جامعة الكوفة
كلية علوم الحاسوب و الرياضيات
قسم الرياضيات
الدراسات العليا
للعام الدراسي 2023-2024

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Advanced Complex Analysis**				
Credits	2				
Module Level	**MSc.**		**Semester of Delivery**	1st / 2023-2024	
Module Leader	Asst. Prof. Dr. Najlae Falah Al Saffar		**e-mail**	najlaa.hameed@uokufa.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Scientific Committee Approval Date			**Version Number**	1.0	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	- **To understand the applications of Residue for evaluation of definite and improper integrals occurring in Real analysis and Applied mathematics.** - **The purpose is to prepare the student to independent work in these topics and especially to use the methods of complex analysis in other areas of mathematics, (for example harmonic analysis and differential equations) as well as in applied areas (fluid dynamic, signal analysis, statistics).**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Students would be able to:** - **Be familiar with complex numbers and their geometrical interpretations.** - **Understand the concept of complex numbers as an extension of the real numbers.** - **Represent the sum function of a power series as an analytic function.** - **Demonstrate the ideas of complex differentiation and integration for solving related problems and establishing theoretical results.**

	- **Understand concept of residues, evaluate contour integrals and solve polynomial equations.**
Indicative Contents المحتويات الإرشادية	**It is important for the student to know and understand that: this course is intended both for mathematics students continuing to honors work and for other students using mathematics at a high level in theoretical physics, engineering and information technology, and mathematical economics.**

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	- **Lectures,** - **Encourage students' participation in the examples and exercises through classes,** - **Assignments,** - **Seminars,** - **Reports.**

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Complex Number, Analytic Function**
Week 2	**Power Series**
Week 3	**Multivalued Functions**
Week 4	**Complex Integration (1st part)**
Week 5	**Complex Integration (2st part)**
Week 6	**Complex Integration (3st part)**
Week 7	**Laurent's Series (1st part)**
Week 8	**Mid Exam**
Week 9	**Laurent's Series (2nd part)**

Week 10	**Zeros of Analytic Function**
Week 11	**Isolated Singularity, Maximum Modulus Principle**
Week 12	**Meromorphic Function, Inverse Function**
Week 13	**Calculus of Residues, Evaluation of Real Trigonometric Integral**
Week 14	**Conformal Mapping, Space of Analytic Function**
Week 15	**Seminar**

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	10	5		
	Assignments	5	5		
	Seminar	1	3	15	
	Report	1	2		
Summative assessment	**Midterm Exam**	1	15	8	
	Final Exam	1	70	16	
Total assessment			100% (100 Marks)		

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Dennis G. Zill and Patrik D. Shanahan, A First Course in Complex Analysis with Applications, John Bartlett Publication, 2nd Edition, 2010.**	**Internet**
Recommended Texts	**1. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford, 1990.** **2. J.B. Conway, Functions of One Complex Variable, Springer-Verlag, International student-Edition, Narosa Publishing House, 2002.**	**Internet**

	3. E.T. Copson, An Introduction to the Theory of Functions of a Complex Variable, Oxford University Press, London, 1972. **4. Ruel V. Churchill and James Ward Brown, Complex Variables and Applications, McGraw-Hill Publishing Company, 2009.** **5. H.S. Kasana, Complex Variable Theory and Applications, PHI Learning Private Ltd, 2011.**	
Websites	**There are mane websites for Advanced Complex Analysis.**	

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Advanced fuzzy transformations				
Credits					
Module Level		Master's	Semester of Delivery		
Module Leader	Name		e-mail	Shaimam.altaee@uokufa.edu.iq	
Module Leader's Acad. Title		Assistant Professor	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number		

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The main goal of fuzzy transformations is how to convert ordinary transformations into fuzzy transformations that help in solving fuzzy equations that do not have a solution in ordinary transformations. It also provides additional solutions for equations that have a single solution, and this helps us in the field of application because it gives better solutions and the freedom to choose from those solutions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Converting normal, well-known transformations into fuzzy transformations Solving ordinary fuzzy equations Solving partial fuzzy equations Solve a system of medical equations
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	First, a general review of transformations with all properties and theories

	Secondly, converting the transformations to normal fuzzy logic Third, converting fuzzy transformations into partial blurring Fourth, converting partial blurring to fractal Fifth, solutions to all the above points through usual examples as well as applied examples Including physical, medical and engineering

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Review ordinary transformations with their general concepts and properties
Week 2	Find the derivatives to the nth order for all known transformations and prove them
Week 3	Converting ordinary and well-known transformations, including the Laplace transform, to fuzzy logic, along with converting all properties to fuzzy logic.
Week 4	Converting all derivatives and theories of ordinary transformations into fuzzy logic, with a detailed explanation of fuzzy logic.
Week 5	Solving ordinary equations using fuzzy transformations has been transformed As well as solving fuzzy equations using these transformations
Week 6	Solving medical systems, applied physics examples, and Fortran equations using fuzzy transformations, including the Laplace transform.
Week 7	Convert fuzzy transformations into partial fuzzy transformations with all the properties
Week 8	Converting all ordinary fuzzy derivatives into partial fuzzy transformations with all theorems
Week 9	Solving the heat equation, the transport equation, and the vector equation with some important applications using the partial fuzzy Laplace transform.
Week 10	Introduction to ordinary fractal equations

Week 11	**Converting ordinary fractal equations into fuzzy fractal equations with some solution methods**
Week 12	Converting the partial fuzzy transform into a fractal fuzzy transform in order to solve fractal equations that are not solvable using these transformations.
Week 13	Examples of fractal applications using these transformations
Week 14	Comparing solutions of fuzzy equations with other solutions using other transformations
Week 15	Comparing applications and solutions of fuzzy equations with other solutions using other transformations
Week 16	

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam				
	Final Exam				
Total assessment			100% (100 Marks)		

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

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أسم المقرر: المعادلات التفاضلية الجزئية

اسم الوحدة / أو الموضوع	مخرجات التعلم المطلوبة	الساعات	الأسبوع
تصنيف المعادلات التفاضلية الجزئية من الرتبة الاولى والثانية, حل معادلات التفاضلية الجزئية خطية- غير خطية من الرتبة الاولى	انوع المعادلات التفاضلية الجزئية من الرتبة الثانية بمعاملات ثابتة وطرق حلها	6	الاول والثاني والثالث
حل المعادلات التفاضلية الجزئية خطية-المتجانسة ذات معاملات ثابتة ودرجات عليا	انوع المعادلات التفاضلية الجزئية من الرتبة الثانية بمعاملات متغيرة وطرق حلها	4	الرابع والخامس
دراسة أنواع مختلفة من المعادلات التفاضلية الجزئية بمعاملات متغيرة وطرق حلها, دراسة المؤثر التفاضلي	تحويل لابلاس	4	السادس والسابع
أستخدام تحويل لابلاس لحل المعادلات الجزئية من الرتبة الاولى- الثانية	متسلسلات فورير	4	الثامن و التاسع
طريقة فصل المتغيرات- متسلسلات فورير – متسلسلات فورير لنصف المدى- التوسيع الفردي والزوجي	معادلة الانتشار الحراري	4	العاشر والحادي عشر
تكوين معادلة الموجة في وطرق حلها في البعد الواحد او البعدين , مسائل تطبيقية على معادلة الموجة	معادلة الموجة في البعد الواحد وفي بعدين	4	الثاني عشر

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Advance Graph theory				
Credits					
Module Level		2	Semester of Delivery		
Module Leader	Haneen Kareem Hussein Al-Janabi		e-mail	Haneenk.aljanabi@uokufa.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number	1.0	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Delivery Plan (Weekly Syllabus)

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المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to graph theory
Week 2	Introduction to graph theory
Week 3	Coloring of Graph theory (Coloring of graph, Chromatic Polynomial, Chromatic Uniqueness of some graph)
Week 4	Coloring of Graph theory (Coloring of graph, Chromatic Polynomial, Chromatic Uniqueness of graphs)
Week 5	Domination of Graphs
Week 6	Domination of Graphs
Week 7	Some Algebraic Aspects of Graphs
Week 8	Some Algebraic Aspects of Graphs
Week 9	Chemical Graph Theory
Week 10	Chemical Graph Theory
Week 11	Mid Exam
Week 12	Turán graph
Week 13	Ramsey theory
Week 14	Algorithms of Graph
Week 15	Algorithms of Graph
Week 16	Algorithms of Graph
Module Evaluation تقييم المادة الدراسية	

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		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	5	4	
	Assignments	5	5	3, 6, 9, 11, 14	
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam	1	20	12	
	Final Exam	1	70	16	
Total assessment			100% (100 Marks)		

