Kingdom of Saudi Arabia

Ministry of Higher Education

King Saud University

Department of Mathematics Handbook

College of Science

1439/1440 H.

2018/2019 G.

King Saud University

College of Science

Department of Mathematics

Handbook of the Department of Mathematics

General Information Bulletin


كلية العلوم
College of Science
Bld: 4
مبنى ٤
كلية العلوم
COLLEGE OF SCIENCE
College Administration
إدارة الكلية
Physics & Astronomy Dept.
قسم الفيزياء والفلك
Statistics & O. Research Dept.
قسم الإحصاء وبحوث العمليات
Geology Dept.
قسم الجيولوجيا
Mathematics Dept.
قسم الرياضيات
معهد الملك عبد الله للتقنية النانو
King Abdullah Institute for Nanotechnology
NANO
RVKSU
Riyadh Techno Valley
King Saud University
وادي الرياض للتقنية
كلية العلوم مبنى ٤
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Contents

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More information about the Department and the faculty members, is available on the Department website: http://math.ksu.edu.sa

About the Department

The Department of mathematics was established in 1378 H (1958 G). It is one of the earliest established departments and, at present, it is one of the largest departments in the University. Since its inception, the Department is continuously developing and serving the ever increasing number of students from different colleges of the University. The Department has two branches, one for the males and the other is for the females in the main campus in Deriyah.

Currently, there are 85 faculty members comprising professors, associate professors and assistant professors specialized in various mathematical areas, namely; analysis, algebra, geometry, topology, numerical analysis, discrete mathematics and different areas of applied mathematics. In addition to faculty members, the Department has also 46 lecturers, investigators, teaching assistants and demonstrators.

Apart from teaching duties, the faculty members in the Department are actively involved in research in different areas of mathematics and their research papers are published in reputed international journals. Some of the faculty members are on the editorial boards of various journals and many of them are also reviewers of various journals of international repute. The Department is also planning to establish an Excellence Center in Applied Mathematics to promote high quality of research having practical applications and a B.Sc. Program in actuarial and financial mathematics.

The activity of the Department involves cooperation at the national and at the international levels. At the national level, cooperation with Hail University has started two years ago through an M.Sc. program, while at the international level the Department is:

- Arranging cooperation with the Department of Mathematics in the University of Calgary in Canada which has been recently selected as a benchmark department.
- Arranging cooperation with the University Parise-1 (Pantheon Sorbonne).

The Department awards B.Sc., M.Sc. and Ph.D. degrees in different areas of mathematics. By the end of the academic year 1438-1439 H (2017/2018 G), there were 505 students enrolled for the B.Sc. Degree, 5 for the M.Sc. and 14 for the Ph.D. Moreover, 103 students have been graduated in that

year, out of them 102 were conferred the B.Sc. Degree, and one a Ph.D. Degree.

In addition, the Department teaches mathematics courses required by other programs of the College of Science such as Statistics, Operation Research, Chemistry, Physics and Astronomy. It also caters for the needs of mathematics teaching of other colleges in the University such as Engineering, Computer science, and Agriculture. Furthermore, the Department offers training services through the Community Service Center, and consultations to various sectors in the Kingdom in the field of mathematics and its applications.

Vision

Leadership in achieving excellent outcomes in mathematics and its applications, and to contribute to the enrichment of the knowledge-society.

Mission

To provide distinguished programs to produce competent graduates in mathematics and its applications, to meet the developmental needs of society, and enrich knowledge through education, scientific research, authoring and translation, and optimal use of technology.

Objectives

- To produce qualified graduates having proper thinking skills to contribute to the community service
- To attract distinguished mathematicians and mathematically talented students.
- To boost up teaching and research capabilities of the departmental faculty and promote research and scientific publications.
- To provide an environment that supports creativity and maintains general ethics.
- To enrich the Arabic library with authored and translated mathematical books.
- To enhance the position of the department internally and externally, and to develop community interactions.

- To optimize the use of technology and available resources.

Graduates' Job Opportunities

- Mathematicians or Actuaries in government ministries and institutions and private sectors that require mathematical skills such as: the Ministry of Education, Ministry of Finance, the Saudi Arabian Monetary Agency, the General Organization for Social Insurance, the Central Department of Statistics and Information, the Public Pension Agency, Banks, Research Centers, ARAMCO, SABIC, etc.
- Meritorious students pursue higher studies and ultimately join as faculty in colleges and universities in the Kingdom of Saudi Arabia.

Departmental Administration

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Main Scientific Awards

Several international and national awards have been obtained by some faculty members; namely:

The Lester R. Ford award, Mathematical Association of America, 2006: Dr. Ibtesam Bajunaid

Almarai award, organized by Almarai Company, 2008-2009: Dr. Najla Al-Towaijiry

The "Award of Excellence in Teaching",

- Dr. Fairouz Tchier for the academic year 2008/2009.
- Dr. Haifa M. Jebreen for the academic year 2017/2018.

