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joint degree

Erasmus University Rotterdam

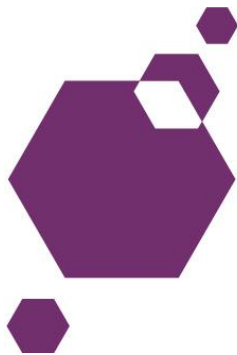
University of Amsterdam

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Study guide 2024-2025

Research Master's Program Business Data Science

July, 2024



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Introduction

The Research Master Business Data Science prepares talented and motivated students to enter high quality PhD programs in Business. It is a joint initiative of the Erasmus School of Economics of the Erasmus University Rotterdam (EUR), the Faculty of Economics and Business of the University of Amsterdam (UvA), and the School of Business and Economics of the Vrije Universiteit Amsterdam (VU).

The Research Master Business Data Science is a multidisciplinary research master program in which course instruction is provided by top scholars from the three participating Schools with a central focus on the performance of academic research within business disciplines, such as entrepreneurship and innovation, finance, human resources and organization, marketing, and operation research analytics.

The Business Data Science program distinguishes itself based on the following unique features:

- It is a two-year research master (120 EC) aiming to train future PhD students who will start their doctorate at one of the Schools in business and economics of the three partner universities.
- It has a strong focus on data science, presented to the students at a higher theoretical level than in a traditional master program.
- It ties the foundations of data science directly to different business fields. The availability of big data from a growing range of interconnected, interactive, and interoperable devices and the concurrent development of powerful quantitative techniques are giving rise to new perspectives and paradigms in scientific practice. This is particularly true in the field of business. As data collection has transformed from a tedious, expensive, and time-consuming practice into a continuous and, often, unobtrusive side-effect of day-to-day practices, behaviors and actions of people within and across organizations can be studied far more closely. Moreover, computing power and storage are not the limiting factors they once were.

To leverage these opportunities, there is an increasing demand for highly trained specialists who can extract insights out of big data to solve business-related problems.

- It is a small-scale program, where students work in close collaboration with faculty. The class-size limit of 30 students guarantees a high level of interaction in the classroom, detailed feedback from faculty, and the support of a strong cohort. Individual field courses will generally have fewer students due to their concentration in the various tracks.
- It is embedded in the fervid research culture of three leading universities, benefitting from the expertise and research network of top-notch faculty. Not only are the rich variety of topics and methodological approaches covered in this program unique, the broad network employed/drawn on by participating faculty (with connections at MIT, NYU, LBS, and JADS, to name a few) is a valuable asset for future scholars. The Research Master Business Data Science will create and take advantage of the same excellent educational and research environment and facilities as the Tinbergen Institute Research Master program in Economics (henceforth referred to as TI), including existing practices with regard to student recruitment and placement support. The cooperation between the three Schools guarantees first-rate education provided by highly qualified scholars, embedded in an excellent infrastructure.
- In addition, the program helps students to jumpstart their PhD trajectory not only through solid training, but also with direct experience in research (provided during the seminars, research clinic, research hackathons, skill workshops, thesis, interaction with faculty, research assistantships opportunities), and teaching (e.g., teaching assistantships opportunities).

The Research Master Business Data Science is therefore highly distinctive from existing training in the field of data science: it is a Research Master's program that primarily focuses on training academic researchers who apply data science techniques in the discipline of business.

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Research Master's Program Business Data Science

Registration with the universities

The Research Master Business Data Science (BDS) is a joint program of Erasmus University Rotterdam (EUR), University of Amsterdam (UvA) and Vrije Universiteit Amsterdam (VU).

Students are registered at three universities (EUR, UvA and VU). Erasmus University is the host university for the BDS program and charges the tuition fee. The students' grades are registered by Erasmus University. The degree that is awarded after the final examination is a joint degree (MSc) of the three partners.

Tuition fees are due until the final examination, the thesis, has been passed. The tuition fees are determined annually by the Dutch government and the universities.

The BDS research master program has its own Director of Graduate Studies (DGS) and Admission Board. The Examination Board and Educational Board serve both the BDS and Tinbergen Institute research master program.

