



MSc
MACHINE LEARNING
& DATA SCIENCE

EFI ARAZI SCHOOL OF COMPUTER SCIENCE

2022-2023

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Reichman University was founded with the aim of nurturing future leaders. In just twenty-seven years, we have created a pioneering and innovative academic center. Our students are imbued with a commitment to excellence and original thinking. 'The university of the future,' as we see it, has to prepare its students for a constantly changing world by being able to innovate skillfully, to dare, and to initiate. We believe that the knowledge and tools acquired at Reichman University support personal and professional goal fulfillment and enable our graduates to tackle the challenges of our global reality."

A handwritten signature in black ink, reading "Uriel Reichman".

Prof. Uriel Reichman

Founding President and Chairman of the Academic Board, Reichman University



PROGRAM



The Efi Arazi School of Computer Science has built an innovative and intensive M.Sc. program in Machine Learning & Data Science, aimed at providing a deep theoretical and practical understanding of machine learning and data-driven methods. The program will address foundations and techniques, as well as application domains and use cases.

In recent years, data science methodologies have become the bonding language and foundational tools of scientific and industrial research. Machine learning and data-driven methods have developed considerably, and now penetrate almost all areas of modern life. This trend has deeply affected computer science, medical science, life sciences, and biology, as well as finance, chemistry, physics, and social sciences. Gathering, analyzing, and interpreting data using modern, data-driven, and machine learning methods are now part of the daily routine in many parts of academia and industry alike. Clearly, the vision of a data-driven world presents many exciting challenges to data experts. These include developing algorithms and methods to deal with data, exploiting new cloud-based platforms, deploying and taking advantage of software solutions, and handling information diversity at scale, as well as communicating, interpreting, and leveraging the results obtained through analysis pipelines and processes.

To answer the call of the growing market demand for data scientists, the Efi Arazi School of Computer Science is offering a unique M.Sc. program for students with a strong quantitative background and education. Students will attend frontal lectures, recitations, and seminars, and will lead and participate in projects of different scales. Through these projects, students will gain hands-on experience in various data science and machine learning domains. Project participation will be in collaboration with academia, both internally and externally, and with industry.

The conducive learning environment at the Efi Arazi School of Computer Science provides a community, as well as team-up opportunities, for students, scientists, and researchers from the entire scientific spectrum. The program will expose our students to industry and other activities that parallel their academic training.

Upon completing our M.Sc. program in data science, our graduates will have gained a strong background in the science and technologies that form the basis to the growing activity in data analysis, data collection and processing, and related usage. They will have expertise in programming for data science using Python, including skills in using programming in statistical analysis and machine learning. 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 program will open a new path for any student with a strong mathematical background and programming experience, but without a computer science degree. It will provide these students with the opportunity to become skilled and knowledgeable data scientists. (Candidates without Computer Science degrees will need to successfully complete Computer Science preparatory courses.)

Ultimately, Reichman University's Machine Learning and Data Science program, at the School of Computer Science, will endow our students with the knowledge, the market understanding, and the scientific and technical skills required to work creatively and effectively in these domains.





CURRICULUM

Students are required to take 36 credits: 21 credits of mandatory core courses including a final project, 3 credits of mandatory electives, and 12 credits from a list of general computer science electives. Any student with an insufficient background in either computer science or math will be required to take additional preparatory courses, to be determined by the Admissions Committee. All mandatory courses, and some elective courses, are taught in English. Some courses may only be taught in Hebrew.

MANDATORY CORE COURSES (16 credits)

- Probability and Statistics for Data Science and Machine Learning
- Intro to Machine Learning
- Intro to Data Mining, Big Data Platforms and Data Visualization
- Intro to Neural Networks and Deep Learning
- One of the following advanced courses:
 - Advanced Machine Learning
 - Advanced Statistics
 - Advanced Algorithms

ELECTIVE COURSES (15 credits)

Students are required to take at least 3 credits from the highlighted courses below. It is possible, and even recommended, to take more.