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Graph Theory				
Credits	%30				
Module Level		Diplom	Semester of Delivery		
Module Leader	Hayder Baqer Ameen		e-mail	Hayder.ameen@uokufa.edu.iq	
Module Leader's Acad. Title		Assi-Professor	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number	1.0	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1- ان يعرف الطالب معنى نظرية البيانات 2- ان يعرف الطالب المفاهيم الاساسية في نظرية البيانات 3- ان يعرف الطالب تارخ نشوء نظرية البيانات 4- ان يتعلم الطالب العلاقة بين المصفوفات ونظرية البيانات 5- ان يتعلم الطالب الدروب والمسارات في نظرية البيان 6- ان يتعلم الطالب على الاشجار في نظرية البيان
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- يتعرف الطالب معنى نظرية البيانات 2- يتعرف الطالب المفاهيم الاساسية في نظرية البيانات 3- يتعرف الطالب تارخ نشوء نظرية البيانات 4- يتعلم الطالب العلاقة بين المصفوفات ونظرية البيانات
Indicative Contents المحتويات الإرشادية	1- تعليم الطالب معنى نظرية البيانات 2- تعلم الطلبة تاريخ نشات نظرية البيانات 3- يتعلم الطالب المفاهيم الاساسية لنظرية البيانات 4- يتعرف الطالب على العلاقة بين البيانات والمصفوفات 5- يتعرف الطالب على الدروب والمسارات في نظرية البيان 6- يتعرف الطالب على الاشجار
Learning and Teaching Strategies	

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استراتيجيات التعلم والتعليم	
Strategies	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	التعرف على معننظرية البيانات
Week 2	تعلم الطالب تاريخ نشوء نظرية البيان وبعض المفاهيم الاساسية في نظرية لبيان
Week 3	تعلم الطالب البيان والبيان الجزئي
Week 4	تعرف على بعض تطبيقات نظرية البيان في الحياة اليومية مثل مشكلة الخدماتومبرهنة التصافح مع برهانها
Week 5	تعلم الطالب التشاكل في نظرية البيان
Week 6	حل تمارين واختبار الفصل الاول
Week 7	تعلم الطالب البيانات الموجهه
Week 8	تعلم الطالب المفاهيم الاساسية في البيانات الموجهه
Week 9	حل تمارين وامتحان الشهر الثاني
Week 10	تعلم الطالب العلاقة بين البيانات والمصفوفات
Week 11	تعلم الطالب المسارات والدروب
Week 12	حل تمارين
Week 13	يتعلم الطالب معنى الاشجار وبعض مبرهنات الخاصة بيها
Week 14	تعلم الطالب بعض تطبيقات الاشجار
Week 15	حل بعض التمارين
Week 16	

Module Evaluation تقييم المادة الدراسية					
		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam				
	Final Exam				
Total assessment			100% (100 Marks)		

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

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نموذج وصف المقرر

وصف المقرر

يوفر وصف المقرر هذا إيجازاً مقتضياً لأهم خصائص المقرر ومخرجات التعلم المتوقعة من الطالب تحقيقها مبرهناً عما إذا كان قد حقق الاستفادة القصوى من فرص التعلم المتاحة. ولابد من الربط بينها وبين وصف البرنامج.

1. المؤسسة التعليمية	
2. القسم العلمي / المركز	نظرية الاعداد
3. اسم / رمز المقرر	الدراسات العليا- ماجستير
4. أشكال الحضور المتاحة	
5. الفصل / السنة	الاول- 2023
6. عدد الساعات الدراسية (الكلي)	
7. تاريخ إعداد هذا الوصف	
8. أهداف المقرر	
يهدف هذا المقرر إلي إعطاء الطالب المفاهيم ألساسية لألعداد الصحيحة وخواصها والتي يعتمد عليها في دراسة المفاهيم الجبرية المجردة. معرفة كيفية التفكير المنطقى ومن ثم التوسع فى دراسة عالقات النطابق و ألستنتاج الرياضى إلكتساب مهارات كتابة البراهين دراسة نظرية كال من فيرمات و ولسن وتطبيقاتها إعطاء مفاهيم أساسية فى نظرية الشبكات و الجبر البولى القسمة الخوارزمية بناء ألعداد الصحيحة و عالقات التطابق القاسم المشترك االعظم و النظرية ألساسية فى الحساب دالة أويلر – نظرية فيرمات – نظرية ولسن و تطبيقاتهما دراسة الجذور ألولية دراسة الخواص الهامة فى الشبكات و الجبر البولى دراسه انماط مختلفه من االعداد مثل االعداد االوليه , التامه ,الزائده , مرسين , الناقصه و فيرما. كما يهدف المقرر الى دراسة المتتابعات وانواعها وتطبيقاتها. بالاضافة الى هذا يهدف المقرر الى اعطاء الطالب فكره عن احد اهم موضوع في نظرية الاعداد وهو المعادلات الديفونتونية وتطبيقاتها.	

9. مخرجات المقرر وطرائق التعليم والتعلم والتقييم
أ- الاهداف المعرفية أ1- اكتساب المعارف عن طريق تعلم نظريات ومفاهيم أساسية في نظرية الاعداد. أ2- .قدرة الطالب على تطبيق المبادئ ألساسية لنظرية ألعداد التي تعلموها في هذا المقرر لحل بعض المشاكل العددية. أ3- التعرف على اهمية وتطبيقات مفاهيم نظرية الاعداد.
ب - الاهداف المهاراتية الخاصة بالمقرر ب1 – قدرة الطالب على تطبيق هذه المفاهيم في مجلات اخرى مثل التشفير. ب2- القدرة على تحديد إلجراءات التحليلية المناسبة إليجاد الحل المناسب لبعض المشاكل الحياتية.
طرائق التعليم والتعلم
طرائق التقييم
إختبارات يومية و واجبات و إختبارات شهرية و اختبار نهائي.

10- بنية المقرر	
Course Description	
Topic	**Details**
The Integers and Divisibility	-The well ordering Property, -Mathematical Induction,

	-Binomial Theorem and its applications, - Representation of integers, -Divisibility.
Greatest Common Divisors and Prime Factorization	- Greatest Common Divisors and least common multiples, and Primes, - Factorization of integers and the Fermat numbers, -Euclidian Algorithm, -Fundamental Theorem of arithmetic, - Linear Diophantine equation.
Congruences and their Applications	-Proprties of congruences, -Linear congruences, -System of linear cogruences - Congruences modulo Polynomial, -Chinese Remainder Theorem, - Divisiblity tests.
Some Special Congruences	- Fermat's Last Theorem -Pseudoprimes, -Wilson's Theorem, -Euler's Theorem.
Multiplicative Functions	-Euler's phi – function, -The sum and number of divisors, - The Möbius inversion formula, - Perfect numbers and Mersenne primes.
Primitive roots	- The order of an integer and primitive roots, - Primitive roots for primes, -Primitive roots modulo prime powers, - Existence of primitive roots, - Primality Tests Using Primitive Roots.
Quadratic Residues and Reciprocity	- Quadratic residues and nonresidues, - Quadratic reciprocity and Euler's criterion, -Gauss's lemma - The Jacobi symbol.
Diophantine equations	-Definition of Diophantine equation, -Some types of Diophantine equations, --Some nonlinear Diophantine equations.
Recurrence relations	-Linear recurrence sequences, -Nonlinear recurrence sequences, -Solving these sequences, -Lucas sequences -Identities related to Lucas sequences.

References	1. David M. Burton. Elementary number theory, 7th edition. McGraw-Hill, 2011. 2. Alan Baker. *A Comprehensive Course in Number Theory*. Cambridge University Press, 2012. 3. Ben Green. *Analytic Number Theory: Lecture Notes*. University of Oxford, Oxford, 2016. 4. Godfrey Hardy and Edward Wright. *An Introduction to the Theory of Numbers*. Oxford University Press, 1980. 5- Rosen, Kenneth H. Elementary number theory and its applications. Addison-Wesley, 1984.