The program's learning outcomes

Students who successfully complete the Joint Research Master Business Data Science will:

Knowledge and understanding

- I. have advanced knowledge and broad understanding of data science research methodology and its applications in business and management; this covers methods in statistics, econometrics, machine learning, and management science;
- II. have advanced knowledge and understanding of key research areas in business data science, for example in entrepreneurship, finance, human resources, marketing, and operation research analytics;

Application of knowledge and understanding

- III. be able to define research questions in business and management and answer these questions by specifying relevant theories, collecting relevant data, and applying advanced data science methods;
- IV. be able to apply/develop new data science approaches in order to solve relevant research questions in business and management;
- V. be able to design and specify models that tackle managerially-relevant research questions;
- VI. be able to design and implement approaches to validate model specifications and algorithms (e.g., formal proofs, analytical demonstrations, or empirical proof-of-concept in field or lab settings) in line with academic standards;

Making judgement

- VII. can critically evaluate research outcomes, and reflect on the ethical and social implications of the outcome of their analysis;

Communication

- VIII. be able to write research papers that are well structured, reflecting academic editorial standards;
- IX. be able to present and defend their research to an audience of academic researchers;

Learning skills

- X. to contribute original research to this field, under academic supervision;
- XI. respect and practice all current standard principles of scientific integrity, ethics, responsible data management and privacy;
- XII. have developed an attitude to independently keep track of the developments in one field of specialization and to embark on independent research in this field;
- XIII. work well in a team and reflect on own role and contribution within teams.

Curriculum

The Research Master in Business Data Science is a two-year program consisting of 120 EC. It is tailored to prepare recent Bachelor's degree graduates for PhD research and an academic career in one of the sub-disciplines in Business. The program is connected to three-year PhD research positions in the three participating faculties in Economics and Business but also prepares for research positions or a PhD at highly ranked universities elsewhere.

The learning objectives of the program are achieved through a curriculum designed around a Data Science foundation, a Business foundation and Research practice.

The program offers three tracks: Quantitative Finance, Management Science, Operation Research Analytics.

Data Science Foundation - Acquiring skills. In year 1, the primary objective is to build a solid data science foundation and expose students to a variety of methodological approaches. These skills are applied to various business disciplines in the field courses.

Business Foundation - Building knowledge. In year 2, students focus on a given business sub-discipline, selecting from among: 1) quantitative finance, 2) management science, and 3) operation research analytics. The courses assigned for each of these sub-disciplines have been carefully selected by a team of experts with the aim of ensuring the perfect learning trajectory that will lead to substantive contributions in the fields of each particular sub-discipline. The quantitative finance specialization starts in year 1 of the program

Research Practice - Aligning skills and knowledge. The program starts with an overview of the business problems that data science can address, which also exposes students to fundamental components of the different business fields. This early exposure helps students to absorb and process materials presented later in courses on methodology, with respect to the various business perspectives. Students become further acquainted with the different business fields during visits to the research departments of the partner schools throughout the first year, for which they will have to write a research proposal, as well as during the research hackathon. The research hackathon makes students think about how to approach the problems that arise in the various disciplines and puts their knowledge to the test. The research internship allows students to practice what they have learnt and introduces students to researchers and actual research projects. The Research Master thesis represent students' final moments of integrating business and data science, and will showcase their ability to identify relevant problems and address them using cutting-edge techniques to make a substantive contribution to the field. All courses are also open to current PhD students and students in the other ARC Research Master program who fulfill the prerequisites indicated in the Study Guide and in the course manual.

To further ensure a high research mindset, the lecturers of the program are selected experts from the three Schools and are top researchers in their field. Since classes are in small groups, teachers can be easily addressed by students. Students are stimulated to engage in research seminars and other activities and to make contact with the various research groups and individual researchers to explore research options.

Next to taking courses, students are encouraged to select a research topic for the final thesis and to actively explore potential supervisors. The final thesis is a research project, set up by the student under experts' supervision. The matching of students and supervisors, while largely the results of individual communication between the two parties, is supported by the DGS.

Osiris and Canvas

Study results are registered in Osiris. Students are encouraged to regularly check if all results in Osiris are up to date and correct.

Osiris is also used by students to register for courses, to address the Examination Board with individual requests and to apply for graduation.

Canvas is the digital learning environment for all courses in the curriculum. Teachers use Canvas for announcements, to publish course material, assignments and grades. Students upload their homework in Canvas. All assignments uploaded by students are automatically checked for plagiarism.

Students use their @student.eur account to access Osiris and Canvas.

Course Calendar 2024-2025

The courses are taught in blocks of eight weeks, with lectures during the first six (core courses) or seven weeks (field courses); the eighth week of each block typically serves as an exam week. Exception is block V which is extended by 2 weeks.

First-year (core) courses have weekly one-hour tutorials, taught by a teaching assistant, in which students work on and discuss homework assignments. In core courses, no graded homework may be assigned in the week prior to the exam.

Course attendance is mandatory; this applies to all core and field courses, the skills workshops, the research hackathon, and the business foundation (including the visits to/seminars of the research departments). Attendance is registered via attendance sheets and in Canvas.