MACHINE LEARNING AND DEEP LEARNING

- Advanced Topics in Deep Learning
- Recommendation Systems
- Data Streaming and Online Algorithms
- Advanced Topics in Machine Learning
- Unsupervised Learning Methods
- Intro to Reinforcement Learning

BIG DATA AND STATISTICS

- Cloud Computing
- Advanced Big Data Platforms
- Application of Machine Learning on Big Data Platforms
- Advanced Topics in Statistics and Data Analysis

APPLIED MACHINE LEARNING AND DATA SCIENCE

- Scientific Computing
- Bioinformatics
- Numerical Analysis
- Computer Graphics
- Computer Vision
- Natural Language Processing
- Image Processing
- Topics in Data Mining and Genomics

INFRASTRUCTURE AND COMPUTER SCIENCE GENERAL COURSES

- Distributed Algorithms
- Cryptography
- Advanced Cryptography: Secure Computation
- Network Security
- Advanced Algorithms

PREPARATORY COURSES FOR NON-COMPUTER SCIENCE GRADUATES

- Intro to Computer Science and Programming in Python
- Intro to Operating Systems and Databases
- Data Structures, Algorithms and Complexity
- Linear Algebra for Data Science

MANDATORY FINAL PROJECT (5 credits)

- Final Project: Independent research and development with industry and/or academic collaboration. Can be extended to a thesis.

Reichman University reserves the right to cancel, alter, or expand the academic programs offered.

REICHMAN UNIVERSITY

FAST FACTS



Israel's
first and only

private university



Over **30**
research institutes
at Reichman University

www.runi.ac.il/research-institutes



Over **30,000**
graduates
worldwide

The Career Center

aims to assist alumni in
integrating into the professional
market, as well as to
assist employers who
are seeking to recruit
suitable candidates



Over **2,000**
Raphael Recanati International
School students from over
90 countries make up
1/3 of the Reichman
University student body



The Israeli Council for Higher
Education granted Reichman
University permission to confer

doctoral degrees



REICHMAN UNIVERSITY: THE MOST INTERNATIONAL UNIVERSITY IN ISRAEL

Reichman University created new, academic **interdisciplinary concepts** in the fields of entrepreneurship, counter-terrorism and sustainability - models that are being implemented around the world



Over **300** Lone Soldiers studying for full degrees

Reichman University's Alumni Association,

with over 30,000 graduates, forms a professional and social alumni community that promotes **networking** from different countries, and strengthens the pride and belonging to Reichman University and the alumni



Ranked **no. 1** in Israel for our treatment of **IDF reservists**



APPLICATION, ADMISSION, TUITION

APPLICATION PERIOD

The application period for the 2022-2023 academic year is **November 15, 2021 - August 31, 2022**

The application period for students required to take preparatory courses ends on **June 30, 2022**.

Due to the competitive nature of the admissions process, we recommend that applicants prepare their application well in advance of the deadlines. Reichman University reserves the right to impose stricter criteria upon applicants during the late application period or upon applicants who submit material late. Preference will be given to applicants who submit all required material during the regular application period.

ADMISSION CRITERIA

- Completed undergraduate degree from a recognized academic institution
- One of the following:
 - B.Sc. in Computer Science, with a GPA of at least 85%
 - B.Sc. in other fields, with a GPA of at least 90%
- Non-Computer Science students will be required to take the following 3 preparatory classes: Introduction to Computer Science and Programming in Python; Data Structures Algorithms and Complexity; Introduction to Operating Systems and Databases.
- Students with an insufficient quantitative background will be required to complete the following prerequisite courses: Linear Algebra for Data Science; Calculus A/B; Probability Theory.
- The academic program of the Raphael Recanati International School is taught entirely in English. Graduates of schools in which English was not the primary language of instruction are required to pass the TOEFL (Test of English as a Foreign Language) or an equivalent test, such as the IELTS (International English Language Testing System) or the Israel Psychometric Examination.

