(1445–1446)

Master of Science in Mathematics

PROGRAM HANDBOOK

Mission, Goals, and Program objectives

1. Program Mission:

To produce competent postgraduates who can disseminate their mathematical knowledge and understanding and serve the job market and community by providing a stimulating academic and research environment

2. Program Goals:

1. Providing in-depth knowledge of advanced mathematical theories and its applications

2. Preparing postgraduates who can conduct research or undertake professional projects in the field of mathematics.

3. Producing Postgraduates who can disseminate their mathematical knowledge in various forms.

4. Preparing the students to serve the community by pursuing a career in the field of mathematics and related fields.

3. Program objectives

- Equip students with foundational and advanced knowledge of mathematical concepts, principles, and theories, fostering analytical and logical reasoning.

- Prepare graduates to apply mathematical techniques and tools to solve real-world problems in various fields such as science, engineering, finance, and technology.

- Develop the ability to conduct research, identify relevant mathematical problems, and apply suitable methods to propose solutions.

- Enhance communication skills, enabling students to effectively articulate mathematical ideas and solutions in both written and oral formats.

• Instill ethical values, professionalism, and a commitment to integrity in academic and professional endeavors.

• Promote lifelong learning and encourage students to pursue advanced studies or professional development in mathematics and related disciplines.

• Encourage students to serve the community and contribute to societal development through careers in education, research, and industry.

Career Avenues

121310 – Planning and Development Manager

212001 – Mathematics Science Specialist

231017 – Mathematics and Statistics Professor

233012 – Secondary Teacher of Mathematics

233033 – Intermediate Level of Math teacher

234101 – Primary School teacher

234108 – Primary School Math and Science Teacher

331402 – Mathematics Assistant

Zero Group – Armed Forces Officer

Admission requirements

- The candidate must be a Saudi national or a non-Saudi who has obtained an official scholarship through one of the cultural exchange programs.
- The candidate must hold a B Sc degree in Mathematics or Mathematics education (or its equivalent) from any university recognized by the MOE either inside or outside the Kingdom of Saudi Arabia.

- The candidate must have a GPA of (3.25) out of (5) at the bachelor's degree level as a minimum to be admitted in the program
- The candidate must have secured atleast a score of 4 in IELTS or equivalent English Test.
- The candidate must not have previously been dismissed from any university for disciplinary or academic reasons.
- The candidate must pass the written test, and a personal interview held by the Department of Mathematics.
- The candidate must have the approval of the employer if he/she works in either the government sector or the private sector

Graduation requirements

- The Minimum period of study is 2 years and the Maximum time allowed is 4 years.
- The Student must complete around 9 core courses and 2 elective courses in the first three semesters and submit a thesis on the research topic under a Supervisor allotted by the Department Council.
- For successful completion of each course, the student must secure atleast 75% marks (3.75 in 5 point scale of GPA).
- Regarding Master Thesis Course, the student must comply with the Thesis regulations given below.

Thesis Regulations

1. Registration of the thesis:

Requirements and Procedures:

1. In order to register for Thesis, the graduate student must have successfully completed the course work of all courses successfully.
2. The graduate student has the option to choose the supervisor of his choice. However, the Head of the Department will allocate the supervisor in consultation with the coordinator of Higher Education Committee of the Department.
3. The student in consultation with the allocated research supervisor selects the topic and makes a formal application to the competent authority for consideration and approval.
4. Once approved, the graduate student registers the title in the National Library to avoid duplicate work.

Responsibilities and Procedures for Scientific Guidance:

1. The Research Supervisor advises the student on the research methodology to be adopted.
2. The Supervisor periodically interacts with the student and provide guidance with regard to collection and review of literature, identifying the research problem and its solution.

2. Scientific Supervision:

(The regulations of the selection of the scientific supervisor and his/her responsibilities, as well as the procedures/ mechanisms of the scientific supervision and follow-up)

Appointment of Supervisor:

1. The Research Supervisor must be a doctorate degree holder holding an academic rank of Assistant Professor and above. However, in case of the supervisor being an Assistant Professor, he must have published atleast 2 publications after acquiring Ph D degree and immediately before the appointment as Assistant Professor.

