Application Security<br>Dr. David Movshovitz | 3 | 3 | Exam |
| 3614 | Practical probability Models for Computer Science Seminar<br>Dr. Gail Gilboa Freedman | 3 | 3 | Submitted work |
| 287 | Digital Systems Construction<br>Prof. Shimon Schocken | 3 | 3 | Exam |
| 3510 | Distributed Algorithms<br>Prof. Gadi Taubenfeld | 3 | 3 | Exam |
| 3568 | Topics in System Engineering<br>Dr. Rami Marelly | 3 | 3 | Submitted work |

**Exam Schedule** the dates of the examinations can be found on the IDC Herzliya website under Students > Student Information > Course Catalog, Student Regulations and Syllabus > Search Exams A personal examinations schedule is published at the Student's Information website (My IDC).