ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

NATIONAL and KAPODISTRIAN UNIVERSITY of ATHENS

ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ & ΤΕΧΝΟΛΟΓΙΑΣ ΤΗΣ ΠΛΗΡΟΦΟΡΙΑΣ
SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY

ΜΕΤΑΠΤΥΧΙΑΚΟ ΑΝΑΛΥΤΙΚΗ του ΑΘΛΗΤΙΣΜΟΥ
MSc SPORTS ANALYTICS

MSc in Sports Analytics

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First Semested			
Courses	ECTS	Specialization	Part Time semester
Introduction to R and Python	5	1,2	1
Data Analysis	5	1	1
Visualization and Data Science-Story Telling	5	1,2	4
Sports Performance Analysis	5	1,2	4
Introduction to Statistical Methods	5	2	1
Second Semester			
Courses	ECTS	Specialization	Part Time semester
Sports Modelling	5	1,2	2
Big Data Analytics and Management	5	1,2	2-5
Applied Sport Economics	5	1,2	5
Machine Learning	5	1,2	2-5
Data Analysis	5	2	2
Sustainability in Sports	5	2	5
Third Semester			
Courses	ECTS	Specialization	Part Time semester
Basketball Data Science	5	1,2	3
Football Analytics	5	1,2	3
Anthology of Sports	2,5	1,2	6
Operational research and scheduling of athletic events	2,5	1,2	6
Coaching by numbers	2,5	1,2	6
Sports Law	2,5	1,2	6
Sports Management	2,5	1,2	6
Olympic Event Organization	2,5	1,2	6
Biomechanics of human movement	2,5	1,2	6
Integrated Exercise Physiology	2,5	1,2	6
Special Topics of Sports Analytics	2,5	1, 2	1-6

Anthology of Sports

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3 OR 6**
COURSE TITLE	Anthology of Sports		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	1,5	2,5
Workshops		
Labs		
	15	2,5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/HAgDoQe52eWfTEg

(2) LEARNING OUTCOMES

Learning outcomes
• Understanding the specific characteristics of data analysis across different sports and the differences in data structure and nature.

- Familiarization with the challenges of collecting, managing, and analyzing sports data in diverse competitive environments.
- Application of data analysis methods in track and field sports, with emphasis on prediction, movement evaluation, and technical performance.
- Understanding analytical approaches in net & wall sports, such as tennis and volleyball.
- Introduction to data analysis techniques in American sports, such as baseball, American football, and hockey.
- Analysis of challenges arising in e-games, due to the large availability of behavioral and strategic player data.
- Comparison of analytical requirements between one-on-one individual sports and team sports.
- Development of skills in applying analytical strategies through case studies using real data from various sports.
- Cultivation of abilities in designing and utilizing data for decision-making in sports.

General Competences

- Analysis and synthesis of data and information, using the necessary data technologies.
- Ability to work in an interdisciplinary environment.
- Adaptation to new situations.

(3) SYLLABUS

This course aims to introduce students to the specific characteristics of data analysis across various sports, as well as to the challenges related to data collection, data issues, and analysis. The course will cover track and field sports (prediction, movement and technique evaluation), net & wall sports (such as tennis and volleyball), and American sports (baseball, American football, and hockey). It will also examine the challenges that arise in e-games, where there is an abundance of available data (ranging from player behavior patterns to strategic choices). Finally, a comparison will be made between one-on-one individual sports and team sports. Case studies using data from different sports will be included.

Through this course, students will gain an understanding of the application of data analysis methods in different sports, as well as the challenges that emerge from this process. This knowledge will equip them with the tools needed to develop and implement analytical strategies in the field of sports.

(4) TEACHING and LEARNING METHODS - EVALUATION

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	criteria are provided on the course eClass platform and in the course materials.

(5) RECOMMENDED BIBLIOGRAPHY

- Albert, J., & Bennett, J. and Cochran, J.J. (2007). Anthology of Statistics in Sports. ASA-SIAM Series on Statistics and Applied Probability. Society for Industrial and Applied Mathematics.
- Albert J., Glickman M.E., Swartz T.B, Koning R.H. (2019). Handbook of Statistical Methods and Analyses in Sports, Handbooks of Modern Statistical Methods, Chapman & Hall/CRC
- Statistics Meets Sports Hardcover – March 1, 2023
- Dominicy Y. and Ley C. (2023). Statistics Meets Sports. Cambridge Scholars Publishing; 1st edition (March 1, 2023)

Applied Sport Economics

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**2 OR 5**
COURSE TITLE	Applied Sport Economics		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization Elective in SPORTS SCIENCE
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/g3K9BQqjQjxzxBj

(2) LEARNING OUTCOMES

Learning outcomes
• Understanding the fundamental principles and methodology of economic analysis in sports and the structures of the sports industry.

- Familiarity with the economic characteristics of professional leagues, teams, and athletes.
- Analysis of competition and pricing strategies within sports organizations.
- Understanding demand elasticity and the factors influencing fans' consumer behavior.
- Introduction to collective bargaining of player contracts and salaries, and the labor market mechanisms in sports.
- Understanding revenue distribution mechanisms and financial equilibrium between teams and leagues.
- Assessment of the economic impact of sports facilities and events at local and national levels.
- Analysis of the rights and broadcasting market as a key revenue pillar of the sports industry.
- Development of applied decision-making skills based on economic data for all stakeholders in sports.

General Competences

- Analysis and synthesis of data and information, using the necessary data technologies.
- Decision-making.
- Working in an interdisciplinary environment.
- Adaptation to new situations.

(3) SYLLABUS

The aim of the course is to apply the principles and methodology of economic analysis to various aspects of sports, including professional leagues, teams, athletes, facilities, events, and fan consumer behavior. Key topics addressed include competition, understanding pricing strategies, demand elasticity and its influencing factors, collective bargaining of player contracts and salaries, revenue distribution mechanisms, assessment of the economic impact of facilities and events, and the rights and broadcasting market.

Overall, applied sports economics can provide valuable insights into the complex interactions between economic forces and competitive strategies within the sports industry, significantly contributing to the decision-making process for all stakeholders—from investors and team owners to league administrators, policymakers, and fans.

(4) TEACHING and LEARNING METHODS - EVALUATION

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	use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.