The calendar for 2024-2025 is:

Block	Dates	
Block 0	August 26-August 30	Introduction and refresher courses in Programming and Mathematics
Block I	September 2-October 18	Lectures
	October 21-October 26	Exams
Block II	October 28-December 13	Lectures
	December 16-December 21	Exams
	December 23-January 3	Christmas Holidays
Block III	January 6-February 21	Lectures
	February 24-March 1	Exams
Block IV	March 3-April 17	Lectures
	April 22-April 25	Exams
Block V	April 28-May 2	Break
	May 6-July 12	Lectures and Exams

The course schedule is available on Erasmus University's [timetable](#) (login with ERNA account) or via the Erasmus University's [course guide](#) (select current academic year).

FIRST YEAR OF THE PROGRAM

In case of any difference between the first-year requirements in this study guide and the first-year requirements as stipulated in the Academic and Examination Regulations for 2024-2025 (AER), the AER prevails.

For course descriptions we refer to the [Erasmus course catalogue](#)

In the first year of the Research Master's program, students have to complete 60 EC:

- 11 core courses (44 EC)
- Parallel Computing (3 EC)
- 1 track-specific elective (4 EC) in block III
- Business Foundations (including the visits to the research departments of the schools) (1 EC)

The remaining 8 EC vary for each track (see below).

Students with a sufficient background in econometrics replace Mathematics, Statistics and Econometrics I, II, III with advanced courses. Students with sufficient background in Machine Learning replace Machine Learning I and II for Advanced Machine Learning I and Advanced Machine Learning II (Reinforcement Learning).

Please find an overview of the first year curriculum below.

FIRST YEAR RESEARCH MASTER BUSINESS DATA SCIENCE (Joint degree) 2024-25						
	Aug	Sept-Oct	Nov-Dec	Jan-Feb	Mar-Apr	May-July
Kick-off Principles of programming		Statistics/Asymptotic Statistics* (4 EC)	Econometrics 1/Advanced Econometrics 1* (4 EC)	Econometrics 2/Advanced Econometrics 2* (4 EC)	Econometrics 3/Advanced Econometrics 3* (4 EC)	Research Internship** (4 EC)
		Mathematics/Advanced Mathematics* (4 EC)	Machine Learning 1/Advanced Machine Learning* (4 EC)	Machine Learning 2/Reinforcement Learning* (4 EC)	Deep Learning (4 EC)	Natural Language Processing (4 EC)
		Decision Theory for Business (4 EC)	Parallel Computing (3 EC)	Track-Specific Elective (4 EC) (see below)	Simulation Analysis & Optimization (4 EC)	Track-Specific Elective (4 EC) (see below)
	Business Foundation, Visits to Business Departments, Skills Workshop (Integrity) (1 EC)					TI Lectures
Tracks	Quantitative Finance			Asset Pricing (4 EC)		Elective (4 EC) Empirical Asset Pricing, Empirical Corporate Finance, or Market and Systemic Risk Management
	Management Science (Marketing, Innovation, Strategy, Human Resources and Organization Behavior, Knowledge and Information Networks)			Research Hackathon or Internship** (4 EC)		ABRI Elective** (4 EC)
	Operations Research Analytics			Research Hackathon or Internship** (4 EC)		Integer Linear Programming (4 EC)

*depending on the students' own level, **students can also opt for an elective

List of first-year courses and teachers in 2024-2025

Course name	Instructor(s)	ECTS	Block
Business Foundations and visits to research departments	Dullaert, Huysman, Khapova, Menkveld, Sotgiu, Stam	1 EC	I-II-III
Refresher course Programming in Econometrics	Bos	0 EC	0
Fundamentals of Linear Algebra	Wagener	0 EC	0
Fundamental Mathematics	Wagener	4 EC	I
Advanced Mathematics	Wagener	4 EC	I
Statistics	Nunez Queija	4 EC	I
Asymptotic Statistics	Khismatullina	4 EC	I
Decision Theory for Business	Van den Brink, Estevez-Fernandez	4 EC	I
Machine Learning I	Groenen, Schoonees	4 EC	II
Advanced Machine Learning I	Qaini	4 EC	II
Econometrics I	Camehl	4 EC	II
Advanced Econometrics I	Bos/Koning	4 EC	II
Parallel Computing & Big Data	Engelberts	3 EC	II
Machine Learning II	Schoonees, Groenen	4 EC	III
Reinforcement Learning	Liberali	4 EC	III
Econometrics II	V.d. Klaauw, Bloemen	4 EC	III
Advanced Econometrics II	Kleibergen, Juodis	4 EC	III
Econometrics III	Koopman	4 EC	IV
Advanced Econometrics III	Boswijk, Koopman	4 EC	IV
Simulation Analysis & Optimization	Heidergott, Ridder	4 EC	IV
Deep Learning	Raviv	4 EC	IV
Natural Language Processing	Donkers, Morren	4 EC	V
Research Internship and/or Track-specific Elective block V (see below)		4 EC	V
Asset Pricing	Vellekoop, Laeven	4	III
Empirical Asset Pricing	Andonov, Eiling	4	V
Empirical Corporate Finance	Verwijmeren, Koudijs, Obernberger, Eisert	4	V
Market and Systemic Risk Management	Cai, Zhou	4	V