The "Award of Excellence in Research", organized by the College of Science for the academic year 2017/2018: Dr. Bessem Samet.

The "Award of Best authored Book in scientific and engineering disciplines", organized by King Saud University for the academic year 2017/2018: Dr. Ibraheem Alolyan, Dr. Obaid Algahtani, and Dr. Nasser Bin Turk.

The Study System at the College of Science

Teaching at the College of Science is subject to the following scheme:

1. The school year consists mainly of two regular semesters and a summer semester, when available.

2. The stage of academic progress is indicated by the academic level since the number of levels to graduate is at least eight levels in conformity with the approved Study Plan.

3. The duration of the level is a full semester (not less than 15 weeks) and this period does not include the periods of registration and final exams.

4. The duration of the summer semester is not less than eight weeks where the teaching time allocated for each course is doubled.

5. A number of courses (subjects) are taught during each academic level according to the program of each specialty in the different departments.

6. Students have to study 136 class units (credit hours) to obtain a Bachelor's Degree as follows:

A. The student studies a number of 31 credit hours during the Preparatory Year (two semesters in one academic year).

B. The student studies 97 credit hours (optional + compulsory) in the Program of Specialization in the various College departments throughout the six semesters following the Preparatory Year (beginning with the third semester).

C. University Requirements: The student selects 8 credit hours of the requirements of the University out of 22 optional credit hours during the period of study at the College.

7 - The student chooses the specialty department before the end of the Preparatory Year based on the conditions set by each department.

1. The New Academic System (e-Register)

Registration is the cornerstone of the academic system, the center of the educational process, and the first step to start university life. The new Academic System (e-Register) offers new students the following opportunities:

1. To create an e-mail through the site of the Deanship of Electronic Transactions and Communications:

http://www.ksu.edu.sa/sites/KSUArabic/Deanships/Computer/Pages/

2. To have an access to the academic system by using the link: *http://edugate.ksu.edu.sa*; then, entering a user name and a password.

3. Online Registration (registration, adding, and dropping): a student can register, in person, from any location during the periods of registration and dropping plus an additional period specified in the academic calendar; thus, without having to visit the College or the Department, the student can perform the following:

A. Registration: Registration of courses and deciding the required number of credit hours.

B. Adding and dropping: The student may drop and add courses during the first week of teaching provided that the study load does not go above , or lower than, the allowed course load.

4. To view the course schedule of the College and the available/closed groups.
5. To view the study schedule and print it.
6. To view the Academic Record and print a copy (an unofficial copy).
7. To view the results of the final exams as soon as they are put online.
8. To view the Study Plan, the courses passed by the student, and the ones remaining to be studied.
9. To know about the penalties imposed upon the student.
10. To view the financial rewards.
11. To make suggestions and submit complaints.
12. To write the academic performance evaluation of faculty members.
13. To exchange electronic messages and change the password.

* In case of any problem while registering, please consult the College Registration Office (Room 1A7 - Building 4).

2. Rules and Mechanisms for Registration of Courses

• The Course is a module that meets the needs of the level specified in the

approved Study Plan in each specialty (Program). The Course has a number, a code, a title, and a description depending on the different departments (see the Department's Manual Guide).

• The Course is divided into a set of theoretical lectures and practical lessons (study units) taught weekly during the academic level.

• The Credit Hour is a weekly theoretical lecture that is not less than fifty minutes, or a practical lesson which is not less than one hundred minutes.

• The registration of the courses for all students is done automatically through the website: *http://edugate.ksu.edu.sa*

• The academic levels vary in the number of the units of study, from 12 units to 20 units, for each level.

• The Courses are registered automatically at the beginning of the following semester for the student's convenience. Then, the student can modify the course schedule by adding or dropping.

• The following table shows the student's study load corresponding to the cumulative average:

GPA	2	2.5	3	3.5	4	4.5	5
Hours allowed for registration	14	15	16	17	18	19	20

The Processes of dropping and adding are performed by the student electronically in the first week of the semester through accessing the gate of the academic system of the University Deanship of Admission and Registration (*http://edugate.ksu.edu.sa*).

• No student has the right to register a course without passing its pre-requisite course.

• Students, who pass all courses without failures, are registered in the courses of the level beginning gradually with the lower levels according to the study plans approved.

• Students, who fail in some courses, are registered in courses that ensure their minimum study load in each semester taking into account the following points:

- No conflict in the course study schedule.
- Satisfying the previous requirements of the course or courses to be registered.