Responsibilities:

1. The Supervisor is responsible for the quality of the research being undertaken by the graduate student and the output.
2. The Supervisor advises the student from time to time and help the students in case of any hardship in research.
3. The Supervisor must make a record of the progress of research by the graduate student from time to time.
4. The Supervisor must ensure that atleast one paper is published/accepted in a scientific journal before submission of the thesis.
5. On completion of preparation of the thesis by the student, the supervisor reviews for any correction and modification and recommends the names of examinations for the evaluation of thesis and defense.

3.Thesis Defense/Examination:

(The regulations for selection of the defense/examination committee and the requirements to proceed for thesis defense, the procedures for defense and approval of the thesis, and criteria for evaluation of the thesis)

1. The Thesis evaluation committee is formed comprising of three examiners – (Supervisor and two other examiners). Out of the two external examiners, one must be within the department.
2. The thesis evaluation committee is approved in the Department Council, College Council and approved by the Higher Studies Committee of the University.
3. On approval, the supervisor forwards the thesis to the examiners for their evaluation and comments and a suitable date for defense is notified.
4. On the date of defense, the graduate student makes a presentation on his/her work before the audience and responds to their queries.
5. After the open defense, the graduate student defends the thesis in private before the Committee.

   Criteria for evaluation:

   The committee considers the following aspects:

   (a) Originality of Research
   (b) Research Methodology
   (c) Past work done in the area
   (d) Reporting of the derived results
   (e) Scope for further research

(f) Presentation by the student and the defense on the questions raised by the committee members.

Notification of the Outcome:

On completion of the defense, the Chairman of the Committee prepares a report signed by all three members and reads in the open house whether or not the Thesis could be considered for award of Master Degree before the audience.

GPA, Graduation requirements etc

The Average and cumulate GPA are calculated every semester for the student automatically by the system. To know how to calculate the averages, one should follow the following steps:

Calculating the Semester Average

- The GPA is calculated considering the following points:

1. Knowing the number of credits of the courses.
2. Knowing the mark obtained in each courses.
3. Knowing the corresponding grade of each mark.
4. Knowing the value of each grade.
5. Knowing the points = number of hours of the course x value of the grade.
6. Determining the total points obtained in all courses of the semester.
7. Determining the total number of credits registered in the semester.
8. The average is calculated every semester according to the following equation:

$$\text{GPA} = \frac{\text{Total points (item 6)}}{\text{Number of hours registered in the semester (item 7)}}$$

The following table shows the percentage of marks, grade and value obtained by the student in each course, which is used to calculate the points:

Mark	Grade	Letter of Grade	Value of Grade
From 95 - 100	+ Excellent	+A	5.00
From 90 to less than 95	Excellent	A	4.75
From 85 to less than 90	+ Very Good	+ B	4.50
From 80 to less than 85	Very Good	B	4.00
From 75 to less than 80	+ Good	+ C	3.50
Less than 75	Failure	F	1.00
Absence from lectures (25% or more)	Debarred	H	1.00

Calculating the Average cumulative:

- The GPA semester average is calculated as follows:

(1) The grand total of points (for all semesters that have been completed).

(2) The grand total of credit hours (for all semesters that have been completed successfully).

- The cumulative average is calculated according to the following equation:

$$\text{GPA} = \frac{\text{Grand total of points}}{\text{Grand total of credit hours}}$$

Study Plan for Master Program of Science in Mathematics
(Thesis Option)

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College, or Program)
Level 1	Math 620	Differential Equations	Required	--	3(3,0,0)	Program
	Math 632	Linear Algebra	Required	--	3(3,0,0)	
	Math 610	Research Methodology	Required	--	3(3,0,0)	
	Math 629	Complex Analysis	Required	--	3(3,0,0)	
Level 2	Math 633	Numerical Analysis	Required	--	3(3,0,0)	
	Math 639	Selected Topics in Discrete Mathematics	Required	--	3(3,0,0)	
	Math 615	Partial Differential Equations (I)	Required	--	3(3,0,0)	
	Math 613	Calculus of variations	Required	--	3(3,0,0)	
Level 3	Math 621	Selected Topics in Applied Mathematics	Elective	--	3(3,0,0)	
	Math xxx	Elective Course	Elective	--	3(3,0,0)	
Level 4	Math 699	Thesis	Required		6(0,0,6)	

Course description

توصيف المقررات

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريض 610	أساليب البحث العلمي	3	