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Stochastic Processes**				
Credits	2				
Module Level		M.Sc. & PhD	**Semester of Delivery**		
Module Leader	Hussein K. Asker		**e-mail**	Husseink.askar@uokufa.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		PhD
Scientific Committee Approval Date			**Version Number**	1.0	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	To provide graduate students in the department of Mathematics with broad coverage of concepts, theories and analysis methods for probability, random variables, stochastic processes and stochastic differential equations (SDE), which serve as the foundation for advanced courses in SDEs.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	When students complete this course, they should be able to: • Understand and description the random variable. • Understand and description the Behavior of stochastic processes. • Model and analyze systems with stochastic processes. • Understand and description the SDEs. • Solve some special types of SDE.
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

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Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction:** Basic concept of probability: Sample space, Events, Probability Measure, Independence and Conditional Probability, Bayes Rule, Bernoulli Trials (Independent Trials)
Week 2	**Random Variable:** **a. One Random Variable:** Discrete and Continuous Random Variable, Distribution Functions, Probability Density Functions, Cumulative Distribution Function, Bernoulli Distribution, Binomial Distribution, Exponential Distribution, Normal Distribution, Expectation, Moments, Chebyshev's inequality.
Week 3	**b. Two Random Variables:** Joint Distribution Function, Joint Density Function, Conditional Density, Expectation, Moments.
Week 4	**c. Multiple Random Variables:** Expectations, Gaussian Case, Independence and conditional density.
Week 5	**Functions of Random variables and their Distributions:** Function of one random variable, function of two Random variables, Two functions of two random variables and the Jacobian matrix, Generation of random variates for Monte Carlo simulation, Random number generator (RNG), Generation of variates from general distributions, Generation of normal (or Gaussian) variates.
Week 6	**Sequences of Random Variables and Convergence:** Three types of convergence, Law of large numbers, Central Limit Theorem.
Week 7	**Stochastic Processes:** Definition of Stochastic Processes, Classification of random processes, Stationary Stochastic Processes, Markov Processes.
Week 8	**Brownian motions**
Week 9	**Stochastic integrals**
Week 10	**Ito's formula.**
Week 11	**Moment inequalities, Gronwall-type inequalities**

Weeks 12+ 13 + 14	**Stochastic Differential Equations (SDE),** existence and uniqueness of solutions
Week 15+ 16	**Solve some special types of SDE.**

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	2%	4+6+10+13	
	Assignments	3	3%	5+11+14	
	Projects / Lab.				
	Report	1	5%	16	
Summative assessment	**Midterm Exam**	1	20%	15	
	Final Exam	1	70%		
Total assessment			100% (100 Marks)		

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts	1- Kobayashi, H., Mark, B. L., & Turin, W. (2011). Probability, random processes, and statistical analysis: applications to communications, signal processing, queueing theory and mathematical finance. Cambridge University Press. 2- Mao, X. (2007). Stochastic differential equations and applications. Elsevier. 3- Sundarapandian, V. (2009). Probability, statistics and queuing theory. PHI Learning Pvt. Ltd.. 4- Theodoridis, S. (2015). Machine learning: A Bayesian and optimization perspective. Academic press.	
Websites		

جامعة الكوفة
كلية علوم الحاسوب و الرياضيات
قسم الرياضيات
الدراسات العليا
للعام الدراسي 2023-2024

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Abstract Algebra				
Credits	2				
Module Level		1	Semester of Delivery		1
Module Leader	Hayder Baqer Ameen		e-mail	Hayder.ameen@uokufa.edu.iq	
Module Leader's Acad. Title		Asst.Professor	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date		10/9/2023	Version Number	1.0	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1- The student acquires an idea of the basics of group theory. 2- The student acquires knowledge about some types of groups and the relationship between them. 3- Identifying the concept of group associations and their properties. 4- Learn about Sylow's theory and its applications
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Developing the student's ability to deal with technical means. 2- Developing the student's ability to deal with the Internet. 3- Develop the student's ability to deal with multimedia. 4- Develop the student's ability to dialogue and discussion. 5- Developing the student's ability to share their ideas with others in order to have the right and optimal solution.
Indicative Contents المحتويات الإرشادية	1. The student acquires an idea of the basics of group theory. 2. The student acquires knowledge about some types of groups and the relationship between them. 3. Identifying the concept of group associations and their properties. Learn about Sylow's theory and its applications
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Indicative content includes the following: Definition of mathematical system, binary operation, closed binary operation,

	Associative binary operation and semigroup, Introduction to group Theory, identity element, inverse element, certain types of groups (symmetric (S_n), Group of Integer Modulo n (Z_n)) with their properties, order of group, commutative groups, Finite and infinite groups, subgroups, equivalent theorem, proper subgroups, examples, intersection and union of subgroups, Direct product and direct sum of two sub group with properties, related theorems, Cyclic groups Definition, generators of group, Division algorithm, Lagrange theorem, index of subgroup, Center of a group, Normal subgroup, quotient group, Homomorphism and Kernel of groups, Isomorphism Theorem, First Isomorphism Theorem, Cayley Theorem Second and Third Isomorphism Theorems. The main strategy that will be adopted in introducing this unit is to encourage students to participate in the exercises given during the lecture, while simultaneously improving and expanding their scientific reasoning skills through discussion with their partner as a team. It is also possible to achieve this through the research required of the student to complete it and the interactive educational websites that include some books for the libraries of mathematics departments in international universities.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	Material Covered
Week 1	Definition of mathematical system, binary operation, closed binary operation, Associative binary operation and semigroup with examples and properties
Week 2	Definition of identity element, inverse element and group with examples and properties
Week 3	Some certain types of groups (symmetric (S_n), Group of Integer Modulo n (Z_n)) with their properties
Week 4	Definitions of order of group, commutative groups, Finite and infinite groups
Week 5	Definition of subgroups, equivalent theorem, proper subgroups, examples, intersection and union of subgroups
Week 6	Direct product and direct sum of two sub group with properties, related theorems and examples
Week 7	Cyclic groups Definition, generators of group, properties and examples
Week 8	Division algorithm, Lagrange theorem, index of subgroup
Week 9	Definition of Center of a group, with some of its properties and examples
Week 10	Definition of Normal subgroup, properties and examples.
Week 11	Definition of quotient group, properties and examples
Week 12	Definition of Homomorphism, inverse of homomorphism, Kernel, related theorems, properties and examples
Week 13	Isomorphism definition, Cayley theorem, properties and examples

Week 14	First Isomorphism theorem, with examples
Week 15	Second and third Isomorphism theorems, with examples
Week 16	Preparatory week before the final Exam

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	(15 min)/4	5%	3,6,9	LO #1, 2, 10 , 11 and 13
	Assignments	5	3%	3-10	LO # 3, 4, 6, 7 and 8
	Projects / Lab.				
	Report		2%	1	LO # 5, 9 and 12
Summative assessment	Midterm Exam	2h	20%	2	LO # 1-7
	Final Exam	3h	70%		All
Total assessment			100% (100 Marks)		

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Abstract algebra, Dived pertain	yes

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Advanced Functional Analysis				
Credits	3				
Module Level		MSc	Semester of Delivery		2nd
Module Leader	Ali Abdulhussein Naser		e-mail	ali.shukur@uokufa.edu.iq	
Module Leader's Acad. Title		A. Prof.	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number	1.0	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Functional analysis is one of the youngest objects in mathematics. Nowadays, it considered to be a unifying subject that generalizes much of linear algebra, real and complex analysis, with emphasis on infinite dimensional spaces. This book introduces this vast topic from these elementary preliminaries and develops both the abstract theory and its applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the course, students will be able to: 1. Determine whether the operator is bounded or not 2. Prove some facts on linear bounded operators. 3. Prove some theorems convergence in different classes of spaces. 4. Determine whether an operator has conjugate or not. 5. Determine the localization of operator sectrum 6. Prove some facts resolvent operator.
Indicative Contents المحتويات الإرشادية	Prerequisites: Measure, topology, algebra (Review). Prerequisites are courses on Analysis and Linear Algebra, and the second year courses on Complex Analysis, Topology and Measure. Vector: Definition and examples. Linear bounded: Definitions and examples, integral operator, weighted shift operator, composition operator Spectral analysis: Spectrum, resolvent, spectral radius

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module is delivered in the form of lectures and workshops/tutorials and assessed via an exam (70%) and coursework (30%) consisting of homework tests and project work.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Prerequisites: Metric space (Review)
Week 2	Topological metric space (Review), Convergence, compact topological metric space
Week 3	Vector space: Basic concepts and examples
Week 4	Normed space
Week 5	Linear bounded operators
Week 6	Integral operator
Week 7	Equivalent norms
Week 8	Linear bounded functional
Week 9	Space of linear bounded operators
Week 10	Hanh-Banach Theorem
Week 11	Conjugate Spaces
Week 12	Conjugate oprators
Week 13	Spectrum and Resolvent of operators I
Week 14	Spectrum and Resolvent of operators II

Week 15	Spectrum and Resolvent of operators III

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	5	5,9,13	
	Assignments	3	5	4,7,10	
	Projects / Lab.				
	Report	1	5	10	
Summative assessment	Midterm Exam		15	11	
	Final Exam		70		
Total assessment			100% (100 Marks)		

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Antonevich A, Volentonevich Ya, Functional Analysis and Integral Equations, BSU, 2006	
Recommended Texts	K. Saxe, Beginning Functional Analysis, Springer, 2001.	
Websites		

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قسم الرياضيات
الدراسات العليا
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Advanced partial differential equations and application's				
Credits					
Module Level		Master's	Semester of Delivery		
Module Leader	Name		e-mail	Shaimam.altaee@uokufa.edu.iq	
Module Leader's Acad. Title		Assistant Professor	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number		