Track specific electives

Experimental Research*	Van Horen	4	*
Theoretical Foundations of Entrepreneurship and Strategy*	Stam	4	*
Contemporary Issues in Organizational Behavior and Human Resource Management*	Khapova, Stollberger	4	*
Marketing Research with Purpose*	Verlegh	4	*
Research on Digital Innovation*	Tuertscher, Huysman	4	*

* The Amsterdam Business Research Institute of the Vrije Universiteit Amsterdam (ABRI), offers PhD education in Business and Management. **The schedule for ABRI courses differs from the schedule used in the Business Data Science curriculum.** Please check the [ABRI webpage](#) for the schedule for 2024-2025 and to register for the courses.

Study schedule for year one, 2024-2025

Period	Course code	Course name	Credits
0	TIC10001	Introduction Day	0
0	TIC10002 TIC10003	Fundamental Linear Algebra Refresher Course Principles of Programming in Econometrics	0 0
1-5	TIC10005	Business Foundations	1
1	TIC10011	Scientific Ethics for students	0
1-5	TIC20011	Scientific Integrity (credit awarded in the second year)	1
1	TIC10050 TIC10051	<i>One of the following courses:</i> Fundamental Mathematics Advanced Mathematics	4
1	TIC10052 TIC10053	<i>One of the following courses:</i> Statistics Asymptotic Statistics	4
1	TIC10300	Decision Theory for Business	4
2	TIC10040 TIC10041	<i>One of the following courses:</i> Econometrics I Advanced Econometrics I	4

2	TIC10200 TIC10201	<i>One of the following courses:</i> Machine Learning I Advanced Machine Learning	4
2	TIC10202	Parallel Computing and Big data	3
3		<i>Choose track:</i> Quantitative Finance Track Management Science Track Operation Research Analytics track	
3	TIC10042 TIC10043	<i>One of the following courses:</i> Econometrics II Advanced Econometrics II	4
3	TIC10203 TIC10204	<i>One of the following courses:</i> Machine Learning II Reinforcement Learning	4
3		Track specific elective: see below	4
4	TIC10044 TIC10045	<i>One of the following courses:</i> Econometrics III Advanced Econometrics III	4
4	TIC10207	Simulation Analysis & Optimization	4
4	TIC10208	Deep Learning	4
5	TIC10210	Natural Language Processing	4
5	TIC10405	Research Internship/elective	4
5		Track-specific field course	4

Students choose a track before block 3. Tracks are:

- Quantitative Finance
- Management Science
- Operation Research Analytics

Track-specific field courses year 1 Quantitative Finance

Period	Course code	Course name	Credits
3	TIC10301	Asset Pricing	4
5	TIF10009 TIF10011 TIF10010	<i>Two of the following courses:</i> Empirical Asset Pricing Empirical Corporate Finance Market and Systemic Risk Management	8

Track-specific field courses year 1 Management Science track

Period	Course code	Course name	Credits
3	TIF10205 TIF10400 TIF10403	<i>One of the following courses:</i> Experimental Research (ABRI)* Research Hackathon Research Internship	4
5	TIF10206 TIF10320 TIF10209 TIF10321	<i>Two of the following courses:</i> Marketing Research with Purpose (ABRI)* Theoretical Foundations of Entrepreneurship and Strategy (ABRI)* Theoretical Perspectives on Digital Innovation (ABRI)* Contemporary Issues in Organizational Behavior and Human Resource Management (ABRI)*	8

* The Amsterdam Business Research Institute of the Vrije Universiteit Amsterdam (ABRI), offers PhD education in Business and Management. **The schedule for ABRI courses differs from the schedule used in the Business Data Science curriculum.** Please check the [ABRI webpage](#) for the schedule for 2024-2025 and to register for the courses.

Track-specific field courses year 1 Operation Research Analytics track

Period	Course code	Course name	Credits
3	TIF10400 TIF10403	<i>One of the following courses:</i> Research Hackathon Research Internship	4
5	TIF10211 TIF10405	<i>Both of the following courses:</i> Integer Linear Programming Research Internship	8

At predetermined times throughout the first year, the DGS interviews students to discuss their progress in the program.

At the end of the first year, only students who have earned at least 48 ECTS from the first-year courses and who completed the Business Foundations course (including the visits to the Research departments) can continue to the second year of the program. Students will also need to meet additional entrance requirements specific to each second-year course.