توصيف المقرر

The main objective is to prepare the students gain awareness about review of scientific literature, identify scientific problem and associated research methods and writing scientific reports thus prepare them undertake independent research in their field of interest on completion of the Program

1. الأهداف:

- **إثبات القدرة على اختيار الأساليب المناسبة للبحث الأهداف والغايات**
- **فهم قيود أساليب بحث معينة**
- **تطوير المهارات في تحليل البيانات النوعية والكمية وكيفية العرض**
- **تطوير مهارات التفكير النقدي المتقدمة**
- **إظهار مهارات الكتابة المحسنة.**
- **التعرف على أهمية البحث.**
- **القدرة على تمييز بيان الغرض ، سؤال بحث أو فرضية ، وهدف بحثي.**
- **مناقشة أنواع تصميم الدراسة.**
- **إظهار أساليب أخذ العينات.**
- **التفريق بين السببية وعدم وجود علاقة سببية**
- **حدد العينة المناسبة للبحث.**
- **التمييز بين أساليب وتقنيات جمع البيانات.**
- **إجراء البحوث العلمية على نحو فعال.**
- **استخدام أساليب التفكير النقدي في حل مشاكل البحث العلمي.**
- **استخدام موارد تكنولوجيا المعلومات المتاحة.**

2. المحتوي

مقدمة في أساليب البحث ودور البحث العلمي في مختلف المجالات – أواع البحث العلمي : عملية – نظرية إحصائية – خطوات إجراء البحث العلمي – المسح الأدبي – أهداف وفروض البحث العلمي - تطور الإطار النظري للبحث –عينات من الأساليب السابقة في موضوع البحث العلمي – استراتيجية البحث العلمي – منهجية إجراء البحث العلمي – اعتماد واختيار اسلوب للبحث العلمي - أخلاقيات إجراء البحوث العلمية - كتابة البحث العلمي.

Course Code	Course Title	Credits	Prerequisite
Math 610	Research Methodology	3 hours	

Course Description

The main objective is to prepare the students gain awareness about review of scientific literature, identify scientific problem and associated research methods and writing scientific reports thus prepare them undertake independent research in their field of interest on completion of the Program

1. Objectives/ILO:

- Demonstrate the ability to choose methods appropriate to research aims and objectives
- Understand the limitations of particular research methods
- Develop skills in qualitative and quantitative data analysis and presentation
- Develop advanced critical thinking skills
- Demonstrate enhanced writing skills.
- Recognize the importance of research.
- Able to distinguish a purpose statement, a research question or hypothesis, and a research objective.
- Discuss types of study design.
- Demonstrate the sampling methods.
- Differentiate between causal and no causal association
- Select the proper sample for the research.
- Discriminate between data collection methods and techniques.
- Conduct scientific research effectively.
- Use critical thinking methods in solving scientific research problems.
- Use available IT resources.

2. Content:

Introduction to research and the role of research in various fields.

Types of Research – Experimental, Theoretical, Statistical (Survey) - The research process - Conducting a critical review of the literature - Development of research questions and objectives - Development of a theoretical framework - Sampling techniques - Decisions in developing a research design and research strategy - (eg. Case study, action research) - Research methodologies (eg. qualitative, quantitative, ethnography) - Research techniques (methods and analysis) - Ethical issues in doing research - Writing a comprehensive research proposal

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
613 ريض	حساب المتغيرات والتحكم الأمثل	3	

توصيف المقرر

The main obtective : To provide various theories and concpets of Optimal Control and prepare the students solve mathematical problems using variational approach

1. الأهداف:

• اكتساب المعرفة حول الحساب التاريخي للنظرية ، الرموز القياسية والصيغ البسيطة

•calculus of variations. صياغة مشاكل بسيطة في

• اكتساب القدرة على استخدام التقنيات التحليلية لحساب التفاضل والتكامل ، والبرمجة الديناميكية والمبدأ الاعظم وما إلى ذلك.

• تطبيق نظرية وتقنيات حساب التفاضل والتكامل والتحكم الأمثل لحل بعض مشاكل التحكم.