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The primary goal is how to find the working solution and the special solution for advanced partial differential equations of all kinds and find additional solutions for them in order to obtain many solutions that help us in choosing the best solution and applying them in areas of life, including the physical and medical application of those equations and solving complex partial models in chemical applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Solve complex partial equations of all kinds Solving physical partial differential equations Solve a system of complex partial chemical and medical equations
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	First: finding the general solution for linear partial differential equations Second: Semi-linear partial equations Third: Uncovered and complex partial equations Fourth, solve the complex physical system Solving complex molecular chemical systems

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Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Review partial differential equations with their general concepts and properties
Week 2	Finding the general and specific solution for linear partial equations
Week 3	Finding the general and specific solution for semi-linear partial equations
Week 4	Finding the general and specific solution for non-linear partial equations
Week 5	Finding the general and specific solution for complex semi-linear partial equations in a physical system
Week 6	Finding the general and specific solution for complex non-linear partial equations in a physical system
Week 7	Finding the general and specific solution for complex semi-linear partial equations in chemical and biological systems
Week 8	Finding the general and specific solution for complex non-linear partial equations in chemical and biological systems
Week 9	Finding the general and specific solution for complex semi-linear fuzzy partial equations in chemical and biological systems.
Week 10	Finding the general and specific solution for complex linear fuzzy partial equations in chemical and biological systems.
Week 11	Finding the general and specific solution for complex non-linear fuzzy partial equations in chemical and biological systems.
Week 12	Finding the general and specific solution for complex semi-linear fuzzy partial equations in chemical and biological systems.fractal fuzzy

Week 13	Examples of fractal applications using these transformations
Week 14	Comparing solutions of fuzzy equations with other solutions using other transformations
Week 15	Comparing applications and solutions of fuzzy equations with other solutions using other transformations
Week 16	

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam				
	Final Exam				
Total assessment			100% (100 Marks)		

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Advanced partial differential equations and application's				
Credits					
Module Level		Master's	Semester of Delivery		
Module Leader	Name		e-mail	Shaimam.altaee@uokufa.edu.iq	
Module Leader's Acad. Title		Assistant Professor	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number		

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The primary goal is how to find the working solution and the special solution for advanced partial differential equations of all kinds and find additional solutions for them in order to obtain many solutions that help us in choosing the best solution and applying them in areas of life, including the physical and medical application of those equations and solving complex partial models in chemical applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Solve complex partial equations of all kinds Solving physical partial differential equations Solve a system of complex partial chemical and medical equations
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	First: finding the general solution for linear partial differential equations Second: Semi-linear partial equations Third: Uncovered and complex partial equations Fourth, solve the complex physical system Solving complex molecular chemical systems

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Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Review partial differential equations with their general concepts and properties
Week 2	Finding the general and specific solution for linear partial equations
Week 3	Finding the general and specific solution for semi-linear partial equations
Week 4	Finding the general and specific solution for non-linear partial equations
Week 5	Finding the general and specific solution for complex semi-linear partial equations in a physical system
Week 6	Finding the general and specific solution for complex non-linear partial equations in a physical system
Week 7	Finding the general and specific solution for complex semi-linear partial equations in chemical and biological systems
Week 8	Finding the general and specific solution for complex non-linear partial equations in chemical and biological systems
Week 9	Finding the general and specific solution for complex semi-linear fuzzy partial equations in chemical and biological systems.
Week 10	Finding the general and specific solution for complex linear fuzzy partial equations in chemical and biological systems.
Week 11	Finding the general and specific solution for complex non-linear fuzzy partial equations in chemical and biological systems.
Week 12	Finding the general and specific solution for complex semi-linear fuzzy partial equations in chemical and biological systems.fractal fuzzy

Week 13	Examples of fractal applications using these transformations
Week 14	Comparing solutions of fuzzy equations with other solutions using other transformations
Week 15	Comparing applications and solutions of fuzzy equations with other solutions using other transformations
Week 16	

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam				
	Final Exam				
Total assessment			100% (100 Marks)		

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Advanced numerical analysis			
Credits	2			
Module Level	MSc		Semester of Delivery	
Module Leader	Pfoof.Dr. Adil AL-Rammahi		e-mail	Adilm.hasan@uokufaedu.iq
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Scientific Committee Approval Date			Version Number	1.0

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	لدراسة مفاهيم متقدمة في التحليل العددي المتمثلة في الاندراج و التقريب و التكامل و حلول المعادلات العددية
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	دراسة متقدمة في نظريات و طرق التحليل العددي
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Delivery Plan (Weekly Syllabus)

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المنهاج الاسبوعي النظري	
	Material Covered
Week 1	L- Spline
Week 2	Q-Spline
Week 3	C-Spline
Week 4	Approximation -LSA
Week 5	Approximation –Taylor
Week 6	Newton Interpolations
Week 7	test
Week 8	Integration
Week 9	Integration
Week 10	Approximation Chebyshev
Week 11	Approximation Legendre
Week 12	Approximation Laguerre
Week 13	IFS Fractals
Week 14	IFS Fractals
Week 15	Integral equations
Week 16	**test**

Module Evaluation

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تقييم المادة الدراسية					
		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes		10	1,3,5,7,9,11	10
	Assignments				
	Projects / Lab.				
	Report		10	12	10
Summative assessment	Midterm Exam		10	6	10
	Final Exam		70	16	70
Total assessment			100% (100 Marks)		100

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Aitkinson k.E." introduction to Numerical Analysis " ; Wiley ;New York ;1978 .	YES
Recommended Texts	Burden R.L. and Fairs J.D. " Numerical Analysis " Brooks/Cole ublishing Company ;1984 .	YES
Websites		

University of Kufa
Faculty of Computer Science and Mathematics
Computer Science Department
Academic Year 2023/2024
M.Sc. and PhD Level

Course Information

Course Name: Analytic Number Theory	**Course Code:**
Prerequisite: **Level: MSc. and PhD**	**Credit Hours:**

Lecturer Information

Name: Dr. Ammar Ali Alrammahi	**Academic rank: Assistant professor**
Office Hours:	**Email: ammara.meamah@uokufa.edu.iq**

Course module description:

This module uses techniques from complex analysis to study problems in number theory. First, we develop some necessary real and complex analysis, in particular the notion of analytic continuation. We make a study of the Gamma function. We develop the theory of Dirichlet series of a complex variable and study the Riemann zeta function – a central object in analytic number theory – and its connection to the distribution of prime numbers.

Course module objectives:

To provide the student with an understanding of the concepts of complex analytic techniques in the theory of numbers.

Course/ module components

- **Text Books (author(s), title, publisher, year of publication)**
  1. T. M. Apostol. Introduction to analytic number theory. Springer Verlag, 1976.

Teaching methods:

Duration: 16 weeks, 32 hours in total
Lectures: 2 per week
Tutorials: Approximately 1 per week
Assignments: 1 Assignment

Learning outcomes:

By the end of the module students are expected to be able to:

- use real analytic methods in the theory of arithmetical functions
- find analytic continuations of functions;
- formulate and solve problems using Dirichlet series;
- appreciate the proof of the prime number theorem and the link with the Riemann zeta function.

Assessment instruments

- Midterm exam 30
- Final examination: 70 marks

Allocation of Marks	
Assessment Instruments	**Mark**
First examination	**30%**
Final examination:	**70%**
Total	**100%**

Course/module academic calendar

Week	**Basic and support material to be covered**	**Homework/reports and their due dates**
(1)	Arithmetical Functions	
(2)	Multiplicative Functions	
(3)	Dirichlet Series	
(4)	Generating Functions of Arithmetical Functions	
(5)	Average Orders of Arithmetical Functions	
(6)	Elementary Theorems on the Distribution of Primes	
(7)	Techniques of Real Analysis; Euler Summation	
(8)	Abel Summation	
(9)	Mid-term Exam	
(10)	Analytic Continuation	
(11)	Functions of Finite Order	
(12)	Dirichlet Series and Mellin transforms	
(13)	Holomorphic Properties of Functions Defined by Dirichlet series	
(14)	Dirichlet Series as Mellin Transforms; Perron's Formula	
(15)	The Riemann Zeta Function	
(16)	Final Exam	

University of Kufa
Faculty of Computer Science and Mathematics
Computer Science Department
Academic Year 2023/2024
M.Sc. and PhD Level

Course Information

Course Name: Analytic Number Theory	**Course Code:**
Prerequisite: **Level: MSc. and PhD**	**Credit Hours:**

Lecturer Information

Name: Dr. Ammar Ali Alrammahi	**Academic rank: Assistant professor**
Office Hours:	**Email: ammara.meamah@uokufa.edu.iq**

Course module description:

This module uses techniques from complex analysis to study problems in number theory. First, we develop some necessary real and complex analysis, in particular the notion of analytic continuation. We make a study of the Gamma function. We develop the theory of Dirichlet series of a complex variable and study the Riemann zeta function – a central object in analytic number theory – and its connection to the distribution of prime numbers.

Course module objectives:

To provide the student with an understanding of the concepts of complex analytic techniques in the theory of numbers.