(5) RECOMMENDED BIBLIOGRAPHY

- Késenne, S. (2014). The economic theory of professional team sports: An analytical treatment. Edward Elgar Publishing.
- Leeds, M. A., Von Allmen, P., & Matheson, V. A. (2022). The economics of sports. Routledge

Basketball Data Science

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3**
COURSE TITLE	Basketball Data Science		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/7mNQnGqQspHozKs

(2) LEARNING OUTCOMES

Learning outcomes
• Combination of programming, mathematics, and statistics skills for data analysis in the field of basketball. • Understanding of the fundamental principles of data science in sports, with

emphasis on applications in high-level basketball. • Familiarity with modern systems for collecting performance data, such as player movement tracking cameras. • Analysis of tracking data and their synchronization with game statistics. • Extraction of meaningful insights into player and team performance through integrated analytical approaches. • • Development of skills in applied evaluation of competitive behavior based on real-world data conditions.
General Competences
• Analysis and synthesis of data and information, using the necessary data technologies. • Decision-making. • • Working in an interdisciplinary environment.

(3) SYLLABUS

The detailed curriculum in Basketball data science combines programming skills and specialization in the field, with knowledge of mathematics and statistics to extract meaningful basketball-related insights from data. At the most elite level of basketball, teams use tracking cameras positioned at all angles of the court to monitor every movement each player makes on the floor. This data is then synchronized with player statistics to provide a comprehensive analysis of player performance.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes
REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE	Camera, mic, PC, MS Office, and TEAMS

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(5) RECOMMENDED BIBLIOGRAPHY

- Zuccolotto, P., & Manisera, M. (2020). Basketball data science: With applications in R. CRC Press.
- Shea, S. M., & Baker, C. E. (2013). Basketball analytics: Objective and efficient strategies for understanding how teams win. Advanced Metrics.

Big Data Analytics and Management

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**2**
COURSE TITLE	Big Data Analytics and Management		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization Course in Analytics with Applications in Sports Science
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/zLp3HGgD7bGAZRy

(2) LEARNING OUTCOMES

Learning outcomes
• Understanding the fundamental principles of analyzing and managing big data. • Familiarity with the challenges and issues of the Big Data era, such as scalability and information complexity.

• Understanding modern technologies and trends in the field of Big Data, including large databases and processing platforms. • Introduction to the Map-Reduce paradigm and the basic principles of distributed data processing. • Understanding Big Data Mining and its applications. • Familiarity with fundamental database concepts and basic design schemas. • Development of basic SQL skills for data retrieval and management. • Introduction to Data Engineering and data cleaning processes. • Handling missing values and applying data preprocessing techniques. • Familiarity with web scraping techniques for building datasets from websites.
General Competences
• Analysis and synthesis of data and information, using the necessary data technologies. • Decision-making. • Working in an interdisciplinary environment. • Adaptability to new situations.

(3) SYLLABUS

The course examines the analysis and management of large-scale data. It also explores the problems and challenges that arise in the era of Big Data. Technologies and trends in the field of Big Data are analyzed, including large databases, the Map-Reduce paradigm, Big Data mining, and Big Data platforms. Definitions and explanations of fundamental database concepts and their basic design schemas are provided. A brief introduction to the SQL language is also included. In addition, the course covers data engineering and data cleaning, with emphasis on handling missing values and collecting data from websites (web scraping).

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions

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- Chen, M., Mao, S., & Liu, Y. (2014). Big data: Related technologies, challenges and future prospects. Springer.
- Marz, N., & Warren, J. (2015). Big data: Principles and best practices of scalable realtime data systems. Manning Publications.

Biomechanics of human movement

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3 OR 6**
COURSE TITLE	Biomechanics of human movement		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	1,5	2,5
	15	2,5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/6ojKMn9ewLQbXB4

(2) LEARNING OUTCOMES

Learning outcomes
• Understanding the fundamental concepts of biomechanical modeling for the analysis of human movement.

• Familiarity with the mechanical modeling of sports skills in the context of athletic performance. • Development of knowledge in human body kinematics and the related descriptive parameters. • Understanding the basic principles of movement dynamics and the forces that influence human motion. • Introduction to modeling the human musculoskeletal system for applications in performance analysis and enhancement. • Development of applied skills in human movement analysis through biomechanical approaches.
General Competences
• Working in an interdisciplinary environment.

(3) SYLLABUS

The course focuses on the concepts of biomechanical modeling for the analysis of human movement. It addresses students' needs regarding mechanical modeling from the perspective of analyzing sports skills, the development of key concepts in human body kinematics and movement dynamics, as well as an introduction to modeling the human musculoskeletal system.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes
REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE	Camera, mic, PC, MS Office, and TEAMS
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- McGinnis, P. M. (2013). Biomechanics of sport and exercise. Human Kinetics.

Coaching by numbers

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3 OR 6**
COURSE TITLE	Coaching by numbers		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	1,5	2,5
	15	2,5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/nwJ9zHLsTFkEMAC

(2) LEARNING OUTCOMES

Learning outcomes
• Upon successful completion of the course, students will be able to: • Interpret and critically evaluate key performance indicators (KPIs) in individual and team sports.

• Analyze data from multiple sources (statistical databases, video footage, tracking systems, wearable devices) and integrate them into coaching decisions. • Apply video analysis techniques to identify tactical, technical, and physical performance patterns. • Design data-informed training interventions aimed at addressing specific weaknesses and enhancing existing strengths. • Translate quantitative findings into actionable insights for coaches, strength & conditioning staff, and athletes. • Assess the suitability of analytical methods depending on the sport and competitive environment. • Combine data-driven evidence with coaching expertise, recognizing the assumptions and limitations of quantitative tools.
General Competences
• Analysis and synthesis of data and information, using the necessary data technologies. • Working in an interdisciplinary environment. • Decision-making. • Adaptation to new situations.

(3) SYLLABUS

In today's data-driven world, sports teams increasingly rely on analytics to gain a competitive edge. While coaches have traditionally depended on experience and intuition, the emergence of sports data analytics has revolutionized the way teams approach game strategies and player development. Sports data is part of a process of collecting, analyzing, and interpreting information related to athletic performance. Coaches and players use it to gain insights and make evidence-based decisions. Sports analytics data can be collected from various sources, such as video, wearable devices, tracking systems, and statistical databases. By identifying patterns in player performance, coaches can adjust training programs to address specific weaknesses or enhance existing strengths.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.

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</table>

(5) RECOMMENDED BIBLIOGRAPHY

- O'Donoghue, P., & Holmes, L. (2014). Data analysis in sport. Routledge.
- Passos, P., Araújo, D., & Volossovitch, A. (2016). Performance analysis in team sports. Taylor & Francis.

Data Analysis

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY			
ACADEMIC UNIT	DEPARTMENT OF STATISTICS			
LEVEL OF STUDIES	POSTGRADUATE			
COURSE CODE		**TRIMESTER**	**1**	
COURSE TITLE	Data Analysis			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**CREDITS**
			3	5
			30	5
COURSE TYPE	Specialization			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH			
COURSE DELIVERY METHOD	Distance			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO			
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/C8WjF6tdmJzyLE2			

(2) LEARNING OUTCOMES

Learning outcomes
• Develop an understanding of basic statistical methods using R. • Ability to perform descriptive analysis and graphical representation of data.