• تجميع المعرفة الرياضية في نمذجة مشاكل التحكم الأمثل الأمثل مثل بلوزا ، مايرولجرانج صياغة الخ

•Pontryagin القدرةعلى تطبيق النهج المتغير للتحكم الأمثل ، مبدأ الحد الأقصى في حل المشاكل الرياضية

• تقديم عرض تقديمي حول موضوع معين

2. المحتوي:

المتغيرات العامة للدوال القصـــوى المقيدة . معادلات أويلر. معادلة هاملتون-جاكوبي وموضـــوعات ذات الصـلة. المتغير الثاني والشـروط الكافية القصـوى. التشـكيل التحكم الأمثل بالمسـائل ، بولزا، ماير، وصـيغة لاغرانج، اقتراب المتغيرات للتحكم الأمثل ، مبدأ الحد الأقصى بونترايجين، البرمجة الديناميكية.

Course Code	Course Title	Credits	Prerequisite
Math613	Calculus of Variations and Optimal control	3 hours	

Course Description

1. **Objectives : To provide various theories and concpets of Optimal Control and prepare the students solve mathematical problems using variational approach**

   ILO:

Upon completion of the subject, students will be able to:

- acquire knowledge about historical account for the theory, standard notations and simple formulations
- Formulate simple problems in calculus of variations.
- Gain ability to use Analytical techniques of Calculus of variations, dynamic programming and the maximum principle etc.
- Apply theory and techniques of calculus of variations and optimal control to solve certain control problems.
- Synthesize mathematical knowledge in modeling simple optimal control problems such as Bolza, Mayer and Lagrange Formulation etc.
- Be able to apply Variational Approach to Optimal Control, Pontryagin Maximum Principle in solving mathematical problems
- Make presentation on a given topic

2. Content:

General variations of a functional constrained extrema. Euler equations. Hamilton-Jacobi equation and related topics. The second variation and sufficient conditions for an extremum. Formation of optimal control Problems, Bolza, Mayer and Lagrange Formulation, Variational Approach to Optimal Control, Pontryagin Maximum Principal, Dynamic programming.

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريض615	Numerical Partial Differential Equations (I)	3	

توصيف المقرر

Course Code	Course Title	Credits	Prerequisite
Math615	Numerical Partial Differential Equations (I)	3 hours	

Course Description

Objectives: To provide an in-depth knowledge in spaces of test functions and distributions, derivatives of distribution and its properties, convolution products of distribution, tempered distributions, Fourier transform of tempered distribution, Sobolov spaces and its simple properties.

Upon completion of the subject, students will be able to:

- Gain an in-depth knowledge about the basic concepts underlying test functions and distributions, fourier transforms and Sobolev spaces.
- Prove and apply the properties and theorems in test functions and distributions, convolution of distributions, Fourier transforms and Sobolov spaces.
- Contrast the concept of test functions and distributions.
- Develop problem solving skills on convolution products, Fourier transforms and Sobolev spaces.

2. Content:

Test Functions, Distributions, Derivatives of distributions, Distribution with compact support, Convolution of distributions, Tempered distributions, Fourier transforms of tempered distribution, Sobolov spaces and its properties

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريض 620	المعادلات التفاضلية	3	

توصيف المقرر

The main objective : To make the students aware of Stability Theory, Poincare's Theory etc and solve differential equations including Sturm-Liouville Boundary Problems using various techniques

1. الأهداف:

• فهم المفهوم الأساسي لنظرية الاستقرار.

للنظم ثنائية الأبعاد.Poincare• اكتساب المعرفة حول نظرية

• تعلم كيف يتم استخدام المعادلات التفاضلية لدراسة المشاكل الجسدية المختلفة وصياغتها.

Poincare. • صياغة المشاكل التي تنطوي على المعادلات التفاضلية لتحليل نظرية

• الحصول على حلول لعدة فئات مهمة من المعادلات التفاضلية.

Sturm-Liouville• فهم مشكلة حدود

وتحليل استقرار الخطية وغير الخطية.L -S• البحث عن حل مشكلة حدود

• القدرة على تقديم عروض / ندوة حول موضوع معين.