Calculating the Average and Cumulative GPA:

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

Calculating the Semester Average:

The GPA is calculated considering the following points:

1. Knowing the number of hours of the courses.
2. Knowing the mark obtained in each course.
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 × value of the grade.
6. Determining the total points obtained in all courses of the semester.
7. Determining the total number of hours registered in the semester.
8. The average is calculated every semester according to the following formula:

GPA=	Total points (item 6) _____ 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
From 70 to less than 75	Good	C	3.00
From 65 to less than 70	Pass +	D+	2.5
From 60 to less than 65	Pass	D	2.00
Less than 60	Failure	E	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 studied).
2) The grand total of credit hours (for all semesters that have been studied).
3) The cumulative average is calculated according to the following formula:

GPA =	Grand total of points _____ Grand total of credit hours

Here is an example of how to calculate the grades above:

Calculating the grade of the first semester:

Course	Credit Hours	Mark	Grade	Grade Value	Points
Phys 101	4	67	D+	2.5	4 × 2.5 = 10
Chem101	4	73	C	3	4 × 3 = 12
Eng 121	3	77	C+	3.5	3 × 3.5 = 10.5
Arab 101	2	81	B	4	2 × 4 = 8
	13				40.5
GPA = Total points ÷ No. of hours registered in semester = 40.5 ÷ 13 = 3.12					

Calculating the grade of the second semester:

Course	Credit Hours	Mark	Grade	Grade Value	Points
Math 101	3	61	D	2	3 × 2 = 6
Stat 101	3	73	C	3	3 × 3 = 9
Computer Science 206	3	80	B	4	3 × 4 = 12
Arab 103	3	88	B+	4.5	3 × 4.5 = 13.5
Islam 101	2	92	A	4.75	2 × 4.75 = 9.5

Eng 122	3	97	A+	5	3 × 5 = 15
	17				65
GPA = Total points ÷ No. of hours registered in semester = 65 ÷ 17 = 3.82					

Calculating the average cumulative:

GPA = Total points ÷ Total hours of all semesters = 105.5 ÷ 30 = 3.52

Dropping and Adding a Course:

- The process of dropping and adding is performed through portal **(http://edugate.ksu.edu.sa)** during **the first week of the semester only**; but the number of credit hours registered has to be at least 12 hours.
- The student may drop only one course due to an excuse acceptable to the Dean of the College. This procedure should occur at least five weeks before the final exams begin. The student has the right to apply for such a procedure at a maximum of four courses during the whole period of study at the College.

Attendance, postponing and dropping out of College:

• The student must be regular in attendance attending at least 75% of the lectures and the practical classes.

• If any student has a percentage of absence of 25%, or more, in any course, he is denied access to the final exam of this course and his result is F.

• A student may apply for postponement of the study before the beginning of the semester for an excuse accepted by the College Board. The postponement should not exceed two consecutive semesters or three intermittent semesters as a maximum limit while studying at the College.

• The University Council may, in case of necessity, exempt the applicant from the previous provision.

• If a student drops out of College for one semester without requesting the postponement of his registration, the University has the right to dismiss his registration. The University Council has the right to do this for a lesser period of time.

• The student is not considered as dropping out of College if he is a visiting student at another university.

Visiting Student:

The Visiting Student is a student who studies some courses at another university, or at a branch of the university to which he belongs without being transferred. The courses he studied are accredited according to the following regulations:

- ❖ The student has to have a transcript (including a grade point average) for, at least, two semesters at his college before he applies as a visiting student.
- ❖ The student must obtain a prior approval from his college permitting him to study as a visiting student while specifying the courses that will be studied. The College has the right to require a specific grade to be achieved by the student to offset the course. The student should obtain an official letter from the Deanship of Admission and Registration directing him to study as a visiting student.
- ❖ The student has to join a college or a university officially recognized.
- ❖ The courses, under consideration by the student to be studied outside the University, must be equivalent in their description to the University courses, and their course units should be no less than the units of any of the courses contained in the graduation requirements.

- The maximum of the total units of study that can be calculated from outside the University is twenty percent (20%) of the total units required for graduation at King Saud University.
- The courses that are studied by the visiting student are not included in the cumulative average. These courses are recorded in his academic record.
- The student must provide the Deanship of Admission and Registration with the results he obtained during the first two weeks of study in the semester following the period of study as a visitor. If not reported within that period, the student is considered as dropping out of College during those semesters.

Dismissal from the University:

The student is dismissed from the University in the following cases:

- If he receives three consecutive warnings due to a cumulative average below a minimum of 2.
- The student may be given a fourth opportunity by the Council of the University based upon the recommendation of the College Council to raise his cumulative GPA by studying the available courses.
- The University Council may give the dismissed students, due to warnings, an opportunity that does not exceed two semesters as a maximum.
- If the student does not fulfill his graduation requirements at the College in a period of up to half of the period prescribed for graduation in addition to the duration of the Program.
- The student is given an exceptional opportunity by the University Council to meet the graduation requirements during a maximum period not exceeding twice the original term specified for graduation.
- The University Council may allow dismissed students, due to the exhaustion of failure times, to attend twice the duration of the Program. This extension should not exceed a maximum of two semesters.