- Understand and apply random number simulations from theoretical distributions.
- Applying confidence intervals and hypothesis tests for one or two samples (independent and paired).
- Analysis of categorical data using contingency tables.
- Introduction to simple and multiple linear regression for modeling relationships between variables.
- Understanding and applying analysis of variance (ANOVA) for one and two factors.
- Development of skills in analyzing real datasets from various scientific fields.
- Become familiar with case studies and interpretation of statistical results in applied problems.
- Understanding basic principles of writing reports and presenting data analyses in a scientific manner.

General Competences

- Searching, analyzing, and synthesizing data and information, including the use of necessary technologies.
- Adaptability to new situations.
- Ability to work independently.
- Ability to work in an international environment.
- Ability to work in an interdisciplinary environment.
- Generation of new research ideas.
- Promotion of free, creative, and inductive thinking.

(3) SYLLABUS

Statistical methods are presented through simple problems using R: descriptive analysis, graphical representation, simulation of random numbers from theoretical distributions, confidence intervals, hypothesis tests for one and two independent samples, hypothesis tests for two paired samples, contingency tables, simple and multiple regression analysis, and analysis of variance (ANOVA) for one and two factors. Case studies and analysis of real datasets from various scientific fields (Economics, Marketing, Social Sciences, Sports, Medicine, Psychology, and others) are included. Basic principles of report writing and presenting data analyses are also covered.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
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<tr><td>Assignment writing</td><td>40</td></tr>
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	use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.

(5) RECOMMENDED BIBLIOGRAPHY

- Field, A., Miles, J., & Field, Z. (2012). Discovering Statistics using R. SAGE Publications Ltd.

Football Analytics

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3**
COURSE TITLE	Football Analytics		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/jDYSjmF3TCLfgjQ

(2) LEARNING OUTCOMES

Learning outcomes
• Understanding the evolution of performance analysis in professional football and the role of data in modern teams.

- Become familiar with performance analysis technologies, with an emphasis on video and detailed match data.
- Development of skills in interpreting and applying analytical insights within coaching and match processes.
- Ability to present and support evidence-based knowledge to coaches and decision-makers.
- Understanding basic principles of managing and utilizing large databases of players and teams.
- Applying data and analytical models for strategic club planning and decision-making.
- Development of skills in evaluating and assessing players and teams using modern football analytics methods.
- Cultivation of abilities for data-driven decision-making in match situations.

General Competences

- Analysis and synthesis of data and information, including the use of necessary data technologies.
- Decision-making.
- Ability to work in an interdisciplinary environment.

(3) SYLLABUS

Performance analysis in football has developed in recent years to the point where all professional teams have access to some level of data and employ performance analysts to assist coaches, analysts, players, and staff in working with new available technologies, particularly video. However, as detailed data and analytical insights become integrated into club processes, it is essential for personnel to have the skills not only to interpret and apply this information correctly but also to present and support knowledge to decision-makers. Teams also gather large databases containing their own subjective player information, but these data are often not managed properly, and clubs still have limited knowledge of how to use data for strategic planning. The Football Analytics course aims to develop managers who can make decisions—based on provided models—regarding match selections as well as the evaluation of both players and teams.

(4) TEACHING and LEARNING METHODS - EVALUATION

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	use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.

(5) RECOMMENDED BIBLIOGRAPHY

- Memmert, D., & Raabe, D. (2018). Data analytics in football: Positional data collection, modelling and analysis. Routledge.
- Memmert, D., Strauss, B., & Theweleit, D. (2023). Mind Match Soccer: The Final Step to Become a Champion. Springer Nature.

Integrated Exercise Physiology

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3 OR 6**
COURSE TITLE	Integrated Exercise Physiology		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	1,5	2,5
	15	2,5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/nFmXaKrAjMtFBkx

(2) LEARNING OUTCOMES

Learning outcomes
• Understanding the importance of biological and physiological data in monitoring athletic performance and athlete health. • Become familiar with physiological adaptations to exercise and training and

their contribution to performance improvement.
- Development of skills in assessing biological and physiological parameters using appropriate methods and tools.
- Understanding the main types of biological data that can be included in an athlete's monitoring record for medical or performance purposes.
- Ability to manage and interpret athlete monitoring data within the context of applied sport science.
- Development of applied skills in analyzing athletic activity by utilizing scientific knowledge and evidence-based practices.

General Competences

- Ability to work in an interdisciplinary environment.

(3) SYLLABUS

The aim of this course is to enable students to understand, monitor, and analyze biological and physiological data that can be included in athlete monitoring for performance and/or health purposes. Upon completion of the course, students will be able to recognize physiological adaptations to exercise and training, manage methods and tools for assessing biological and physiological parameters, identify all relevant biological data that can be included in an athlete's monitoring record for medical or performance purposes, and analyze athletic activity by applying scientific knowledge.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes
REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE	Camera, mic, PC, MS Office, and TEAMS

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- Kraemer, W. J., Fleck, S. J., & Deschenes, M. R. (2011). Exercise physiology: integrating theory and application. Lippincott Williams & Wilkins.

Introduction to Mathematics for Sports Analytics

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**1**
COURSE TITLE	Introduction to Mathematics for Sports Analytics		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	1,5	0
	15	0

COURSE TYPE	Specialization In Applied Sports Analytics
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/9geDri852Sic5io

(2) LEARNING OUTCOMES

Learning outcomes
The purpose of this introductory course is to refresh students' knowledge of basic mathematical concepts, particularly for those who do not come from a science or STEM

background.
General Competences
• Ability to work in an interdisciplinary environment. • Promotion of free, creative, and inductive thinking.

(3) SYLLABUS

During this course, the following topics will be covered: the concepts of differentiation, integration, function maximization, and basic concepts of linear algebra and matrices (matrix operations, matrix inversion, and determinants).

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
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TEACHING METHODS	

Activity	***Semester workload***
Lectures	15

	Lab Exercise	20
	Self-Study hours	30
	Course total	***65***
STUDENT PERFORMANCE EVALUATION	Evaluation language is English. Evaluation methods include lab exercises, written assignments, and/or written examinations. Oral examinations of the assignments may be conducted if clarifications are needed or if there are suspicions of plagiarism or unauthorized use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.	

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- Kraljevic, A. H. (2006). Calculus for Non-Mathematics Majors. Pearson.
- Harville, D. A. (2008). Matrix Algebra From a Statistician's Perspective. Springer.

Introduction to R and Python

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**1**
COURSE TITLE	Introduction to R and Python		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/4Rzjft7BXJbDE7r

(2) LEARNING OUTCOMES

Learning outcomes
• Understanding the basic principles of programming and algorithm development.