2. المحتوي:

الوجود والتفرد لحلول النظم الخطيه، نظرية الإســـتقرار، نظرية بونكير للنظم ذات البعد الثاني ، مســـائل شتيرم- ليوفيلالحدوديه

Course Code	Course Title	Credits	Prerequisite
Math620	**Differential Equations**	3 hours	

Course Description

1. **Objectives: To make the students aware of Stability Theory, Poincare's Theory etc and solve differential equations including Sturm-Liouville Boundary Problems using various techniques**

ILO:

Upon completion of this course, the student will be able to:

- Understand the basic concept of Stability Theory
- Acquire knowledge about the Poincare's theory for two dimensional systems
- Learn how the differential equations are used to study various physical problems and formulate the same.
- Formulate problems involving differential equations to analyse Poincare theory
- Obtain solutions of several important classes of differential equations
- Understand the Sturm-Liouville boundary problem
- Find the solution of S- L boundary problem and analyze stability of linear and non-linearsystems
- Able to make presentations / seminar on a given topic

2. Content:

Existence and uniqueness of solutions of linear systems. Stability theory. Poincare's theory for two dimensional systems. Sturm-Liouville boundary problems.

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريض621	Selected Topics in Applied Mathematics	3	

توصيف المقرر

Course Code	Course Title	Credits	Prerequisite
Math621	Selected Topics in Applied Mathematics	3 hours	

Course Description

1. **Objectives : To provide various theories and concpets of Optimal Control and prepare the students solve mathematical problems using variational approach**
   ILO:

Upon completion of the subject, students will be able to:

2. Content:

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريض 615	المعادلات التفاضلية الجزئية **1**	3	Math620

توصيف المقرر

The main objective : To provide the students with various concepts of PDEs such as space distribution, tempered distribution and fourier transforms. Sobolve spaces etc and train the students prepare presentation on selected topics.

1. الأهداف .

• اكتساب المعرفة حول المشتقات الضعيفة

• القدرة على تحديد مساحة التوزيعات والتبولوجيا المرتبطة بها

• فهم مفهوم الضرب الالتفافي لاثنين من التوزيعات

• اكتساب المعرفة وتطبيق نظرية الوجدانية للمعادلات الخطية

• تحديدفضاءالتوزيعات

• فهم خصائص فضاءالتوزيعات

• اكتساب المعرفة حول تحويل فوربيه تعمل على فضاءالتوزيعات

•sobolev اكتساب المعرفة حول مسافات

• القدرة على تقديم عرض حول موضوع معين

• القدرة على صياغة النماذج الرياضية التي تنطوي على المعادلات التفاضلية الجزئية وإيجاد الحلول التحليلية هناك

2. المحتوي:

فضـــــاءدوالالاختبار $C_0^\infty(\Omega)$ -فضـــــاءالتوزيعاتوالتوبولوجياالخاصـــــة بها - ناتج ضـــــرباثنينمنالتوزيعات– نظريةالوجودللمعادلات الخطية ذات المعاملاتالثابتة–فضاءالتوزيعاتوتحويلاتفوربيه -فضاءاتسوبوليف.

Course Code	Course Title	Credits	Prerequisite
Math615	Partial Differential Equations I	2 hours	Math620

Course Description

1. **Objectives: To provide the students with various concepts of PDEs such as space distribution, tempered distribution and fourier transforms. Sobolve spaces etc and train the students prepare presentation on selected topics.**

ILO:

At the end of the course, the student shall

- Acquire knowledge about weak derivatives
- Able to define space of distributions and their associated topologies
- Understand the concept of convolution product of two distributions
- Acquire knowledge and apply the existence theorem for linear equations
- Define a Tempered Distribution
- Understand the properties of tempered distribution
- Acquire knowledge about the Fourier transform acting on Tempered distribution
- Acquire knowledge about sobolev spaces
- Able to make presentation on a given topic
- Able to formulate mathematical models involving partial differential equations and find analytical solutions there on

2. Content: The space of test functions $\mathbf{C}_0^\infty(\Omega)$. The space of distributions and its topology. The convolution product of two distributions. Existence theorem for linear equations with constant coefficients. The space of tempered distributions and Fourier transforms. Sobolev spaces.

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
632 ريض	الجبر الخطى	3	

توصيف المقرر

The main objective : Become fully conversant with all basic concepts of Linear Algebra such as Linear Functionals, Linear Transformation, Vector Spaces and associated theorems and results and able to apply to solve mathematical problems.

1: الأهداف .

• فهم مفهوم الدالة الخطية والمساحات المزدوجة

• القدرة على كتابة اثبات على النظريات المرتبطة بها

• فهم مفهوم التحول الخطي القدرة على تقديمه في شكل مصفوفة .