Business Foundations and visits to the research departments of the partner schools

Throughout the first year, students join organized visits to the research departments of the partner schools. During these visits, students are introduced to all research groups connected to the program, meet with scholars, and learn about the ongoing research projects. After having visited all research departments, students select a research topic and address a professor who is not teaching in the first year of the program. Students write a research proposal (2-3 pages) and discuss the proposal with the researcher.

The visits to the departments facilitate the matching process between students and prospective supervisors and introduce researchers to students who they did not (yet) encounter in the classroom.

Active participation during all visits is mandatory and will be checked by means of attendance sheets or in Canvas. Signing off for fellow students is considered fraud and will disqualify both students for the 1 EC for this module. Further penalties may be imposed by the examination board.

Research Hackathon

This course (4 EC) allows students to put their methodological knowledge to the test and to address business research questions that are of high academic and managerial relevance. It offers an important meta-learning experience, connecting all the teachings preceding the course and thought simultaneously.

For this course, students are expected to have prior experience with one or more high-level programming languages, such as R, Python, C++, and MATLAB and to work with LISA. Students are expected to bring their own laptop to the classes.

Research Internships

During Block 3 and 5 of the first year, and/or Block 1 and 2 of the second year of the research master Business Data Science, students have the option to pursue an individual research practice internship (3 EC) supervised by a researcher at EUR, UvA, or VU. The main purpose of the research internship is that students understand and experience how researchers conduct research and acquire additional knowledge in a specific area. In this way, the research internship can be used to either broaden the student's scope or allows the student to further specialize in a particular subfield or discipline.

Please note that projects for the research internship need to be approved by the internship coordinator before the start of the research internship period. Please carefully check the requirements for the internship by reading the course manual in Canvas and on the Intranet.

Maintaining a healthy work-life balance

A research master program is very demanding, especially in combination with a change of country and (study) culture. Our Intranet pages refer to [university student counsellors](#) and to workshops that are offered by the universities for students looking for personal support.

Registration for and withdrawal from courses

Students need to register for all courses by themselves at least three weeks before the start of the block. Registration is through [Osiris student](#) and is linked to the Canvas page for the course. Not registering for a course or registering beyond the deadline causes complications.

Assessment, grading, credits, and retakes in the core courses

Core courses are graded on a 1-10 scale, where 1 indicates very poor performance, 6 is the lowest passing grade, and 10 refers to outstanding performance. The final grade for a course block is rounded to the nearest multiple of .0 or .5, with the following exceptions: any grade between 5.0 and 5.5 is rounded to a 5; a 5.5 is rounded to a 6; a 0.5 does not exist. Grades for homework or midterm examinations do not need to be rounded.

The Research Hackathon, the Research Internship and the skills courses are marked with a pass or fail.

The Business Data Science program does not schedule retakes. Failed exams in the first year cannot be retaken in the same academic year. Instead, students should retake failed first-year courses in their second year in the program. Students cannot re-sit examinations that they have already passed or for which they have earned credits.

A compensation rule applies to students who have earned at least 48 ECTS for first-year courses within the first year of enrollment and who have completed the Business Foundations and visits to research departments module (1 EC) Students meeting this requirement may compensate at most one 5 in the core course sequence A with a 7.5 or higher obtained within the same core course sequence, and up to two courses in the core course sequence B. The compensation rule applies across years. Core course sequences are:

- **Course sequence A:** (Advanced) Mathematics/Statistics/Asymptotic Theory/(Advanced) Econometrics I-III;
- **Course sequence B:** (Advanced) Machine Learning I/ Machine Learning II (Reinforcement Learning) /Deep Learning/Natural Language Processing/Decision Theory for Business/Simulation Analysis & Optimization.

Right of inspection

As soon as possible and within 28 days of the announcement of the results of a written examination, the student can, on request, inspect his/her assessed work, the questions and assignments set, as well as the standards applied for marking. Inspection of the assessed work can only take place while the student is supervised by the examiner or an employee of the TI education office.

Checklist year 1

- Students complete 60 EC in year 1
- Course attendance is mandatory
- Students need to register in Osiris for courses at least 3 weeks before the start of the course
- Students with a strong background in math/stats/econometrics/machine learning take advanced courses in statistics, mathematics, econometrics and machine learning
- The program offers three tracks: students select their track before the start of block III
- Blocks III and V offer specific courses depending on the track
- Students have to complete 48 EC of first-year courses plus the Business Foundations/visits (1 EC) to research departments for access to year 2 of the program and for access to the compensation rule
- The compensation rule allows under conditions to compensate insufficient grades (fives)
- No retakes are scheduled in the same academic year

SECOND YEAR OF THE PROGRAM

The requirements in this section apply to the 2023 cohort of Research Master students.

In case of any difference between the second-year requirements in this study guide and the second-year requirements as stipulated in the Academic and Examination Regulations for 2024-2025 (AER), the AER prevails.