• Become familiar with the R environment and the management of objects and data. • Application of arithmetic operations, loops, and functions in R. • Development of skills in data visualization through charts and graphs in R. • Understanding the basic syntax and data types of Python. • Use of conditional structures, loops, and functions in Python. • Introduction to basic data processing techniques, such as reading/writing files, sorting, and filtering. • Implementation of a simple, integrated application using fundamental programming concepts
General Competences
• Searching, analyzing, and synthesizing data and information, including the use of necessary technologies. • Early-stage data processing. • Ability to work independently. • Ability to work in an international environment.

(3) SYLLABUS

Fundamentals of Programming. Introduction to R: basic package elements, command-line interface, and graphical interface. Arithmetic operations and expressions. Objects, object types, and data types. Loop syntax: for, while, and repeat loops. Program creation and result lists. Special commands. Plotting in R, including multiple plots. Functions. Introduction to Python. History, uses, and advantages. Basic syntax. Variables and data types: numbers, strings, lists, tuples, and dictionaries. Basic operations: assignment, arithmetic operations, printing text. Conditional statements: if-else. Loops: for and while. Creating and calling functions. Introduction to data processing: reading and writing files, data manipulation (sorting, filtering, etc.). Application of programming concepts: development of a simple end-to-end project as an example.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.

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(5) RECOMMENDED BIBLIOGRAPHY

- Wickham, H., & Grolemund, G. (2017). R for Data Science. O'Reilly Media.
- Matthes, E. (2019). Python Crash Course: A Hands-On, Project-Based Introduction to Programming. No Starch Press.

Introduction to Statistical Methods

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**1**
COURSE TITLE	Introduction to Statistical Methods		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization in Applied Sports Analytics
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/QdBwMFs6WojAfYp

(2) LEARNING OUTCOMES

Learning outcomes
• **Understand the basic tools and techniques of statistical analysis** for data interpretation and decision-making. • **Become familiar with SPSS software** to apply statistical methods to real-world

data. • **Develop skills in identifying patterns, trends, and relationships** through statistical data processing. • **Understand the contribution of statistical analysis to predicting and interpreting future behavioral changes.** • **Applying statistical results** in evidence-based decision-making processes in scientific and applied contexts.
General Competences
• Ability to work in an interdisciplinary environment. • Decision-making skills. • Promotion of independent, creative, and analytical thinking.

(3) SYLLABUS

This course introduces students to essential tools and techniques for analyzing and interpreting data, supporting informed decision-making. Through the application of statistical methods in SPSS, students develop skills to identify patterns, trends, and relationships in data, and enhance their ability to anticipate future behavioral changes.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
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Machine Learning

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**2 OR 5**
COURSE TITLE	Machine Learning		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization Course in Sports Data Science and Elective Specialization in Applied Sports Analytics
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/RgDzPEQrYYwae2w

(2) LEARNING OUTCOMES

Learning outcomes
• **Understand foundational concepts of Machine Learning** and their applications in data analysis. • **Recognize overfitting** and the bias–variance trade-off.

- **Differentiate between prediction and inference** in statistical learning.
- **Apply cross-validation techniques**, including train/test/validation splits and Bootstrap methods.
- **Gain knowledge of supervised and unsupervised learning approaches**.
- **Use classification methods** such as LDA, k-NN, neural networks, decision trees, random forests, SVM, and Naïve Bayes.
- **Evaluate model performance** using metrics including accuracy, sensitivity, specificity, ROC/AUC, Lift, Brier score, and F1.
- **Apply clustering techniques**, including hierarchical, k-means, density-based, and stochastic methods.
- **Use dimensionality reduction methods** such as PCA and SVD for data compression and representation.
- **Familiarize with shrinkage and variable selection techniques**, including LASSO.

General Competences

- Analysis and synthesis of data and information, including the use of appropriate data technologies.
- Decision-making skills.
- Ability to work in an interdisciplinary environment.

(3) SYLLABUS

The course examines fundamental concepts related to Machine Learning. Topics include overfitting and the bias–variance trade-off, as well as the distinction between prediction and inference. Cross-validation techniques are discussed, including train/test/validation splits and Bootstrap methods. Various learning approaches are also covered, such as supervised and unsupervised learning, along with classification methods including LDA, k-NN, neural networks, decision trees, random forests, support vector machines (SVM), and Naive Bayes.

The course also addresses model performance evaluation using metrics such as accuracy, misclassification rate, sensitivity, specificity, ROC curves, AUC, Lift, Brier score, and F1. Clustering techniques are introduced, including distance-based methods, hierarchical clustering, k-means, stochastic model-based clustering, and density-based clustering. Finally, dimensionality reduction methods, such as Principal Component Analysis (PCA) and Singular Value Decomposition (SVD), as well as shrinkage and variable selection techniques like LASSO, are analyzed.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Distance</td></tr>
<tr><td>METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS</td><td>Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.</td></tr>
<tr><td>ENSURING COMMUNICATION AMONG STUDENTS</td><td>Teleconference, Chat via eclass and/ or TEAMS, and QA sessions</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes</td></tr>
<tr><td>REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE</td><td>Camera, mic, PC, MS Office, and TEAMS</td></tr>
<tr><td>COURSE POLICY ON PLAGIARISM AND PLAGIARISM DETECTION TOOLS</td><td>Turnitin</td></tr>
<tr><td>COURSE POLICY ON USE OF AI TOOLS</td><td>The use of Artificial Intelligence is permitted with explicit reference to the bibliography (2) for the verbal correction of assignments and as long as students have understood the basic principles and methods of the course.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>30</td></tr>
<tr><td>Assignment writing</td><td>40</td></tr>
<tr><td>Lab Exercise</td><td>20</td></tr>
<tr><td>Self-Study hours</td><td>40</td></tr>
<tr><td></td><td></td></tr>
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<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>130</td></tr>
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</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
.</td><td>Evaluation language is English. Evaluation methods include lab exercises, written assignments, and/or written examinations. Oral examinations of the assignments may be conducted if clarifications are needed or if there are suspicions of plagiarism or unauthorized use of Artificial Intelligence tools. Assessment</td></tr>
</table>

	criteria are provided on the course eClass platform and in the course materials.

(5) RECOMMENDED BIBLIOGRAPHY

- Hastie, T., Tibshirani, R., & Friedman, J. (2009). The elements of statistical learning: Data mining, inference, and prediction. Springer.
- James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). An introduction to statistical learning: With applications in R. Springer.
- Murphy, K. P. (2012). Probabilistic machine learning: An introduction. MIT Press.