• القدرة على تمثيل التحول الخطي في شكل مخروطي

• فهم مفهوم ممتد المتجهات للفضائات المتجهة

• القدرة على تقديم المفاهيم الأساسية والنظريات في أجزاء الجبر الخطي كما هو موضح في محتوى المقرر.

• استخدام المفاهيم والنظريات الأساسية في أجزاء الجبر الخطي كما هو موضح في محتوى المقرر من أجل حل المشكلات المطبقة

2. المحتوي

المؤثر(الناقل) الخطى والفراغات المزدوجة الخطية، الأشـــكال القانونية للمؤثرات و التحويلات الخطية، صيغة جوردان والصيغ الدورية- الصيغ متعددة الخطية والهرميتية - التحويلات الطبيعية وتحويلات الوحدة للفراغات الاتجاهية. tensor– ممتد الاتجهات

Course Code	Course Title	Credits	Prerequisite
Math632	Linear Algebra	3 hours	

Course Description

1. **Objectives : Become fully conversant with all basic concepts of Linear Algebra such as Linear Functionals, Linear Transformation, Vector Spaces and associated theorems and results and able to apply to solve mathematical problems.**

ILO:

After completing the course students shall be able to:

- Understand the concept of Linear Functional and Dual Spaces
- Able to write proof for associated theorems
- Understand the concept of Linear Transformation and able to present in matrix form (Both Real and Complex including Unitary Matrices)
- Able to represent Linear Transformation in canonical form
- Understand the concept of tensor product of vector spaces
- Able to present basic concepts and theorems within the parts of linear algebra as described by the course content.
- Use basic concepts and theorems within the parts of linear algebra as described by the course content in order to solve applied problems
- Communicate with the help of mathematical terminology also in other contexts.

2. Content:

Linear functional and dual spaces, Canonical form of linear transformations, Jordan and rational forms, Multilinear forms, Hermitian, unitary and normal transformations, Tensor product of vector spaces.

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريض633	التحليل العددي	3	

توصيف المقرر

The main objective : To prepare the students understand various concepts of Numerical Analysis and solve problems using various methods such as iterative techniques, chord method, newton method, Bairsou Technique etc.

1. الأهداف:

- فهم مفاهيم قواعد المتجهات والمصفوفات
- البحث عن حل تكراري للمعادلات غير الخطية باستخدام تقنيات مختلفة
- تطبيق التكرار الثاني وأعلى من أجل المعادلات غير الخطية
- اكتساب مهارة لتطبيق تقنيات مختلفة مثل طريقة وتر ، طريقة نيوتن ، طريقة الموضع الزائف وطريقة دلتا دلتا
- فهم مبدأ ونظرية طريقة برنولي وتقنية Bairsou
- أن تكون قادراً على إيجاد حل لنظام المعادلات غير الخطية باستخدام الاستبدال ، طريقة secant ، طريقة نيوتن –رافسون.

2. المحتوي

حساب الفاصلة المتحركة –خطأ التقريب- معايير المتجهات والمصفوفات- طرائق عددية لحل المعادلات ذات المتغير الواحد (الوضع الزائف-نيوتن-التكرار الدالي- القاطع وايتكن تحليل الخطأ لهذه الطرائق ودراسة معدلات التقارب 0 طرائق خاصة لحل كثيرات الحدود – حساب كثيرات الحدود و مشتقاتها- متوالية شتورم – طريقة برنولى- طريقة برسيو). طرائق عددية لحل مجموعة من المعادلات الغير تحليل الخطأ والتقارب لهذه الطرائق.خطية: نيوتن- نيوتنب الفروق المنتهية، القاطع، القاطعالموجبة بالتحديد، ،والنزولاالانحداري

Course Code	Course Title	Credits	Prerequisite
Math633	Numerical Analysis	3 hours	

Course Description

1. **Objectives : To prepare the students understand various concepts of Numerical Analysis and solve problems using various methods such as iterative techniques, chord method, newton method, Bairsou Technique etc.**

   ILO:

After Completion of the course, the student shall:

- Understand the concepts of norms of vectors and matrices
- Find iterative solution of non-linear equations using various techniques
- Apply second and higher order iterations for non linear equations
- Acquire skill to apply various techniques such as the chord method, newton method, false position method and atikin's delta square method
- Understand the principle and theory of Bernoulli method and Bairsou's technique
- Be able to find solution of system of nonlinear equations using substitution, secant method, newton raphson method etc.