The transition regulations published on the Intranet form an integral part of the Academic and Examination Regulations.



The requirement for the second year is that students complete the course Bayesian Econometrics (3 EC); 24 EC consisting of the mandatory field courses that are specific for their track (listed below), electives and research internships (at most 6 EC of internships in year two); skills courses (3 EC) and a thesis (30 EC).

Study schedule for year two, 2024-2025

Period	Course code	Course name	Credits
1+2+3		Track-specific field courses, electives and research internships (internships max 6 cr)	24
2	TIF20117	Bayesian Econometrics	3
1/2/3	TIC20014	Skills Workshop II: Presenting and Academic Writing	3
3+4+5	TIC20899	Research Master Thesis	30

Quantitative Finance track (field-specific courses Y2)

Electives can be selected from (also see list below):

Period	Course code	Course name	Credits
1	TIF20102	Banking	3
1	TIF20107	Continuous Time Asset Pricing	3
1	TIF20100	Public Finance	3
1	TIF20101	Dynamic Corporate Finance	3
2	DHP-QF	Quantitative Investments 2 (VU course)	3
2	TIF20121	Law, Economics and Organizations	3
3	TIF20129	Behavioural Finance	3
4	TIF20302	Corporate Finance Theory	3
4	TIF20124	Sustainable Finance	3
5	TIF10007	Financial Frictions in Macroeconomics	3

Management Science track (mandatory field-specific courses Y2)

Period	Course code	Course name	Credits
1	TIF20212	Marketing Science	3
1	TIF20213	AI@Work	3
1	TIF20303	Social Network Analysis	3
2	TIF20112	Social Media Data Analytics	3

Other field courses can be selected from the elective list below.

Operation Research Analytics track (mandatory field-specific courses Y2)

Period	Course code	Course name	Credits
1	TIF20304	Decomposition Methods	3
1	TIF20305	Heuristic Optimization Methods	3
1	TIF20303	Social Network Analysis	3
2	TIF20112	Social Media Data Analytics	3

Other field courses can be selected from the elective list below.

Note that courses may be cancelled in case there are fewer than five registered students.

Electives can be selected among our list of field courses below, or among the external courses offered by LNMB, ABRI, ERIM or MasterMath. Advanced first year courses can be taken as a field course in year two for 3 EC.

Electives available in 2024 (this list is not exhaustive!)

Period	Course code	Course name	Credits
1	TIF20106	Applied Microeconometrics	3

1	TIF20213	AI@Work	3
1	TIF20218	Machine Learning in Econometrics (ESE, code FEM21045)	3
1	TIF20212	Marketing Science	3
1	TIF20401	Research Internship I	3
1	TIF20215	Social Network Analysis	3
1	TIF20102	Banking	3
1	TIF20107	Continuous Time Asset Pricing	3
2	TIF20126	Econometrics of Networks	3
2	TIF20111	Computational Finance (UvA, code 6314M0350Y)	3
2	TIF20403	Research Internship II	3
2	TIF20112	Social Media Data Analytics	3
3	TIF20126	Advanced Time Series Econometrics	3
3	TIF20123	Forecasting Methods	3
3	TIF20125	Reinforcement Learning	3
3	TIF20129	Behavioural Finance	3
4	TIF20124	Sustainable Finance	3
4	TIF20302	Corporate Finance Theory	3
5	TIF20797	BDS Lecture (TBA)	3
5	TIF20404	Field Paper	3
5	TIF20798	TI Economics Lecture (Peter Hull, <i>Design-based causal identification with regression and IV</i>).	3
	TIF20799	TI Econometrics Lecture (Isaiah Andrews (MIT))	3

Students who want to take external courses for credits need permission from the Examination Board (see below).

Students are strongly advised to complete all modules of the program before the end of the second academic year (i.e. within 24 months). Any extension beyond August 31 complicates the matching to PhD employment positions and involves the payment of tuition fees for (part of) the third academic year.

Taking external courses

Taking external courses for credits needs to be approved by the examination board. The university may charge a tuition fee for the course and additional requirements for participants may apply. Carefully check the university deadlines. Urgent advice is to start the procedures at least 2 months before the start of the course. Costs are only reimbursed if the DGS has advised to take the course. The program allocates typically 3 credits to any field course, including external courses, irrespective of the number of credits allocated to the same course elsewhere (an exception is made for MasterMath courses).

- Courses at Erasmus University Rotterdam: check [here](#).
- Courses at Vrije Universiteit: check [here](#).
- Courses at University of Amsterdam: check [here](#).
- Courses of the national MasterMath program: check [here](#).
- PhD courses of the Dutch Network on the Mathematics of Operations Research: check [here](#).
- ABRI courses: check [here](#).