TOEFL www.toefl.org

IELTS www.ielts.org

APPLY ONLINE AT
forms.idc.ac.il/MA

ONLINE APPLICATION

Please note your application must include:

- Official transcripts of previous academic undergraduate and graduate studies. Transcripts must bear the official stamp of the issuing institution. If you do not send the original transcript, scanned photocopies of the original documents will be accepted if properly notarized.*
- Copy of passport or identity card
- Curriculum Vitae (CV)

Note that candidates may be interviewed.

* An official, notarized English translation must be submitted for all transcripts not originally issued in English or Hebrew.

TUITION & FEES

- The application fee is **300 NIS** (non-refundable)
- The down payment is **NIS 8,000**. Applicants must pay this fee to secure their place in the program after being accepted. Once the down payment has been received the applicant's place is secured and confirmed.
- The tuition for the entire M.Sc. in Machine Learning & Data Science is **NIS 70,000**. Prerequisite courses are charged separately, based on the specific course plan for each student.

If payment is in Israeli shekels, the value in shekels will be determined according to the exchange rate on the day that payment is received.

Reichman University reserves the right to change all tuition and fee rates without prior notice.

FINANCIAL AID

STUDENT AUTHORITY

The Government of Israel offers financial assistance for graduate school tuition to new immigrants under the age of 30, provided they do not already have a graduate degree from abroad and that their program of choice is recognized by the Student Authority. Students must begin their graduate studies within three years of their aliyah date (not including army service), in order to be eligible for this assistance.

For more details about conditions of eligibility and the application process please visit:

https://www.gov.il/en/Departments/Units/students_authority_maya

FAFSA

American students may be eligible for Stafford Loans as part of the Direct Loans Program. Check your eligibility with the RRIS Financial Aid office: rris.financialaid@idc.ac.il

Students can register online at www.studentaid.gov from October 1, 2021 to April 1, 2023 for the 2022-'23 academic year. Our school code is G40703.

For further information see www.runi.ac.il/fafsa

MASA

Jewish students between the ages of 18-30 who have not previously been on a long-term program to Israel and have not made aliyah are eligible for a onetime grant from Masa towards tuition.

www.masaisrael.org



FOR MORE INFORMATION

<https://www.runi.ac.il/en/schools/rris/graduate/pages/financial-aid.aspx>



✔ Networking is the name of the game!

To date, there are more than 27,000 Reichman University graduates from more than 90 countries. This gives students a unique opportunity to meet people from different backgrounds and learn about other nations and cultures, and to establish friendships that last a lifetime. It also creates a worldwide networking system that gives our students an advantage throughout their lives.

✔ Our small classes create an intimate atmosphere, which allows students to get to know each other and the staff. Our philosophy is that our students are our partners.

✔ Reichman University is one of the most prestigious universities in Israel. Employers seek Reichman University graduates because they come with practical tools and hit the ground running. Reichman University operates a Career Development Center that aims to prepare students and alumni for the job market, and to provide them with the tools to find suitable employment both before and after they graduate.

✔ Reichman University offers a large array of extracurricular activities: sports, debate club, Model UN, Israel advocacy, JLIC-RRIS Friday night dinners, shiurim, mincha club, choir, band, and much more.

✔ The Raphael Recanati International School provides very special care for its students. We are the largest academic absorption center in the country. We are especially proud that we are home to more than 300 lone soldiers, who are currently studying here.

WHY REICHMAN UNIVERSITY?

✔ Reichman University was ranked number one in student satisfaction for quality teaching for four consecutive years, in a nationwide survey conducted by Israel's Council for Higher Education. We are the first non-government-subsidized academic institution to grant doctoral degrees.

✔ One-third of Reichman University students are international, making us the most international university in Israel for full-degree students. Israeli students serve as counselors for first-year students in order to help them find their way around and get to know the system.



VISA & STATUS ASSISTANCE

Students are responsible for clarifying and establishing their status in Israel, and can turn to the Raphael Recanati International School staff for advice and assistance. Before commencing studies, all students must clarify their status and eligibility for a student visa (A-2), or Israeli citizenship, with the Israeli embassy or consulate in their country of origin. **A student visa should be obtained in advance, in the student's country of origin.** International students who are children of an Israeli parent must settle all matters, such as deferment of military service, with the nearest Israeli embassy or consulate.