Course/ module components

- **Text Books (author(s), title, publisher, year of publication)**
  1. T. M. Apostol. Introduction to analytic number theory. Springer Verlag, 1976.

Teaching methods:

Duration: 16 weeks, 32 hours in total
Lectures: 2 per week
Tutorials: Approximately 1 per week
Assignments: 1 Assignment

Learning outcomes:

By the end of the module students are expected to be able to:

- use real analytic methods in the theory of arithmetical functions
- find analytic continuations of functions;
- formulate and solve problems using Dirichlet series;
- appreciate the proof of the prime number theorem and the link with the Riemann zeta function.

Assessment instruments

- Midterm exam 30
- Final examination: 70 marks

Allocation of Marks	
Assessment Instruments	**Mark**
First examination	**30%**
Final examination:	**70%**
Total	**100%**

Course/module academic calendar

Week	**Basic and support material to be covered**	**Homework/reports and their due dates**
(1)	Arithmetical Functions	
(2)	Multiplicative Functions	
(3)	Dirichlet Series	
(4)	Generating Functions of Arithmetical Functions	
(5)	Average Orders of Arithmetical Functions	
(6)	Elementary Theorems on the Distribution of Primes	
(7)	Techniques of Real Analysis; Euler Summation	
(8)	Abel Summation	
(9)	Mid-term Exam	
(10)	Analytic Continuation	
(11)	Functions of Finite Order	
(12)	Dirichlet Series and Mellin transforms	
(13)	Holomorphic Properties of Functions Defined by Dirichlet series	
(14)	Dirichlet Series as Mellin Transforms; Perron's Formula	
(15)	The Riemann Zeta Function	
(16)	Final Exam	

University of Kufa

Faculty of Mathematics and Computer Science

Department of Mathematics

First Semester 2023/2024

Course Syllabus of Advanced Complex Analysis for MSc. Level

Course Information	
Course Title	**Advanced Complex Analysis**
Instructor	**Asst. Prof. Dr. Najlae Falah Al Saffar**
E-mail	najlaa.hameed@uokufa.edu.iq

Course Description

1. First Section:

1.1 Complex Number
1.2 Analytic Function
1.3 Power Series
1.4 Multivalued Functions

2. Second Section:

2.1 Complex Integration

3. Third Section:

3.1 Laurent's Series
3.2 Zeros of Analytic Function
3.3 Isolated Singularity
3.4 Maximum Modulus Principle
3.5 Meromorphic Function
3.6 Inverse Function

4. Fourt Section:

4.1 Calculus of Residues
4.2 Evaluation of Real Trigonometric Integral
4.3 Conformal Mapping
4.4 Space of Analytic Function

Useful Resources
1. H.A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford, 1990.
2. J.B. Conway, Functions of One Complex Variable, Springer-Verlag, International student-Edition, Narosa Publishing House, 2002.
3. E.T. Copson, An Introduction to the Theory of Functions of a Complex Variable, Oxford University Press, London, 1972.
4. Ruel V. Churchill and James Ward Brown, Complex Variables and Applications, McGraw-Hill Publishing Company, 2009.
5. H.S. Kasana, Complex Variable Theory and Applications, PHI Learning Private Ltd, 2011.
6. Dennis G. Zill and Patrik D. Shanahan, A First Course in Complex Analysis with Applications, John Bartlett Publication, 2nd Edition, 2010.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Numerical Analysis**			Module Delivery	
Module Type	**Core**			☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**MATH306**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level		3	Semester of Delivery		1
Administering Department		Type Dept. Code	College	Type College Code	
Module Leader	Name		e-mail	E-mail	
Module Leader's Acad. Title			Module Leader's Qualification		Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Name	e-mail	E-mail	
Scientific Committee Approval Date			Version Number		

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MATH204	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	A Study Numerical Solution of First Order Ordinary Differential Equations A Study Numerical Solution of Systems of differential equations. A Study Numerical Solution of Numerical solution of partial differential equation
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Numerical Solution of First Order Ordinary Differential Equations Numerical Solution for System of First Order Ordinary Differential Equations and Solution of Higher order Ordinary Differential Equations Numerical solution of ordinary differential equation by finite difference method Numerical solution of partial differential equation Numerical Methods for Eigenvalues

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	•

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	95	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	80	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
	Quizzes	5	15% (15)	3, 5, 9, 11, 15	LO #1, 2, 10 , 11 and 13

Formative assessment	Assignments	5	15% (15)	2, 4, 10, 12, 14	LO # 3, 4, 6, 7 and 8
	Projects / Lab.	-			
	Report	1	5% (5)	13	LO # 5, 9 and 12
Summative assessment	Midterm Exam	2 hr	15% (15)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Numerical Solution of First Order Ordinary Differential Equations using Taylor series method
Week 2	Numerical Solution of First Order Ordinary Differential Equations using Picard's method, Euler's method
Week 3	Numerical Solution of First Order Ordinary Differential Equations using Runge –Kutta method of second order
Week 4	Numerical Solution of First Order Ordinary Differential Equations using third order and fourth order
Week 5	Numerical Solution for System of First Order Ordinary Differential Equations using Taylor series method, Picard's method, Euler's method(Quiz)
Week 6	Numerical Solution for System of First Order Ordinary Differential Equations using Runge –Kutta method of second order , third order and fourth order
Week 7	(1st Exam)
Week 8	Finite Differences
Week 9	Numerical solution of ordinary differential equation by finite difference method
Week 10	Numerical solution of partial differential equation
Week 11	
Week 12	
Week 13	(2nd Exam)
Week 14	Numerical Methods for Eigenvalues
Week 15	

Week 16	**Final exam**

Delivery Plan (Weekly Tutorial Syllabus) المنهاج الاسبوعي للدرس التعليمي	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Numerical Methods; P.Kandasamy; K.Thilagavathy and K.Gunavathi;(2008).	Yes
Recommended Texts	Numerical Analysis ; Richard L. Burden and J. Douglas Faires ; NINTH EDITION;(2011)	Yes
Websites		

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.

جامعة الكوفة
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الدراسات العليا
للعام الدراسي 2024-2023

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Finite Element Method**				
Credits	**Differential equations**				
Module Level		Postgraduate	Semester of Delivery		**Second**
Module Leader	**Ghassan A. Al-Juaifri**		e-mail	ghassana.ali@uokufa.edu.iq	
Module Leader's Acad. Title		A.Professor	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number		

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

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	Material Covered
Week 1	**Integral Formulations and Variational Methods** **Need for Weighted-Integral Forms**
Week 2	**Some Mathematical Concepts and Formulae , Weak Formulation of Boundary Value Problems**
Week 3	**Variational Methods of Approximation**
Week 4	**The Rayleigh-Ritz Method**
Week 5	**The Method of Weighted Residuals**
Week 6	**Finite Element Analysis of One-Dimensional Problems**
Week 7	**Basic Steps of Finite Element Analysis**
Week 8	**Model Boundary Value Problem,** **Discretization of the Domain**
Week 9	**Finite Element Analysis of Two-Dimensional Problems**
Week 10	**Boundary Value Problems**
Week 11	**The Model Equation**
Week 12	**Finite Element Discretization**
Week 13	**Weak Form**
Week 14	**Finite Element Model** **Interpolation Functions**
Week 15	**Evaluation of Element Matrices and Vectors** **Assembly of Element Equations**
Week 16	final exam

Module Evaluation

تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam				
	Final Exam				
Total assessment			100% (100 Marks)		

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. **Reddy, Junuthula Narasimha. Introduction to the finite element method. McGraw-Hill Education, 2019.** • **JAMES, C. Robinson (2001). INFINITE-DIMENSIONAL DYNAMICAL SYSTEMS. Cambridge University Press.**	
Recommended Texts	1. **Felippa, Carlos A. "Introduction to finite element methods." University of Colorado 885 (2004).**	
Websites		

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Fractional calculus				
Credits	2				
Module Level		Deplom	Semester of Delivery		
Module Leader	Pfoof.Dr. Adil AL-Rammahi		e-mail	E-mail	
Module Leader's Acad. Title		Professor	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number	1.0	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	لدراسة اساسيات التكامل الكسوري و التفاضل الكسوري مع الاشتقاقات الكسورية للدوال الاساسية
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	معرفة الحسبان الكسوري و تطبيقاته
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	basic of fractional calculus
Week 2	Definition of fractional integration
Week 3	Definition of fractional calculus
Week 4	fractional calculus of basic functions
Week 5	fractional calculus of basic functions
Week 6	fractional calculus of basic functions
Week 7	test
Week 8	fractional order Differential equations
Week 9	Fractal physics problem
Week 10	Laplace Transform
Week 11	Laplace Transform
Week 12	fractional Laplace Transform
Week 13	fractional Laplace Transform
Week 14	application
Week 15	application
Week 16	**test**

Module Evaluation

تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes		10	3,7,9,12	10
	Assignments				
	Projects / Lab.				
	Report		10	12	10
Summative assessment	Midterm Exam		10	6	10
	Final Exam		70		70
Total assessment			100% (100 Marks)		100

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	A.AL-Rammahi and F.Harid, Applications of fractional calculus, Diploma Project, 2023.	YES
Recommended Texts		
Websites	A.Mathia, Introduction to fractional calculus,2017.	