Skills Workshops (3 EC in total)

In the second year, practical aspects related to how to handle the review process, and grant applications will be discussed. In these workshops, writing and positioning skills are emphasized. The series closes with a workshop on presentation skills for research talks and conference presentations.

Assessment, grading, credits, retakes and inspections in the second year

Assessment methods for field courses are a combination of class participation, presentations in class, essay assignments and take-home or sit-in examinations. No retakes are scheduled for field courses.

Field courses are graded along the same lines as core courses. The program does not schedule retakes. Instead, students can take another field course or write a field paper to replace the failed course.

The Research Hackathon, the Research Internship and the skills courses are marked with a pass or fail.

Inspections of exams follow the rules for the first-year courses explained above.

Registration for and withdrawal from courses

Students decide in June in year one on a full program of (mandatory) field courses and electives, internships and external courses amounting to a maximum of 27 ECTS. Students need to register for retakes (if applicable) on top of the 27 ECTS. Changes in the selection of courses afterwards require explicit support in writing of the student's supervisor and needs the DGS' approval.

Important note: field courses may be cancelled in case fewer than five students sign up for a course. If a course is cancelled, an additional course can be selected by affected students.

In general, students are only allowed to register for second-year courses if they have earned at least 48 ECTS of first-year's credits and have completed the Business Foundations/research visits to the departments. Furthermore, students have to meet the entrance requirements that are specified for each individual course.

Thesis writing and matching to a supervisor

The Research Master thesis represents the students' final moments of integrating business and data science, and will showcase their ability to identify relevant problems and address them using cutting-edge techniques to make a substantive contribution to the field. In the first year of the program, students are encouraged to select a research topic for the final thesis and to actively explore potential supervisors. The matching of students and supervisors, while largely the results of individual communication between the two parties, is supported by the DGS.

Timeline for the thesis:

- March/April in year 1: meeting with DGS on research topic and potential supervisor
- September/December year 2: students who did not find a supervisor will be assisted
- January year 2: official start of the thesis trajectory
- In block V of year 2: pre-defense when about 80% of the research has been done
- Before August 15: end of the thesis trajectory, deadline to submit the final thesis.

Students who need more time to finalize the thesis and cannot defend or submit by the deadlines, have to re-enroll for the third year in the program and have to pay the tuition fee.

The thesis manual published in Canvas gives details on requirements and assessment, the student's and the supervisor's responsibilities and procedures. Students match up with a master thesis supervisor before block V in the first year of the program, and no later than December of the second year.

Grading of the thesis:

- Weight pre-defense: 20%
- Weight Final Thesis: 80%

Thesis supervisors are available at the three Schools participating in the BDS research master. Under conditions and with permission of the DGS, students are allowed to work with a thesis supervisor from another school and/or university. The assessors of the thesis must be faculty members of one of the three partners in the BDS research master's program.

The matching with a supervisor is largely a result of individual conversations between the student and the supervisor. While there is no formal registration process, the DGS can only support the matching process effectively if all students inform the staff of their matching process by sending an email to thesis@businessdatascience.nl. If there are difficulties in the matching process, students contact the DGS (dgs@businessdatascience.nl).

The three faculties participating in the Business Data Science Research Master Program have PhD positions available for students who have completed the program. In many cases, the thesis supervisor will fulfill the role of PhD thesis supervisor. The DGS updates the students towards the end of the first year about the number of expected PhD positions at the three universities. Students are advised to check with their thesis supervisor under what conditions they can transfer to a paid PhD position with that same supervisor. Students are also encouraged to investigate externally funded PhD opportunities available at the Schools. To facilitate this, potential supervisors present to students their externally funded PhD projects.

Note that PhD positions are given by the faculties and that the DGS has no influence over the number of positions or the distribution of positions to specific supervisors. In a typical year, all students who perform well and pass the research master program can transfer to a PhD position. However, as the faculties and not the DGS provide PhD positions, the DGS cannot guarantee a PhD position for all students.

All theses are checked for plagiarism.

The submission of the thesis can only take place if the student has earned the credits for all other study units (core and field courses, skills workshops, Business Foundations including visits to the research departments, research hackathon/internships and electives).

Graduation

Students are strongly advised to complete all modules of the program before the end of the second academic year (i.e., within 24 months). Any extension beyond August 31 complicates the matching to PhD employment positions and involves the payment of tuition fees for (part of) the third academic year.

Students apply for graduation in Osiris two weeks before the submission of the thesis and always before August 1 if they want to graduate within the same academic year.

A graduation ceremony is organized each year, usually in November.

Seminars

Faculty members organize a wide variety of seminar series and conferences. Student participation in seminars is highly recommended. However, no course credits are allocated. Seminar schedules can be found [here](#).