The Jewish Agency provides advice and assistance to students considering immigrating to Israel.

See: www.jewishagency.org/JewishAgency/English/Aliyah/ and for North America/UK: www.nbn.org.il



CAREER CENTER

The Career Center strives to prepare students to enter the workplace and to help them find employment opportunities, by providing counseling, placement, and informational services. It is tailored to meet the specific needs of the students and graduates of each of Reichman University's schools, according to the relevant market. These services include personal career counseling and assistance, as well as lectures and workshops on job-seeking strategies, LinkedIn, and interviews. In addition, the Career Center creates recruitment and networking opportunities such as job fairs, Coffee Chats, and employers meetings. The center also maintains an updated listing of hundreds of job openings in Israel for students and graduates.

www.runi.ac.il/career/eng

HEALTH INSURANCE



All Reichman University students are required to have comprehensive health insurance coverage throughout the entire period of their studies. Israeli residents, including new immigrants, receive national health insurance for a low monthly fee, in accordance with the country's health insurance legislation. International students who are not covered by Israel's national health insurance (*bituach leumi*) should purchase their own health insurance policy to cover their medical needs while in Israel, or purchase the **UMS HAREL YEDIDIM** insurance policy for international students, offered by Reichman University.

Our special arrangement with HAREL YEDIDIM insurance company provides comprehensive health coverage for \$1,600 USD* per academic year, which will be charged at the beginning of each year.

In order to have continuous coverage, the policy is automatically renewed from one academic year to the next, until the end of the program, unless the student notifies the school in writing that he/she wishes to cancel.