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Lie algebras and their representations				
Credits	2				
Module Level		MSc	Semester of Delivery		2st
Module Leader	Hasan Mohammed Ali		e-mail	Hasan.shlaka@uokufa.edu.iq	
Module Leader's Acad. Title		A. Prof.	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number	1.0	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Lie algebras play a role in many diverse areas of mathematics, from number theory to theoretical physics. The material in this course is beautiful in its own right, but the main purpose of the course is to gain familiarity with these objects so that you can work with them in the context of your interests. Because of this, we will spend time on examples, and students should expect to actively engage during lectures.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of the course, students will be able to: ? 1. Determine whether a particular subset of a Lie algebra L is a subalgebra, an ideal, or a radical. 2. Prove some facts about Lie subalgebras, and Lie ideals, from the relevant definitions and other facts. 3. Prove some theorems related to the representation theory of Lie algebras and its applications. 4. Determine the nilpotent and solvable Lie algebras 5. Determine whether a Lie algebra is simple, semisimple, or non-semisimple. 6. Determine the simple Lie algebras from the semisimple ones as well as determine whether the Lie algebra is Solvable or nilpotent. 7. Prove some facts about Lie and Engels' theorem.
Indicative Contents المحتويات الإرشادية	Prerequisites: Linear algebra, Basic concepts and examples of Algebra (Review)

	Lie Algebra Homomorphisms, the adjoint homomorphism, Derivations, and the Structure Constants. Ideals and Homomorphisms: Constructions with Ideals, Quotient Algebras, and Correspondence between Ideals Low Dimensional Lie Algebras: Lie algebras of Dimensions 1 and 2, Lie algebras of Dimension 3 with one-dimensional derivation, Lie algebras of Dimension 3 with two and three-dimensional derivation Solvable and nilpotent Lie algebras: Solvable Lie algebras, Nilpotent Lie Algebras, Subalgebras of the general linear lie algebra gl(V), Nilpotent Maps, Weights, The Invariance Lemma and An Application of the Invariance Lemma, Engel's Theorem, and the Proof of Engel's Theorem, Lie's Theorem. Some Representation Theory: Definitions, Examples of Representations, Modules for Lie Algebras, Submodules and Factor Modules, Irreducible and Indecomposable Modules, and Homomorphisms.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module is delivered through lectures and workshops/tutorials and assessed via an exam (70%) and coursework (30%) consisting of homework tests and project work.

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Prerequisites: Linear algebra, Basic concepts and examples of Algebra (Review)
Week 2	Lie Algebra: Definition of Lie Algebras, Some Examples of Lie algebras, Lie Subalgebras and Lie Ideals.
Week 3	Lie Algebra Homomorphisms, the adjoint homomorphism, Derivations, and the Structure Constants.

Week 4	Ideals and Homomorphisms: Constructions with Ideals, Quotient Algebras, and Correspondence between Ideals
Week 5	Lie algebras of Dimensions 1 and 2
Week 6	Lie algebras of Dimension 3 with one-dimensional derivation
Week 7	Lie algebras of Dimension 3 with two and three-dimensional derivation
Week 8	Solvable Lie algebras and Nilpotent Lie Algebras
Week 9	Subalgebras of the general linear lie algebra gl(V)
Week 10	Nilpotent Maps and, Weights
Week 11	The Invariance Lemma and An Application of the Invariance Lemma
Week 12	Engel's Theorem, and the Proof of Engel's Theorem
Week 13	Lie's Theorem
Week 14	Some Representation Theory: Definitions, Examples of Representations, Modules for Lie Algebras
Week 15	Submodules and Factor Modules, Irreducible and Indecomposable Modules, and Homomorphisms

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	5	5,9,13	
	Assignments	3	5	4,7,10	
	Projects / Lab.				
	Report	1	5	10	
Summative assessment	Midterm Exam		15	11	
	Final Exam		70		
Total assessment			100% (100 Marks)		

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Humphreys, James E. Introduction to Lie algebras and represent theory, Graduate Texts in Mathematics, 9, Springer-Verlag New Berlin, 1978. H	
Recommended Texts	Carter, R. W. Lie algebras of finite and affine type, Cambridge St Advanced Mathematics, 96, Cambridge University Press, Cambr 2005. Fulton, William and Harris, Joe. Representation theory, Graduate Mathematics, 129, Springer-Verlag, New York, 1991. Serre, Jean-Pierre. Complex Semisimple Lie Algebras. trans. G.A Springer Monographs in Mathematics, Springer-Verlag, New Yor Carter, Roger W. Simple groups of Lie type, Wiley Classics Libra Wiley & Sons, Inc., New York, 1989. Kostant, Bertram. The principal three-dimensional subgroup and numbers of a complex simple Lie group, American Journal of Mathematics, Vol. 81, No. 4 (Oct., 1959), pp. 973-1032.	
Websites		

جامعة الكوفة
كلية علوم الحاسوب و الرياضيات
قسم الرياضيات
الدراسات العليا
للعام الدراسي 2024-2023

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Theory of partial differential equations				
Credits	**Differential equations**		**Functional analysis**		
Module Level		Postgraduate	Semester of Delivery		**Second**
Module Leader	**Ghassan A. Al-Juaifri**		e-mail	ghassana.ali@uokufa.edu.iq	
Module Leader's Acad. Title		A.Professor	Module Leader's Qualification		Ph.D.
Scientific Committee Approval Date			Version Number		

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	
Indicative Contents المحتويات الإرشادية	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	Banach-space valued function spaces and ‘Sobolev-type’ results
Week 2	Orthonormal bases in Hilbert spaces; Convergence and orthonormality in Hilbert spaces
Week 3	The Galerkin method: Truncated Eigenfunction Expansions
Week 4	Higher Regularity; Weak convergence
Week 5	Weak Compactness and our liner parabolic PDE
Week 6	Recovery of the initial condition
Week 7	Priori estimates on the solution
Week 8	Local and Global existence of the Galerkin approximation
Week 9	Picard’s existence theorem
Week 10	Passage to the limit
Week 11	Uniqueness of the solution
Week 12	Strong Solutions
Week 13	Regularity Result
Week 14	Existence of Lipschitz condition
Week 15	A Coupled pair of Cahn-Hilliard equation

Week 16	final exam

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes				
	Assignments				
	Projects / Lab.				
	Report				
Summative assessment	Midterm Exam				
	Final Exam				
Total assessment			100% (100 Marks)		

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• Garvie, Marcus Roland (2003) Analysis of a reaction-diffusion system of -w type, Durham theses, Durham University. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/4105/ • JAMES, C. Robinson (2001). *INFINITE-DIMENSIONAL DYNAMICAL SYSTEMS*. Cambridge University Press.	
Recommended Texts	• Al-Ofl, Abdalaziz Saleem (2008) Analysis of complex nonlinear reaction-diffusion equations, Durham theses, Durham University. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/2422/ • AL-SALMAN, HASSAN, JAWAD (2010) ANALYSIS OF TWO CLASSES OF CROSS DIFFUSION	

	SYSTEMS. Doctoral thesis, Durham University. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/441/	
Websites		

UNIVERSITY OF KUFA
FACULTY OF COMPUTER SCIENCE AND MATHEMATICS

University of Kufa
Faculty of Mathematics and Computer Science
Department of Mathematics

Second Semester 2023/2024

Cryptography Course for MSc. Level

Course Information	
Course Title	Cryptography
Instructor	**Asst. Prof. Dr. Najlae Falah Hameed AlSaffar**
E-mail	najlaa.hameed@uokufa.edu.iq

Course Information	
Course Title	**Cryptography**
Instructor	**Asst. Prof. Dr. Najlae Falah Hameed AlSaffar**

Course Description

1. Introduction To Cryptography

2. Secret Key Cryptography
2.1 Stream Ciphers
2.2 Monographic Cipher
2.3 Polygraphic Cipher

3. Data Encryption Standard (DES)
3.1 Block Ciphers
3.2 Feistel Cipher
3.3 DES Algorithm

4. Public Key Cryptography
4.1 Introduction
4.2 Hard Mathematical Problem(HMP)
4.3 Diffie Hellman Key Exchange Protocol
4.4 ElGamal Cryptosystem
4.5 The RSA Public Key Cryptosystem

5. Quadratic residues and quadratic reciprocity
5.1 The Quadratic Residuosity Problem
5.2 Goldwasser Micali Randomized Public Key Cryptosystem

6. Elliptic Curve Public Key Cryptosystem
6.1 Elliptic Curve Groups over Finite Field
6.2 Brief History of Elliptic Curve Cryptography
6.3 Elliptic Curve Analogues of some Public Key Cryptosystem

7. Digital Signatures
7.1 What is a Digital Signature?
7.2 RSA Digital Signatures
7.3 ElGamal Digital Signatures and DSA

Useful Resources

1. Elementary Number Theory, David M. Burton,McGraw-Hill, (any editions you can get is good but the best is 6th Edition, 2005.