2. Content:

Norms, Arithmetic, and well-posed computations (Norms of vectors and matrices, Floating-point arithmetic and rounding errors, Well-posed computations); Iterative solution of non- linear equations(Functional iterations for a single equation: error propagation, second and higher order iteration methods. Some explicit iteration procedures: The Chord method, Newton method, method of false position and Aitkin's delta square method, Special methods for polynomials: evaluation of polynomials and their derivatives, sturm sequence, Bernoulli's method, Bairsou's method); Solution of Systems of Nonlinear equations: Substitution, Secant and Newton Raphson method, Continuation methods.

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
629 ريض	التحليل المركب	3	

موضوع المقرر:

1. **The main objective : The sutdents gain better understanding about various concepts of contemporary complex analysis and their applications in solving mathematical problems.**

1. الأهداف:

• فهم بعض موضوعات التحليل المركب المعاصر ، ولا سيما في فضاءات خاصة من الدوال التحليلية ، والتطبيقات شبه المطابقة ، الدوال غير المتكافئة إلخ.

• أداء العمل المستقل في هذه المواضيع وخاصة استخدام أساليب التحليل المركب في مجالات الرياضيات الأخرى مثل التحليل التوافقي ، المعادلات التفاضلية ، إلخ.

• اكتساب المهارات لتطبيق تقنيات مختلفة من التحليل المركب المعاصر في حل المشاكل الرياضية

• القدرة على المشاركة في المناقشات العلمية

• إجراء البحوث على المستوى الدولي العالي في التحليل المركب والكلاسيكي المركب وتطبيقاته.

2. المحتوي

الدوال التوافقية ,الصـيغة العامة لنظرية كوشـى, عائلة المنحنيات الطبيعية, الراسـم المحافظ, الاتصـال التحليلي , نظرية الدوال احادية التكافؤ.

Course Code	Course Title	Credits	Prerequisite
Math629	Complex Analysis	3 hours	

Course Description

2. Objectives : The sutdents gain better understanding about various concepts of contemporary complex analysis and their applications in solving mathematical problems.

ILO:

At the end of the course, the student shall be able to :

- Understand some topics of contemporary complex analysis, in particular spaces of analytic functions, quasi-conformal mappings, univalent functions etc.
- Perform independent work in these topics and especially to use the methods of complex analysis in other areas of mathematics such as harmonic analysis, differential equations etc.
- Acquire skills to apply various techniques of contemporary complex analysis in solving mathematical problems
- Able to participate in scientific discussions
- Conduct researches on high international level in contemporary and classical complex analysis and its applications.

2. Content:

Harmonic function, the general form of Cauchy's Theorem, Normal families, Conformal mapping. Analytic continuation, univalent function theory.

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريض639	Selected Topics in Discrete Mathematics	3	

توصيف المقرر

Course Code	Course Title	Credits	Prerequisite
Math639	Selected Topics in Discrete Mathematics	3 hours	

Course Description

1. **Objectives: To provide various theories and concpets of Optimal Control and prepare the students solve mathematical problems using variational approach**
   ILO:

Upon completion of the subject, students will be able to:

2. Content:

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريضXXX	Elective Course	3	

توصيف المقرر

Course Code	Course Title	Credits	Prerequisite
MathXXX	Elective course	3 hours	

Course Description

1. **Objectives : To provide various theories and concpets of Optimal Control and prepare the students solve mathematical problems using variational approach**
   ILO:

Upon completion of the subject, students will be able to:

2. Content:

رمز ورقم المقرر	عنوان المقـــرر	عدد الوحدات	متطلب سابق
ريض699	Thesis	6	

توصيف المقرر

Course Code	Course Title	Credits	Prerequisite
Math699	Thesis	6 hours	

Course Description

1. **Objectives : To provide various theories and concpets of Optimal Control and prepare the students solve mathematical problems using variational approach**
   ILO:

2. Content: The Student performs research in a topic approved by the Department Council and presents a Thesis, defends the same and also report the results in a Scientific Journal.

Some Useful Links

Deanship of admission and registration - https://dar.psau.edu.sa/en

Vice Rectorate of scientific research and higher studies - https://vrpssr.psau.edu.sa/en

Deanship of Student Affairs : https://dsa.psau.edu.sa/en

Deanship of Educational Services : https://des.psau.edu.sa/en

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