Checklist year 2

- Students complete 60 EC in year 2
- Track: students complete the mandatory track-specific field courses for their track of choice
- Students register in June of the first year for the full 2nd year course program (and for retakes from year 1)
- No retakes are scheduled
- Course attendance is mandatory
- For taking external courses: start procedures at least 2 months before the start of the course. Formal approval of the Examination Board is required.
- Deadline for the thesis pre-defense is end of block V; deadline for submission of the thesis is August 15. Students can only schedule the pre-defense with the approval of their supervisor. The thesis cannot be submitted before the credits for all other study units have been earned.
- Students apply for graduation in Osiris at least two weeks before submission of the thesis; students who want to graduate before September 1, apply for graduation before August 1.
- Tuition fees and registration with the universities are due until the final examination, the thesis, has been passed.

USEFUL INFORMATION

The Academic and Examination Regulations

The Academic and Examination Regulations (AER) for the BDS research master program are published on the [Intranet](#). The AER lists the requirements for the program, rules for cum laude, has an extensive chapter on plagiarism and misbehavior and defines the rights of the students.

Communication with the students

On the [Intranet](#) students can find all kinds of information: how to apply for reimbursement of travel costs, annual reports of the Educational and Examination Board, the AER and transition regulations that apply and how to contact study advisers and student counsellors.

Teams will be used by the DGS and the support staff for formal and informal announcements.

The @student.eur email addresses is used for correspondence in Canvas and Osiris. All students will also get access to a formal @businessdatascience email address which can be used for correspondence with potential supervisors or for communication with external persons.

The Examination Board

The Examination Board serves two research master programs: the Tinbergen Institute research master program and the Business Data Science research master program. The Examination Board is responsible for the quality of examinations and diplomas.

The Examination Board consists of four members, one of each faculty participating in the research master programs and one external member. The responsibilities and tasks of the Examination Board are explained in the Academic and Examination Regulations and in the Rules and Regulations for the Examination Board (both available on the Intranet) The Annual Report of the Examination Board is available upon request.

Students may contact the Examination Board for the following reasons:

- The Examination Board decides on deviations from the curriculum that may have a bearing on the diploma. Therefore, any requests for items such as taking courses provided by third parties for credits and exemptions from mandatory courses in the curriculum must be approved by the Examination Board.
- Students who miss an examination due to e.g. illness may ask for a re-sit in the same academic year.
- The Examination Board will rule on requests for adaptations with regard to examinations for students with a disability.

Individual requests are submitted via Osiris. The Intranet provides details on how to start a request and the documentation you need to provide to support your request. Contact address for the examination board is examinationboard@tinbergen.nl.

The Examination Board may take measures against a student in case of fraud, plagiarism or misbehavior.

Lodging an appeal

An appeal may be lodged against the way in which the result for an examination was reached or against any Examination Board decision. A detailed notice of appeal should be submitted to the [Examination Appeals Board](#) (CBE) of the Erasmus University. The procedures of the Appeal Board need to be followed carefully. Please read the instructions and deadlines on the Intranet. In general, the appeal must be lodged within six weeks after the decision which is appealed has been made.

The Educational Board

The Educational Board serves the same two research master programs as the Examination Board.

The Educational Board consists of six members. Three members are from the programs' teaching staff and/or research fellows; three members are research master students in one of the programs.

Student members are nominated by the students after elections and are appointed by the Faculty Board of Erasmus University. Student members are appointed for 2 years. Members are listed on the website. The rules and regulations as well as the annual report of the Educational Board are available upon request.

The Educational Board issues advice, both solicited and unsolicited, to the Directors of Graduate Studies on all matters concerning the educational program, with the objective to maintain or improve the quality of the program. The Educational Board's advice may concern all aspects of the program including composition of the curriculum, student facilities and teacher quality.

The student members organize an annual comprehensive program evaluation the outcome of which is discussed in the Educational Board meeting.

Students are free to contact Educational Board members with any concerns they may have about the program.

The Student Council

The Student Council is an independent student body that both informs and advises students, and organizes regular social events. For composition and agenda see the [website](#).

Facilities

The program supports students with various facilities, such as office space and reimbursement of travel expenses between Amsterdam and Rotterdam for coursework.

Admission

The BDS research master program is a selective program. Selection of students is done in a careful selection process. [Admission requirements](#) are listed on the website.

Funding

The program awards scholarships to selected students based on merit. Scholarships are granted by the Admission Board. Students who accept a scholarship are obliged to sign and thereby accept the scholarship regulations.

For second-year students, additional funding is offered by the faculties through research and/or teaching assistantships. These jobs offer valuable teaching and research experience. Students are encouraged to check job openings at the three faculties. Open positions are also advertised on the Intranet.

Student advisors/counselors

Students can ask the assistance of the study advisors, counselors, or psychologists at Erasmus University (<https://www.eur.nl/en/education/practical-matters/advice-counselling>)

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