2. Handbook of Applied Cryptography, Alfred J. Menezes, Paul C. van Oorschot, Scott A. Vanstone Rosen and Kenneth H., CRC Press, 1997.

3. Introduction to Modern Cryptography, Jonathan Katz and Yehuda Lindell, Chapman & Hall/CRC Cryptography and Network Security. Chapman & Hall/CRC, Boca Raton, FL, 2008.

4. Guide to Elliptic Curve Cryptography, Hankerson, D., Menezes, A., and S. Vanstone, Springer Verlag, 2004.

" There are many sources are available on the Net"

وصف المقرر

1. المؤسسة التعليمية	كلية علوم الحاسوب والرياضيات- قسم الرياضيات
2. القسم العلمي / المركز	**Diophantine Equations – المعادلات الديفونتية**
3. اسم / رمز المقرر	الدراسات العليا- ماجستير
4. أشكال الحضور المتاحة	
5. الفصل / السنة	الثاني- 2023-2024
6. أهداف المقرر	
يهدف المقرر الى إعطاء الطالب المفاهيم الاساسية للمعادلات الديفونتية. وكذلك امكانية تميز انواع المعادلات التي لها حلول في الاعداد الصحيحه. كما يهدف المقرر الى تعريف الطالب بعض المهارات والطرق الجبرية والبرمجية لحل المعادلات التي لها حلول وكذلك تطبيقات بعض هذه المعادلات ا(لمعدلات الاهليجية وتطبيقاتها في التشفير). ويهدف الى تعريف الطالب بمفهوم المتتابعات الخطية وانواعها وتطبيقاتها. واخيرا يهدف المقرر الى تعريف الطالب بطرق حل بعض انواع المعدلات الديفونتية في مجال المتتابعات الخطية.	

7. مخرجات المقرر وطرائق التعليم والتعلم والتقييم
أ- الاهداف المعرفية أ1- اكتساب المعارف عن طريق تعلم نظريات ومفاهيم أساسية في نظرية الاعداد. أ2- .قدرة الطالب على تطبيق طرق حل المعدلات الديفونتية في حل معادلات جبرية مختلفة. أ3- التعرف على اهمية وتطبيقات المعادلات الديفونتية في مجالات عدة في الرياضايات وخصوصا في التشفير. أ4- التعرف على اهمية وتطبيقات المتتابعات الخطية مثل متتابعات لوكاس في الرياضيات و في علوم اخرى.
ب - الاهداف المهاراتية الخاصة بالمقرر ب1- القدرة على الاجابة على الاسئلة التالية : 1-هل المعادلة قابلة للحل؟ 2-إذا كانت قابلة للحل، فهل الحل لهذه المعادلة محدود (تلك التي لها حل وحيد) أم النهائي؟ 3-إذا كانت قابلة للحل، فهل من الممكن إعطاء طريقة فعالة إليجاد جميع الحلول؟ ب2 – قدرة الطالب على تطبيق هذه المعادلات في مجلات اخرى مثل التشفير.
طرائق التقييم
إختبارات يومية و واجبات و إختبارات شهرية و اختبار نهائي.

10- بنية المقرر	
Course Description	
Topic	Details
Introduction to Diophantine equations	-Definition of Diophantine equation, - Some Classical Diophantine Equations, -Some types of Diophantine equations, --Some types of Linear and nonlinear Diophantine equations, - Pythagorean Triples and Related Problems, - Pell-Type Equations.
Elementary Methods for Solving Diophantine Equations	-The Factoring Method, -Solving Diophantine Equations Using Inequalities, -The Parametric Method, -The Modular Arithmetic, -Miscellaneous Diophantine Equations, -The Method of Mathematical Induction,
Recurrence relations	-Linear recurrence sequences, -Nonlinear recurrence sequences, -Solving these sequences, -Lucas sequences, -Identities related to Lucas sequences.
Diophantine equation related to recurrences	-Techniques for solving certain Diophantine equations in some Linear recurrence sequences.
References	1. David M. Burton. Elementary number theory, 7th edition. McGraw-Hill, 2011. 2. Alan Baker. *A Comprehensive Course in Number Theory*. Cambridge University Press, 2012. 3. Ben Green. *Analytic Number Theory: Lecture Notes*. University of Oxford, Oxford, 2016. 4. Godfrey Hardy and Edward Wright. *An Introduction to the Theory of Numbers*. Oxford University Press, 1980. 5- Rosen, Kenneth H. Elementary number theory and its applications. Addison-Wesley, 1984. 6- Andreescu, Titu & Andrica, Dorin & Cucurezeanu, Ion. An Introduction to Diophantine Equations: A Problem-Based Approach. Springer New York Dordrecht Heidelberg London, 2010.

وصف المقرر

1. المؤسسة التعليمية	كلية علوم الحاسوب والرياضيات- قسم الرياضيات
2. القسم العلمي / المركز	**Diophantine Equations – المعادلات الديفونتية**
3. اسم / رمز المقرر	الدراسات العليا- ماجستير
4. أشكال الحضور المتاحة	
5. الفصل / السنة	الثاني- 2023-2024
6. أهداف المقرر	
يهدف المقرر الى إعطاء الطالب المفاهيم الاساسية للمعادلات الديفونتية. وكذلك امكانية تميز انواع المعادلات التي لها حلول في الاعداد الصحيحه. كما يهدف المقرر الى تعريف الطالب بعض المهارات والطرق الجبرية والبرمجية لحل المعادلات التي لها حلول وكذلك تطبيقات بعض هذه المعادلات ا(لمعدلات الاهليجية وتطبيقاتها في التشفير). ويهدف الى تعريف الطالب بمفهوم المتتابعات الخطية وانواعها وتطبيقاتها. واخيرا يهدف المقرر الى تعريف الطالب بطرق حل بعض انواع المعدلات الديفونتية في مجال المتتابعات الخطية.	

7. مخرجات المقرر وطرائق التعليم والتعلم والتقييم
أ- الاهداف المعرفية أ1- اكتساب المعارف عن طريق تعلم نظريات ومفاهيم أساسية في نظرية الاعداد. أ2- .قدرة الطالب على تطبيق طرق حل المعدلات الديفونتية في حل معادلات جبرية مختلفة. أ3- التعرف على اهمية وتطبيقات المعادلات الديفونتية في مجالات عدة في الرياضايات وخصوصا في التشفير. أ4- التعرف على اهمية وتطبيقات المتتابعات الخطية مثل متتابعات لوكاس في الرياضيات و في علوم اخرى.
ب - الاهداف المهاراتية الخاصة بالمقرر ب1- القدرة على الاجابة على الاسئلة التالية : 1-هل المعادلة قابلة للحل؟ 2-إذا كانت قابلة للحل، فهل الحل لهذه المعادلة محدود (تلك التي لها حل وحيد) أم النهائي؟ 3-إذا كانت قابلة للحل، فهل من الممكن إعطاء طريقة فعالة إليجاد جميع الحلول؟ ب2 – قدرة الطالب على تطبيق هذه المعادلات في مجلات اخرى مثل التشفير.
طرائق التقييم
إختبارات يومية و واجبات و إختبارات شهرية و اختبار نهائي.

10- بنية المقرر	
Course Description	
Topic	Details
Introduction to Diophantine equations	-Definition of Diophantine equation, - Some Classical Diophantine Equations, -Some types of Diophantine equations, --Some types of Linear and nonlinear Diophantine equations, - Pythagorean Triples and Related Problems, - Pell-Type Equations.
Elementary Methods for Solving Diophantine Equations	-The Factoring Method, -Solving Diophantine Equations Using Inequalities, -The Parametric Method, -The Modular Arithmetic, -Miscellaneous Diophantine Equations, -The Method of Mathematical Induction,
Recurrence relations	-Linear recurrence sequences, -Nonlinear recurrence sequences, -Solving these sequences, -Lucas sequences, -Identities related to Lucas sequences.
Diophantine equation related to recurrences	-Techniques for solving certain Diophantine equations in some Linear recurrence sequences.
References	1. David M. Burton. Elementary number theory, 7th edition. McGraw-Hill, 2011. 2. Alan Baker. *A Comprehensive Course in Number Theory*. Cambridge University Press, 2012. 3. Ben Green. *Analytic Number Theory: Lecture Notes*. University of Oxford, Oxford, 2016. 4. Godfrey Hardy and Edward Wright. *An Introduction to the Theory of Numbers*. Oxford University Press, 1980. 5- Rosen, Kenneth H. Elementary number theory and its applications. Addison-Wesley, 1984. 6- Andreescu, Titu & Andrica, Dorin & Cucurezeanu, Ion. An Introduction to Diophantine Equations: A Problem-Based Approach. Springer New York Dordrecht Heidelberg London, 2010.