Olympic Event Organization

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3 OR 6**
COURSE TITLE			

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	1,5	2,5
	15	2,5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/gXH9DRnyTXLgk34

(2) LEARNING OUTCOMES

Learning outcomes
• Understand key aspects of planning and executing Olympic and major sporting events, from bidding to evaluation. • Gain insight into coordinating and collaborating with multiple stakeholders in

international events. • Analyze factors influencing athlete and spectator experiences in large-scale events. • Examine critical organizational areas, including infrastructure, security, marketing, and promotion. • Learn principles of sustainable sports event management and their community impact. • Develop applied skills through case studies of Olympic event planning and management.
General Competences
• Adapt effectively to new situations. • Foster independent, creative, and inductive thinking. • Make informed decisions. • Plan and manage projects efficiently.

(3) SYLLABUS

The course focuses on the key issues involved in the successful organization of Olympic events, spanning the bidding process, coordination and collaboration among various stakeholders, and post-event evaluation. It emphasizes the factors that shape the overall experience of both participating athletes and spectators, particularly regarding infrastructure, security, marketing, and promotion. The course also includes case studies on the connection with local communities within the framework of sustainable sports event management.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes

<table>
<tr><td>REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE</td><td>Camera, mic, PC, MS Office, and TEAMS</td></tr>
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<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>15</td></tr>
<tr><td>Self-Study hours</td><td>45</td></tr>
<tr><td></td><td></td></tr>
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</table>

(5) RECOMMENDED BIBLIOGRAPHY

- Parent, M. M., & Ruetsch, A. (2020). Managing major sports events: Theory and practice. Routledge.

Operational research and scheduling of athletic events

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3 OR 6**
COURSE TITLE	Operational research and scheduling of athletic events		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	1,5	2,5
	15	2,5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/25FEdHN4sW6nZ2a

(2) LEARNING OUTCOMES

Learning outcomes
• Understand fundamental principles of Operations Research and their application in sports decision-making. • Use mathematical optimization models to plan and organize sporting events.

- Analyze objectives and constraints in match scheduling, including facilities, team travel, and spectator attendance.
- Model sports scheduling problems using linear optimization techniques.
- Explore nonlinear models and solution algorithms, including genetic algorithms and simulated annealing.
- Evaluate and analyze match schedules using performance metrics such as fairness, balance, and commercial potential.
- Gain experience with software tools for sports schedule development and analysis.
- Apply scheduling methods to various sports and competition formats.

General Competences

- Collect, analyze, and synthesize data using relevant technologies.
- Collaborate effectively in interdisciplinary teams.
- Make informed decisions based on data and analysis.
- Adapt effectively to new situations and challenges.

(3) SYLLABUS

This course aims to introduce students to the applications of Operations Research in sports scheduling. Students will acquire knowledge in 54odelling and problem-solving techniques related to creating fair, efficient, and engaging match schedules across various sports.
Introduction to Operations Research: Fundamental concepts and methodologies, and mathematical decision-making models.
Sports Event Scheduling: Objectives and constraints, factors affecting schedule creation (e.g., facility availability, team travel, spectator attendance).
Problem Modeling: Linear optimization models for sports scheduling.
Nonlinear Models and Solution Algorithms: Techniques such as genetic algorithms and simulated annealing.
Schedule Evaluation and Analysis: Performance metrics for sports scheduling, including fairness, balance, and commercial viability.
Software Applications: Tools for developing and analyzing schedules.
Applications Across Different Sports: Case studies drawn from real-world sports practice.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance

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<tr><td>Lectures</td><td>15</td></tr>
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<tr><td>Self-Study hours</td><td>20</td></tr>
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(5) RECOMMENDED BIBLIOGRAPHY

- Lawrence, J.A. and Pasternack, B.A. (2002). Applied Management Science: Modeling, Spreadsheet Analysis, and Communication for Decision Making. Wiley & Sons
- Ribeiro C.C., Urrutia S., de Werra D. (2023). Combinatorial Models for Scheduling Sports Tournaments. EURO Advanced Tutorials on Operational Research Series. Springer Nature Switzerland; DOI: https://doi.org/10.1007/978-3-031-37283-4
- Serbin B.J. (2019). A Schedule Quick: Quick & Easy Scheduling for Recreational Sports Leagues

Special Topics of Sports Analytics

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**1-6**
COURSE TITLE	Special Topics of Sports Analytics		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization Course in Sports Data Science and Elective Specialization in Applied Sports Analytics
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/mzkNtqLXFs3FwLF

(2) LEARNING OUTCOMES

Learning outcomes
• Explore advanced and innovative topics in Sports Analytics beyond core courses. • Engage with cutting-edge techniques through expert-led lectures and

professional insights.
- Apply advanced performance analysis methods, including player tracking, tactical, and spatial analytics.
- Use machine learning for performance and injury prediction.
- Interpret data from wearable technologies and athlete monitoring systems.
- Integrate interdisciplinary approaches from biomechanics, psychology, and cognitive analytics.
- Understand advanced statistical and computational models, including Bayesian and financial 58odelling.
- Gain exposure to e-sports analytics and gaming data management.
- Develop applied skills through workshops, seminars, and project-based activities.
- Enhance decision-support capabilities for coaching, scouting, and strategic planning.

General Competences

- Searching, analyzing, and synthesizing data and information, including the use of appropriate technologies.
- Ability to work in an interdisciplinary environment.

(3) SYLLABUS

The course "Special Topics in Sports Analytics" aims to expose students to advanced, innovative, and contemporary topics in Sports Analytics through specialized lectures delivered by internationally recognized scientists and industry professionals. The course serves as a platform for introducing cutting-edge techniques and applications that are not fully covered in the program's core courses.

Additionally, this course incorporates activities such as thematic workshops, seminars, conferences, and hands-on project-based exercises that connect theory with practice.

Indicative Topics: (topics may vary each year/semester depending on collaborations and guest lectures)

- Advanced Player Tracking Analytics
- Tactical and Spatial Analysis in Team Sports
- Machine Learning for Performance and Injury Prediction
- Wearable Technologies and Data Interpretation
- Biomechanics and Sports Data
- Bayesian Models in Sports
- Psychology and Cognitive Analytics in Sport Performance
- Salary Cap and Financial Decision Modeling in Sports
- e-Sports Analytics and Gaming Data

• Decision Support Systems for Coaching and Scouting

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes
REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE	Camera, mic, PC, MS Office, and TEAMS
COURSE POLICY ON PLAGIARISM AND PLAGIARISM DETECTION TOOLS	Turnitin
COURSE POLICY ON USE OF AI TOOLS	The use of Artificial Intelligence is permitted with explicit reference to the bibliography (2) for the verbal correction of assignments and as long as students have understood the basic principles and methods of the course.
TEACHING METHODS	***Activity*** / ***Semester workload***
	Lectures: 15
	Assignment writing: 20
	Lab Exercise: 10
	Self-Study hours: 20
	Course total: ***65***
STUDENT PERFORMANCE EVALUATION	Evaluation language is English. Evaluation methods include lab exercises, written assignments, and/or written examinations. Oral examinations of the assignments may be conducted if clarifications are needed or if there

	are suspicions of plagiarism or unauthorized use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.