**Rates are subject to change according to insurance company rate fluctuations.*



RRIS GLOBAL VILLAGE

706

36%
NORTH AMERICA

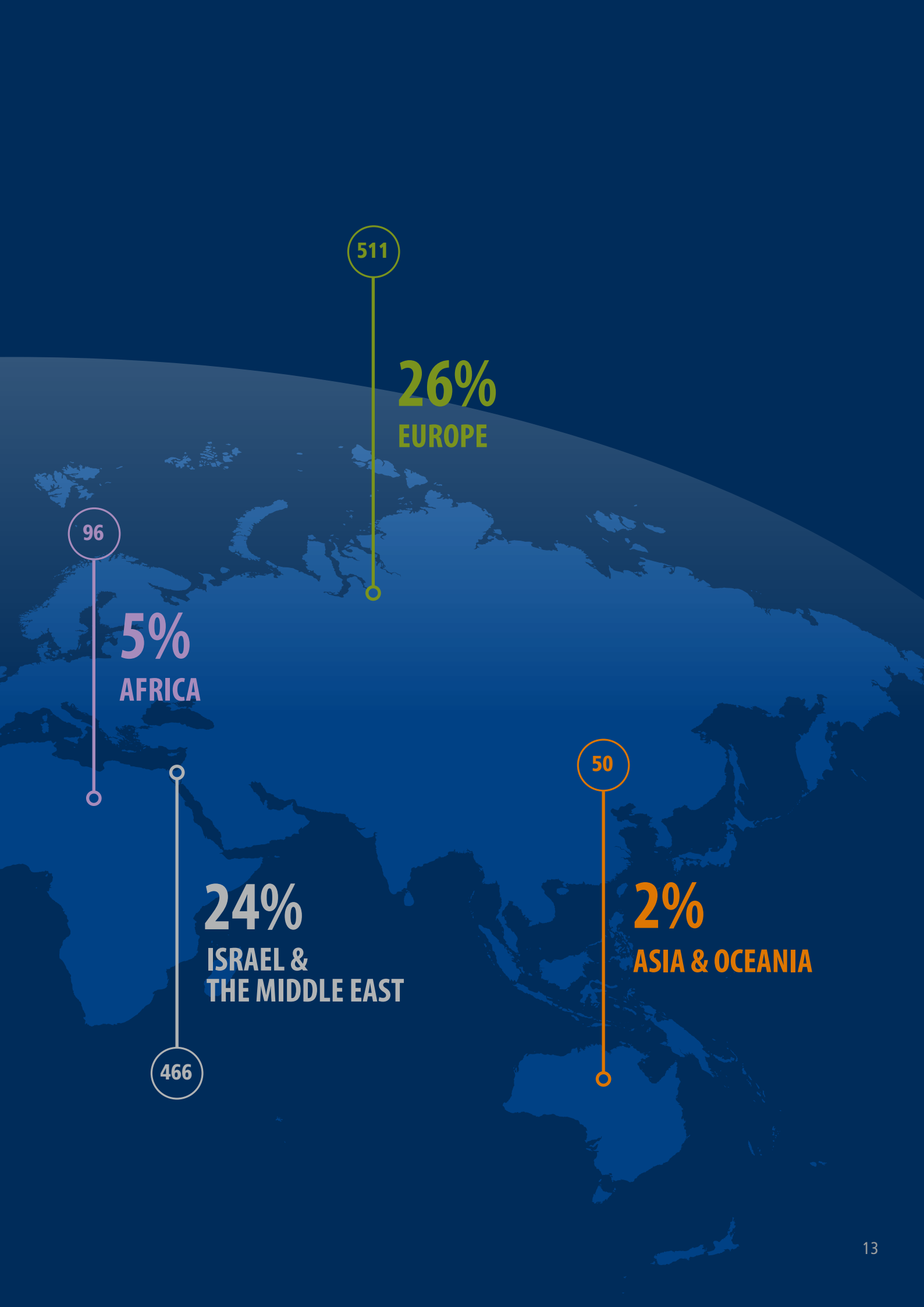
148

7%
LATIN AMERICA

30%



OF THE STUDENT POPULATION
OF REICHMAN UNIVERSITY ARE
INTERNATIONAL STUDENTS.
RRIS IS THE LARGEST ACADEMIC
ABSORPTION CENTER IN ISRAEL.



ACADEMIC CALENDAR

ה'תשפ"ג 2022-2023

Orientation week	October 23, 2022 - October 28, 2022
Fall semester begins	October 30, 2022
Memorial Day for Yitzchak Rabin z"l	November 6, 2022
Hanukkah break	December 25, 2022
Fall semester ends	January 27, 2023
Fall exams begin	January 29, 2023
Spring Semester begins	March 19, 2023
Passover break	April 2, 2023 - April 14, 2023
Studies resume	April 16, 2023
Eve of Holocaust Memorial Day	April 17, 2023
Holocaust Memorial Day ceremony	April 18, 2023
Israel Memorial Day Ceremony	April 24, 2023
Eve of Israel Memorial Day	April 24, 2023
Israel Memorial Day	April 25, 2023
Israel Independence Day	April 26, 2023
Shavuot break	May 25, 2023 - May 26, 2023
Spring semester ends	June 30, 2023
Spring exams begin	July 2, 2023

* The schedule is tentative and is subject to change.



Design Guy Tamir - guy@2plustudio.com
Production Shira Gazit, Liron Tzour
Editor Naomi Lipstein
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Oren Shalev, Ran Yitzhak, Maya Gershon, Shira Gazit



ISRAEL

**The Raphael Recanati International School
Reichman University**

PO Box 167, Herzliya, Israel 46150

Attention: MA Registrar

Tel +972 9 960 2700

Fax +972 9 952 7334

rris.master@idc.ac.il

NORTH AMERICA

**The Raphael Recanati International School
c/o American Friends of Reichman University**

142 W. 57th Street 11th floor

New York, NY 10019

Tel + 1 212-213-5962

Fax +1 212-213-6436

rris.us@idc.ac.il

www.rris.runi.ac.il

Submit your application online

forms.idc.ac.il/MA

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University** Raphael Recanati
International School