



Ministry of Higher Education and
Scientific Research - Iraq
University of Diyala
College of Engineering for Artificial
Intelligence Technology
Department of Cybersecurity Engineering



الملحق ٤: وصف المادة الدراسية

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Probability & Statistics		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	CSE 205		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	2	Semester of Delivery	
Administering Department	Cybersecurity Eng.	College	College of Artificial Intelligence Engineering Technology
Module Leader	Ali Abbood Khaleel	e-mail	Draliak@uodiyala.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	14/05/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	



**Ministry of Higher Education and
Scientific Research - Iraq
University of Diyala
College of Engineering for Artificial
Intelligence Technology
Department of Cybersecurity Engineering**



Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Provide a foundational understanding of statistics and probability, including key concepts such as randomness, probability measures, and finite probability spaces. 2. Explore discrete and continuous random variables, with a focus on binomial, Poisson, exponential, and normal distributions. 3. Develop skills in hypothesis testing, confidence intervals, and inferential statistics to make data-driven decisions. 4. Introduce statistical modeling techniques, including regression analysis, and their applications in prediction. 5. Cover advanced topics such as maximum likelihood estimation (MLE), maximum a priori estimation (MAP), statistical learning, and survival analysis. 6. Equip students with the tools to apply statistical methods to real-world problems, including machine learning and data analysis
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate a clear understanding of fundamental statistical and probability concepts, including probability spaces, conditional probability, and Bayes' theorem. 2. Analyze and interpret discrete and continuous random variables, including calculating mean and variance for various distributions. 3. Apply hypothesis testing and confidence intervals to draw conclusions from data. 4. Construct and evaluate statistical models, including linear regression, and use them for prediction. 5. Implement advanced statistical techniques such as MLE, MAP, and regularization in machine learning contexts. 6. Apply statistical methods to solve real-world problems, including multiple testing and survival analysis.
Indicative Contents المحتويات الإرشادية	• Introduction to statistics and its applications. • Basic probability concepts: sample space, events, and probability rules. • Understanding randomness and uncertainty. • Definition of finite probability spaces. • Definition and properties of discrete random variables.



**Ministry of Higher Education and
Scientific Research - Iraq
University of Diyala
College of Engineering for Artificial
Intelligence Technology
Department of Cybersecurity Engineering**



	• Binomial distribution: properties, mean, and variance. • Statement and proof of the Central Limit Theorem (CLT). • Implications of CLT for the normal distribution. • Sampling distributions and their role in inferential statistics. • Applications of MLE and MAP in machine learning.
--	---

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Deliver weekly lectures to cover theoretical concepts, supported by examples and case studies to illustrate key points. 2. Provide hands-on exercises and assignments to reinforce learning, including problem-solving tasks related to probability, distributions, and statistical inference. 3. Facilitate interactive discussions and group activities to encourage critical thinking and application of statistical concepts. 4. Incorporate the use of statistical software (e.g., R, Python, or SPSS) for data analysis, modeling, and visualization. 5. Use case studies and real-world datasets to demonstrate the application of statistical methods in various fields such as finance, healthcare, and machine learning.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		



**Ministry of Higher Education and
Scientific Research - Iraq
University of Diyala
College of Engineering for Artificial
Intelligence Technology
Department of Cybersecurity Engineering**



Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	20% (10)	6 and 12	LO #1 to #6
	Assignments	2	10% (5)	4, 7 and 10	LO #2 to #6
	Class work	2	10% (5)		
	Report				
Summative assessment	Midterm Exam	1 hr	10% (10)	9	LO #1 - #6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Overview of statistics and Probability
Week 2	Randomness, finite probability space, probability measure
Week 3	Events; conditional probability, independence, Bayes' theorem
Week 4	Discrete random variables; binomial and Poisson distributions; concepts of mean and variance
Week 5	Continuous random variables; exponential and normal distribution
Week 6	Probability density functions, calculation of mean and variance
Week 7	Central limit theorem and the implications for the normal distribution
Week 8	Confidence intervals and hypothesis testing
Week 9	Statistical Modeling, prediction and Regression
Week 10	Inferential Statistics
Week 11	Maximum likelihood estimation (MLE) and maximum a priori estimation (MAP) to machine learning problems
Week 12	Statistical learning
Week 13	Linear model selection and regularization
Week 14	Multiple testing



**Ministry of Higher Education and
Scientific Research - Iraq
University of Diyala
College of Engineering for Artificial
Intelligence Technology
Department of Cybersecurity Engineering**



Week 15	Survival analysis
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- Dekking, Frederik Michel, Cornelis Kraaikamp, Hendrik Paul Lopuhaä, and Ludolf Erwin Meester. <i>A Modern Introduction to Probability and Statistics: Understanding why and how</i>. Springer Science & Business Media, 2006. - Bertsekas, Dimitri, and John N. Tsitsiklis. <i>Introduction to probability</i>. Vol. 1. Athena Scientific, 2008. - Holický, Milan. <i>Introduction to probability and statistics for engineers</i>. Springer Science & Business Media, 2013.	Yes
Recommended Texts	- Kinney, John J. <i>Probability: an introduction with statistical applications</i>. John Wiley & Sons, 2014. - Sugiyama, M., 2015. Introduction to statistical machine learning. Morgan Kaufmann. - Tucker, Howard G. <i>An introduction to probability and mathematical statistics</i>. Academic Press, 2014.	No



**Ministry of Higher Education and
Scientific Research - Iraq
University of Diyala
College of Engineering for Artificial
Intelligence Technology
Department of Cybersecurity Engineering**



	Mendenhall, William, Robert J. Beaver, and Barbara M. Beaver. <i>Introduction to probability and statistics</i>. Cengage, 2020.	
Websites	https://youtube.com/playlist?list=PLo6jdcSSoHsLQGLzFrU6tg3e12IS_GDSZ&feature=shared	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				