(5) RECOMMENDED BIBLIOGRAPHY

- Severini, T. A. (2020). Analytic methods in sports: Using mathematics and statistics to understand data from baseball, football, basketball, and other sports. 2nd Edition. CRC Press.
- Dominicy, Y., & Ley, C. (Eds.). (2023). Statistics Meets Sports: What We Can Learn from Sports Data. Cambridge Scholars Publishing

Sports Law

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3 OR 6**
COURSE TITLE	Sports Law		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	1,5	2,5
	15	2,5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/qrD7GaA9Hnb7emb

(2) LEARNING OUTCOMES

Learning outcomes
• Understand foundational concepts of international law through sports-related examples. • Learn methods for interpreting legal provisions in sports.

• Examine the institutional and regulatory frameworks governing sports nationally and internationally. • Explore legal and regulatory aspects of doping in sports. • Understand mechanisms for resolving sports disputes, including international adjudication. • Analyze the supranational aspects of global sports law and the limits of autonomy and independence. • Study the process of creating and implementing rules in sports, from enactment to practical application.
General Competences
• Ability to work in an interdisciplinary environment. • Adaptability to new situations. • Promotion of independent, creative, and analytical thinking

(3) SYLLABUS

This course introduces the fundamental concepts of international law as shaped through cases from international competitive and sporting activities. It covers the basic methods and procedures for interpreting legal provisions, the institutional framework of sports, the issue of doping, methods for resolving sports disputes, the supranational nature of global sports law, and the limits of autonomy and independence. The goal of the course is to understand how sports rules operate, from their creation to their practical implementation.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes
REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE	Camera, mic, PC, MS Office, and TEAMS

COURSE POLICY ON PLAGIARISM AND PLAGIARISM DETECTION TOOLS	Turnitin
COURSE POLICY ON USE OF AI TOOLS	The use of Artificial Intelligence is permitted with explicit reference to the bibliography (2) for the verbal correction of assignments and as long as students have understood the basic principles and methods of the course.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Evaluation language is English. Evaluation methods include lab exercises, written assignments, and/or written examinations. Oral examinations of the assignments may be conducted if clarifications are needed or if there are suspicions of plagiarism or unauthorized use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.

Activity	***Semester workload***
Lectures	15
Self-Study hours	45
Course total	***60***

(5) RECOMMENDED BIBLIOGRAPHY

- Nafziger, J. (2021). International sports law. In International Sports Law, 2d ed. Brill Nijhoff

Sports Management

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**3 OR 6**
COURSE TITLE	Sports Management		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	1,5	2,5
	15	2,5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/MPG87yrHH6g5aL9

(2) LEARNING OUTCOMES

Learning outcomes
• Understand the principles and functions of sports management in the sports industry. • Manage and coordinate sports organizations, events, and facilities.

• Develop strategic planning and policy implementation skills to achieve organizational objectives. • Learn human resource management processes in sports organizations. • Apply core management practices to ensure effective operation of sports enterprises. • Analyze the legal and ethical considerations affecting sports management. • Enhance decision-making and management skills in complex sports environments.
General Competences
• Adaptability to new situations. • Promotion of independent, creative, and analytical thinking. • Decision-making skills.

(3) SYLLABUS

The Sports Management course focuses on the organization, management, and coordination of various aspects of the sports industry. Its aim is to provide students with the knowledge and skills necessary for the smooth operation and success of sports organizations, events, facilities, and enterprises, with an emphasis on the core functions of sports management. The course covers the understanding of fundamental management principles, the importance of strategic planning, and the implementation of policies and procedures to achieve organizational objectives effectively. It also emphasizes human resource development and management processes, as well as understanding the legal and ethical aspects that influence sports and the administration of sports organizations.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes

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<tr><td>Self-Study hours</td><td>45</td></tr>
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(5) RECOMMENDED BIBLIOGRAPHY

- Masteralexis, L. P. (2023). Principles and practice of sport management. Jones & Bartlett Learning.
- Slack, T., & Parent, M. M. (2006). Understanding sport organizations: The application of organization theory. Human Kinetics.

Sports Marketing

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**2 OR 5**
COURSE TITLE	Sports Marketing		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization in Sports Data Science
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/FAZDHyXwaTYwKHC

(2) LEARNING OUTCOMES

Learning outcomes
• Understand core marketing principles and their application in sports. • Learn sports marketing practices for events, teams, athletes, and products/services.

• Analyze sports consumer behavior and decision-making factors. • Apply market research methods in the sports context. • Design and promote sports programs and communication strategies. • Develop skills in creating and managing sponsorship programs. • Enhance strategic promotion and commercial utilization of sports organizations and events.
General Competences
• Adaptability to new situations. • Promotion of independent, creative, and analytical thinking. • Decision-making skills.

(3) SYLLABUS

The purpose of the course is to familiarize students with the application of marketing principles and functions in the sports sector. Through the course, students analyze and gain deeper insight into topics and practices related to sports events, teams, athletes, and sports products or services. Emphasis is placed on understanding sports consumer behavior, the importance and methods of market research, and the creation and promotion of both sports programs and sponsorship initiatives.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes
REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE	Camera, mic, PC, MS Office, and TEAMS
COURSE POLICY ON PLAGIARISM AND PLAGIARISM DETECTION TOOLS	Turnitin

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<tr><td>COURSE POLICY ON USE OF AI TOOLS</td><td>The use of Artificial Intelligence is permitted with explicit reference to the bibliography (2) for the verbal correction of assignments and as long as students have understood the basic principles and methods of the course.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>30</td></tr>
<tr><td>Assignment writing</td><td>40</td></tr>
<tr><td>Lab Exercise</td><td>20</td></tr>
<tr><td>Self-Study hours</td><td>40</td></tr>
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<tr><td>Course total</td><td>130</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
.</td><td>Evaluation language is English. Evaluation methods include lab exercises, written assignments, and/or written examinations. Oral examinations of the assignments may be conducted if clarifications are needed or if there are suspicions of plagiarism or unauthorized use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.</td></tr>
</table>

(5) RECOMMENDED BIBLIOGRAPHY

- Dees, W., Walsh, P., McEvoy, C. D., McKelvey, S., Mullin, B. J., Hardy, S., & Sutton, W. A. (2022). Sport marketing. Human Kinetics.