وصف المقرر :

In this course, we gives the students the mean concepts of the Statistical Parameters and Notation, Analysis of Variance, Statistical Tests, The Completely Randomized Design CRD, The Randomized Complete Block Design RCBD, Missing Observation and Estimation of Efficiency, Methods of Testing The Significant Difference Between The Treatments, The Latin Square Design , Factorial Experiments, The Split – Plot Design , The Split – Split – Plot Design, The Split – Block Design.

1. المؤسسة التعليمية	كلية علوم الحاسوب والرياضيات
2. القسم العلمي / المركز	علوم الرياضيات
3. اسم / رمز المقرر	إحصاء متقدم/ ماجستير
4. أشكال الحضور المتاحة	محاضرات حضورية
5. الفصل / السنة	الفصل الثاني 2024
6. عدد الساعات الدراسية (الكلي)	30
7. تاريخ إعداد هذا الوصف	2024/1/16

8. أهداف المقرر

To gives the students the relationship between the mean concepts of :-

1. Statistical Parameters and Notation
2. Analysis of Variance and Statistical Tests
3. The Completely Randomized Design CRD
4. The Randomized Complete Block Design RCBD
5. Missing Observation and Estimation of Efficiency
6. Methods of Testing The Significant Difference Between The Treatments
7. The Latin Square Design

8. Factorial Experiments
9. The Split – Plot Design
10. The Split – Split – Plot Design
11. The Split – Block Design

10. مخرجات المقرر وطرائق التعليم والتعلم والتقييم

Learning outcomes:

1. Be able to test Analysis of Variance and Statistical Tests
2. Be able to test a The Completely Randomized Design CRD
3. Be able to test The Randomized Complete Block Design RCBD
4. Be able to test Missing Observation and Estimation of Efficiency
5. Be able to test The Latin Square Design
6. Be able to obtain Factorial Experiments
7. Be able to obtain a The Split – Plot Design

طرائق التعليم والتعلم

Duration: 15 weeks, 30 hours in total
Lectures: 2 per week
Tutorials: Approximately 1 per week
Assignments: 5 Assignment

طرائق التقييم

Assessment instruments

Short reports and/ or Short research projects: One report after 10th week of the semester 5 marks
Quizzes. Two quizzes, 5 marks total.
Home works: five home works during the semester
Final examination: 70 marks

Allocation of Marks	
Assessment Instruments	**Mark**
First examination	**10%**

Second examination	**10%**
Final examination: 70 marks	**70%**
Reports, research projects, Quizzes, Home works, Projects	**10%**
Total	**100%**

Course/module academic calendar

week	Basic and support material to be covered	Homework/reports and their due dates
(1)	Statistical Parameters and Notation	
(2)	Analysis of Variance	
(3)	Statistical Tests	Tutorial , Home works
(4)	The Completely Randomized Design CRD	Tutorial, Quizzes
(5)	The Randomized Complete Block Design RCBD	Assignment
(6)	Missing Observation and Estimation of Efficiency	Tutorial, Home works
(7) First Exam	------	
(8)	Methods of Testing The Significant Difference Between The Treatments	Tutorial, Quizzes
(9)	The Latin Square Design	Tutorial, Home works
(10)	Factorial Experiments	Tutorial , Quizzes
(11)	The Split – Plot Design	Quizzes
Second Exam. (12)	----------	
(13)	The Split – Split – Plot Design	Tutorial Home works
(14)	The Split – Block Design	Tutorial
(15)	Applications	Quizzes
(16)	Final Exam	

3. البنية التحتية	
1- الكتب المقررة المطلوبة	المقرر اختياري
2- المراجع الرئيسية (المصادر)	Author(s): Wayne W. Daniel Title: Basic concepts and methodology for the health sciences Publisher : JOHN WILEY &SONS, INC Year of Publishing: 2010 Author(s): Robert C. Duncan, Rebecca G. Knapp M. Clinton Miller Title: Introductory Biostatistics for the health sciences publisher : JOHN WILEY &SONS, INC
ا- الكتب والمراجع التي يوصى بها (المجلات العلمية , التقارير ,....)	
ب - المراجع الالكترونية, مواقع الانترنيت	

4. خطة تطوير المقرر الدراسي

وصف المقرر :

In this course, we gives the students the mean concepts of set theory, permutation and combination, binomial expansion, probability, axioms of probability, conditional probability and Bayes theorem, independent events, random variables and distribution function, cumulative distribution function, probability mass function, special discrete distribution, special continues distribution, function of random variables and its expectation, variance and other moments, jointly distribution random variables.

1. المؤسسة التعليمية	كلية علوم الحاسوب والرياضيات
2. القسم العلمي / المركز	علوم الرياضيات
3. اسم / رمز المقرر	الاحتمالية / دبلوم عالي لغير الاختصاص
4. أشكال الحضور المتاحة	حضورية
5. الفصل / السنة	الفصل الثاني 2024
6. عدد الساعات الدراسية (الكلي)	60
7. تاريخ إعداد هذا الوصف	2024/1/16

8. أهداف المقرر

To gives the students the relationship between the mean concepts of :-

1. set theory, permutation and combination
2. permutation and combination, binomial expansion
3. probability, axioms of probability, conditional probability and Bayes theorem, independent events.
4. random variables and distribution function, cumulative distribution function, probability mass function.
5. special discrete distribution, special continues distribution, function of random variables and its expectation, variance.
6. jointly distribution random variables

10. مخرجات المقرر وطرائق التعليم والتعلم والتقييم

Learning outcomes:

1. Be able to understand the set theory, permutation and combination
7. Be able to understand the permutation and combination, binomial expansion
8. Be able to understand the probability, axioms of probability, conditional probability and Bayes theorem, independent events.
9. Be able to understand the random variables and distribution function, cumulative distribution function, probability mass function.
10. Be able to understand the special discrete distribution, special continues distribution, function of random variables and its expectation, variance.
2. Be able to obtain jointly distribution random variables.

طرائق التعليم والتعلم

Duration: 15 weeks, 60 hours in total
Lectures: 4 per week
Tutorials: Approximately 1 per week
Assignments: 7 Assignment

طرائق التقييم

Assessment instruments

Short reports and/ or Short research projects: One report after 10th week of the semester 5 marks
Quizzes. Two quizzes, 5 marks total.
Home works: five home works during the semester
Final examination: 60 marks

Allocation of Marks	
Assessment Instruments	**Mark**
First examination	**10%**
Second examination	**10%**
Final examination: 70 marks	**60%**
Reports, research projects, Quizzes, Home works, Projects	**20%**
Total	**100%**

Course/module academic calendar

week	Basic and support material to be covered	Homework/reports and their due dates
(1)	set theory,	
(2)	permutation and combination, binomial expansion,	
(3)	probability, axioms of probability,	Tutorial , Home works
(4)	conditional probability	Tutorial, Quizzes
(5)	Bayes theorem	Assignment
(6)	independent events	Tutorial, Home works
(7) First Exam	------	
(8)	random variables and distribution function	Tutorial, Quizzes
(9)	cumulative distribution function, probability mass function	Tutorial, Home works
(10)	special discrete distribution	Tutorial , Quizzes
(11)	special continues distribution.	Quizzes
Second Exam. (12)	----------	
(13)	special continues distribution, function of random variables and its expectation.	Tutorial Home works
(14)	variance and other moments	Tutorial
(15)	jointly distribution random variables.	Quizzes
(16)	Final Exam	

3. البنية التحتية	
1- الكتب المقررة المطلوبة	المقرر اختياري
2- المراجع الرئيسية (المصادر)	Author(s): Wayne W. Daniel Title: Basic concepts and methodology for the health sciences Publisher : JOHN WILEY &SONS, INC Year of Publishing: 2010 Author(s): Robert C. Duncan, Rebecca G. Knapp M. Clinton Miller Title: Introductory Biostatistics for the health sciences publisher : JOHN WILEY &SONS, INC
ا- الكتب والمراجع التي يوصى بها (المجلات العلمية , التقارير ,....)	
ب - المراجع الالكترونية, مواقع الانترنيت	

4. خطة تطوير المقرر الدراسي

Ideal topological spaces

Chapter one
Ideal spaces
Some type of ideal spaces
Ideal base
Sub space of ideal spaces
Kuratowski clouser operator
Chapter two
Local function
Derived set of ideal spaces
Codensity
Compatibility
Bench point of ideal space
Turing point of ideal spaces
Chapter three
Continuity of ideal spaces
Psi operator
Ideal resolvable space

الأستاذ الدكتور يزي كاظم مهدي الطالقاني