Sports Modelling

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**2**
COURSE TITLE	Sports modelling		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	2,5
	30	5

COURSE TYPE	Specialization Course in Sports Data Science and Elective Specialization in Applied Sports Analytics
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/dkR2pcT2P6fcJQx

(2) LEARNING OUTCOMES

Learning outcomes
• Apply statistical modeling techniques to analyze sports performance. • Use simple and multiple linear regression with least squares for model fitting.

• Select relevant variables and appropriate models for sports datasets. • Identify and address violations of regression assumptions. • Perform prediction and inference on game outcomes and performance metrics. • Extend regression models to specialized sports data. • Explore logistic regression for sports without draws. • Apply multinomial regression for categorical outcomes in sports with draws, such as football.
General Competences
• Analysis and synthesis of data and information, including the use of appropriate data technologies. • Decision-making skills. • Ability to work in an interdisciplinary environment.

(3) SYLLABUS

The course focuses on the application of statistical 71odelling in the field of sports. It begins with an analysis of simple and multiple linear regression, emphasizing model fitting using the least squares method. Topics include variable selection, model selection, and the diagnosis and handling of deviations from model assumptions. Applications are presented using performance analysis data, as well as prediction and inference techniques for game outcomes in sports such as basketball. The course then explores the extension of regression models to specialized datasets suitable for sports 71odelling. Logistic regression is introduced for binary outcomes, with applications in sports that do not allow draws. Finally, multinomial regression is covered for categorical outcomes, with an emphasis on sports that permit draws as final results, such as football.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes</td></tr>
<tr><td>REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE</td><td>Camera, mic, PC, MS Office, and TEAMS</td></tr>
<tr><td>COURSE POLICY ON PLAGIARISM AND PLAGIARISM DETECTION TOOLS</td><td>Turnitin</td></tr>
<tr><td>COURSE POLICY ON USE OF AI TOOLS</td><td>The use of Artificial Intelligence is permitted with explicit reference to the bibliography (2) for the verbal correction of assignments and as long as students have understood the basic principles and methods of the course.</td></tr>
<tr><td>TEACHING METHODS</td><td>
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<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>30</td></tr>
<tr><td>Assignment writing</td><td>40</td></tr>
<tr><td>Lab Exercise</td><td>20</td></tr>
<tr><td>Self-Study hours</td><td>40</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Evaluation language is English. Evaluation methods include lab exercises, written assignments, and/or written examinations. Oral examinations of the assignments may be conducted if clarifications are needed or if there are suspicions of plagiarism or unauthorized use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.</td></tr>
</table>

(5) RECOMMENDED BIBLIOGRAPHY

- Wasserman, L. (2013). All of statistics: a concise course in statistical inference. Springer Science & Business Media.
- Krzanowski, W. J. (1998). An introduction to statistical modelling.
- Morgan, B. J. (2008). Applied stochastic modelling. CRC press.

Sports Performance Analysis

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**1 OR 4**
COURSE TITLE	Sports Performance Analysis		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization Elective
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/39zMXffir9JFdH7

(2) LEARNING OUTCOMES

Learning outcomes
• **Understand the principles of Performance Analysis** in applied sports science.

• **Perform tactical and behavioral evaluations** of athletes in real-world conditions. • **Measure technical effectiveness** using modern analytical methods. • **Analyze specific skills and technical elements** in performance. • **Utilize athlete monitoring technologies** and tools. • **Assess coach and athlete behavior** during training and competition. • **Integrate theoretical concepts** from coaching, pedagogy, and exercise science with practical analysis. • **Develop applied skills** to improve athletic performance using evidence-based methods.
General Competences
• Analysis and synthesis of data and information, including the use of relevant data technologies. • Decision-making skills. • Ability to work in an interdisciplinary environment.

(3) SYLLABUS

The Sport Performance Analysis course is an applied sports science program focused on understanding, improving, and analyzing performance in sports. The curriculum gradually develops students' knowledge in tactical analysis, measurement of technical effectiveness, and analysis of specific technical skills within actual athletic performance, using a range of modern techniques and technologies. Additionally, the course includes familiarity with coach and athlete behavior analysis and the application of athlete monitoring techniques. Core topics in Sport Performance Analysis are complemented by content from related fields such as coaching, pedagogy, and exercise science. These elements give the course a unique perspective, allowing students to understand both the theoretical principles and the applied skills that underpin effective performance analysis.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.
ENSURING COMMUNICATION AMONG STUDENTS	Teleconference, Chat via eclass and/ or TEAMS, and QA sessions

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	MS Teams, e-class, MS Outlook, R, Python, WayGround or Kahoot educational games and quizzes
REQUIRED EQUIPMENT AND TECHNOLOGY KNOWLEDGE	Camera, mic, PC, MS Office, and TEAMS
COURSE POLICY ON PLAGIARISM AND PLAGIARISM DETECTION TOOLS	Turnitin
COURSE POLICY ON USE OF AI TOOLS	The use of Artificial Intelligence is permitted with explicit reference to the bibliography (2) for the verbal correction of assignments and as long as students have understood the basic principles and methods of the course.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION .	Evaluation language is English. Evaluation methods include lab exercises, written assignments, and/or written examinations. Oral examinations of the assignments may be conducted if clarifications are needed or if there are suspicions of plagiarism or unauthorized use of Artificial Intelligence tools. Assessment criteria are provided on the course eClass platform and in the course materials.

Activity	***Semester workload***
Lectures	30
Assignment writing	40
Lab Exercise	20
Self-Study hours	40
Course total	***130***

(5) RECOMMENDED BIBLIOGRAPHY

- O'Donoghue, P. (2014). An introduction to performance analysis of sport. Routledge.
- Memmert, D. (Ed.). (2021). Match analysis: how to use data in professional sport. Routledge.

- Cullinane, A., Davies, G and O'Donoghue.P. (2024). An Introduction to Performance Analysis of Sport, Routledge.

Sustainability in Sports

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**2 OR 5**
COURSE TITLE	Sustainability in Sports		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization Elective in Applied Sports Analytics
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/4EBPYt5LsSSeosH

(2) LEARNING OUTCOMES

Learning outcomes
• Understand the basic principles of Sustainable Development in sports and their importance for modern sports organizations. • Become familiar with the concept and dimensions of the environmental

footprint of sports.
- Develop knowledge of environmental sustainability strategies aimed at reducing the impact of sporting activities.
- Understand and implement social sustainability programs within sports organizations and events.
- Introduction to economic sustainability principles in sports and the benefits of adopting sustainable practices.
- Become familiar with data management and statistical applications for evaluating environmental initiatives.
- Understand the role of marketing sustainable practices and attracting sponsorships through ecological initiatives.
- Develop skills to measure the environmental footprint of sports events using surveys and analytical methods.
- Cultivate the ability to design and implement sustainability strategies in sports organizations and events.

General Competences

- Adaptation to new situations
- Decision-making skills
- Respect for the natural environment

(3) SYLLABUS

The aim of this course is to train students in the implementation of Sustainable Development programs within sports organizations. Specifically, students will become familiar with strategies to reduce the environmental footprint of sports organizations, as well as the implementation of social sustainability programs. The course focuses on the following thematic areas: Introduction to Sustainable Development in Sports. The Environmental Footprint of Sports. Environmental Sustainability in Sports. Social Sustainability in Sports. Economic Sustainability in Sports. Benefits of Implementing Sustainable Practices. Data Management and Statistical Applications for Environmental Sustainability. Marketing of Environmental Practices and Sponsorship Attraction. Changing Perceptions through Ecology and Sports. Measuring the Environmental Footprint of a Sports Event Using Survey-Based Methods

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance

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</table>

(5) RECOMMENDED BIBLIOGRAPHY

- Parnell, D., & Widdop, P. (Eds.). (2015). Sport and Sustainability: Environmental Challenges and Strategic Solutions. Routledge.

Visualization and Data Story Telling

(1) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**TRIMESTER**	**1 OR 4**
COURSE TITLE	Visualization and Data Science-Story Telling		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	5
	30	5

COURSE TYPE	Specialization
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/N9W8bkZPiAysK5A

(2) LEARNING OUTCOMES

Learning outcomes
• Develop data storytelling skills for effective communication of analytical findings. • Ability to identify, collect, and acquire datasets from appropriate sources.

- Extract insights and knowledge from data using suitable analysis techniques.
- Apply data visualization to identify patterns, trends, and relationships.
- Construct a coherent narrative framework that explains the data and enhances audience understanding.
- Present results in multiple formats and media according to the needs of the analysis.
- Adapt data storytelling to different audiences and stakeholders to effectively disseminate conclusions.

General Competences

- Search, analyze, and synthesize data and information, using the necessary technologies.
- Adaptation to new situations.
- Decision-making skills.
- Ability to work independently.
- Work in an international environment.
- Work in an interdisciplinary environment.
- Generation of new research ideas.
- Exercise of critical and self-critical thinking.
- Promotion of free, creative, and inductive thinking.

(3) SYLLABUS

This course teaches students the essential skills to become effective data storytellers. They will learn how to identify and acquire datasets, extract insights from the data, and present their findings in a variety of formats. Students will learn how to "connect the dots" within a dataset through data visualization and uncover the narrative thread that explains what is happening, engaging their audience in a compelling data-driven story. Additionally, students will learn how to tailor their data storytelling to different audiences and stakeholders, adapting the presentation to maximize understanding and impact.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance
METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS	Remotely via email and through weekly office hours (and whenever necessary) via teleconferencing or in-person office visits.

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<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>30</td></tr>
<tr><td>Assignment writing</td><td>40</td></tr>
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<tr><td>Self-Study hours</td><td>40</td></tr>
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</table>

(5) RECOMMENDED BIBLIOGRAPHY

- Knaflic, C. N. (2015). Storytelling with data: A data visualization guide for business professionals. John Wiley & Sons.

Dissertation Thesis

(6) GENERAL

SCHOOL	SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY		
ACADEMIC UNIT	DEPARTMENT OF STATISTICS		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**SEMESTER**	**3 OR 5**
COURSE TITLE	**Dissertation Thesis**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
	0	30

COURSE TYPE	Background Specialization
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH
COURSE DELIVERY METHOD	Distance
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://cloud.aueb.gr/index.php/s/JEMgSGk82LCeR5e

(7) LEARNING OUTCOMES

Learning outcomes
The MSc Thesis aims to provide the student with the opportunity to: • develop and apply research methods to topics of scientific interest related to the field of study of the MSc program;

- deepen their understanding of the topic under investigation;
- review and critically engage with the existing literature;
- develop critical thinking by formulating appropriate research hypotheses;
- collect and appropriately analyze empirical data;
- acquire skills in investigation and drawing evidence-based conclusions;
- develop data storytelling skills for the effective communication of analytical findings to partners from collaborating companies, organizations, or sports teams;
- • identify and collect data from appropriate sources.

General Competences

The general competencies to be developed are the following:

- Ability to search for, analyze, and synthesize data and information using appropriate technologies.
- Ability to generate new research ideas and methodologies.
- Ability to use existing methodologies and tools, as well as to develop new ones.
- Ability to foster creative and inductive thinking.
- Ability to develop research skills consistent with the completion of a postgraduate degree
- Ability to produce a coherent and logically structured text demonstrating research competence and the capacity for independent work.
- Ability to address issues related to research design, methodology, ethics, and theoretical reasoning.
- Ability to develop skills in independent research.

(8) SYLLABUS

The preparation of the Master's Thesis involves the writing of a research study by the student, in which the existing literature is reviewed, research hypotheses are formulated, existing methodologies are examined and extended, relevant data are collected and processed, empirical results are presented, and conclusions are drawn.

The content of the thesis typically includes some of the following sections: Abstract, Introduction, Literature Review, Research Methodology, Data Description, Empirical Results, Simulations to support the findings, Summary and Conclusions, References, and Appendices.

(9) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance

<table>
<tr><td>METHOD AND FREQUENCY OF COMMUNICATING WITH THE STUDENTS</td><td>Remotely via email

Weekly virtual or in-person meetings</td></tr>
<tr><td>ENSURING COMMUNICATION AMONG STUDENTS</td><td>Teleconference, Chat via eclass and/ or TEAMS</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>MS Teams, e-class, MS Outlook, R, Python</td></tr>
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<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Thesis writing</td><td>150</td></tr>
<tr><td>Literature study</td><td>250</td></tr>
<tr><td>Analysis and problem solving</td><td>350</td></tr>
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<tr><td>Course total</td><td>750</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION
.</td><td>The evaluation of the Master’s Thesis is based on a set of criteria assessing each section as well as its overall quality. The thesis must be 70–100 pages in length, in accordance with the MSc thesis writing guidelines.

The thesis is checked for plagiarism and AI-generated content using Turnitin.</td></tr>
</table>

	The thesis is evaluated by a three-member examination committee consisting of the supervisor and two additional faculty members or instructors of the MSc program. The student is required to present the thesis before the committee. The committee assesses the quality of the written thesis, the student's performance during the presentation, and their ability to respond to questions, taking into account their understanding of the thesis subject.

(10) RECOMMENDED BIBLIOGRAPHY

- Regulations for Writing and Submitting the MSc Thesis.
- Guidelines for Writing the MSc Thesis.
- McCullagh, P. (2023). Ten projects in applied statistics. Springer Nature.