Examinations and Grades:

- Based on a proposal from the Department Council, the College Council specifies a mark for the student's semester work, varying from 40% to 60% of the final grade of the course.
- The mark of the course's semester work is calculated by one of the following two methods:

❖ Oral, practical tests, research, or other forms of classroom activity, or from all the above or some of them, in addition to at least one written exam.

❖ Two written exams at least.

• Based on the recommendation of the course teacher, it is permissible for the Council of the Department, that teaches the course, to allow the student to complete the requirements of any course in the following semester and to give the student a grade of I (incomplete) in his academic record. Only the grades achieved by the student are included in the GPA or cumulative after the completion of the requirements of that course.

• If one semester passes without changing the grade incomplete (I), the student is given an F which is calculated in the GPA and cumulative.

• The grades obtained by the student in each course are calculated according to the schedule mentioned above.

Restrictions of the Final Examinations:

• No student may be tested in more than two courses in one day.

• The student is not allowed to enter the final exam after half an hour of its beginning, and is not allowed to leave the exam room before half an hour after its beginning.

• Based on a recommendation from the relevant Department Council, the College Council specifies the duration of the final written exam to be within a period not less than one hour, and not more than three hours.

• Cheating in the exam, initiating it, or violating the instructions and rules of examination procedures are actions punishable in accordance with the Regulations of the Students' Discipline issued by the University Council.

• In cases of necessity, the College Council, in charge of teaching a course, has the right to approve re-marking of the answer sheets in a period of time not later than the beginning of the following semester in accordance with the following rules:

- ❖ A student may apply for re-marking the answer sheets of only one course per semester.
- ❖ The student, who wishes to re-mark his answer sheets, may apply for re-marking to the department that teaches this course, not later than one month after taking the final exam.
- ❖ A student, who has already applied for re-marking and proved the invalidity of his application, should never apply for re-marking his answer sheets in any exam in the future.

Transferring:

1) Transferring from one college to another within the University:

• It is permissible, with the consent of the respective deans of the colleges, to transfer from one college to another in accordance with the conditions approved by the College Council to which the student wishes to transfer.

• The student's college academic record has to show all courses previously studied, including grades, semester and cumulative averages

throughout the study at the college from which he is transferred.

2) Transferring from one major to another within the College:

• The student may, after the approval of the Dean, transfer to another specialty within the College according to the guidelines established by the College Council.

• The student's college academic record has to show all courses previously studied, including grades, semester and cumulative averages throughout the study at the college from which he is transferred.

Graduation:

The student graduates after completing successfully the graduation requirements in accordance with the study plan, provided that his cumulative average is no less than 2 (Pass) .

Educational Programs

The Department offers programs in Mathematics leading to: Bachelor's, Master's and Ph.D. degrees.

Bachelor of Science in Mathematics

The Department started this Program, first for male students in 1378 H (1958 G), and subsequently for female students in 1403 H (1982 G). This Program is being taught in Arabic and English languages. The Department is moving gradually towards teaching in English starting from the year 1429 – 1430 H. It is worth to mention that this Program has been accredited by both the National Center for Academic Accreditation & evaluation, and the German international accreditation agency ASIIN e. V.

Program Mission

To produce competitive graduates and to equip them with basic mathematical knowledge and concepts and proper thinking skills to meet

the developmental needs of the society through a suitable study plan, qualified faculty and stimulating scientific environment.

Program Objectives

(1) To produce competent graduates in mathematics capable of meeting the needs of the labor market.
(2) To enhance skills of alumni in creative thinking, decision making and problem solving.
(3) To develop communication and computer skills of the graduates.
(4) To prepare graduates for higher studies.
(5) To produce graduates capable of continuous independent learning and working efficiently within different working conditions.
(6) To attract mathematically talented students to the program.

Program Learning Outcomes

• Knowledge

By completing the program, the graduates are expected to have sound mathematical knowledge, and acquire a firm foundation of core mathematical disciplines. They are expected to:

- ❖ Recall definitions of basic mathematical terms
- ❖ State some fundamental mathematical theorems.
- ❖ Describe methods of proof.
- ❖ Describe mathematical techniques used for solving applied problems.

• Cognitive Skills

By completing the program, the student is expected to be able to:

- ❖ Construct rigorous mathematical proofs with clear identification of assumptions and conclusions.
- ❖ Analyze and solve problems and reason logically
- ❖ Recognize broad range of mathematics-related problems, assess their solvability and solve them.
- ❖ Recognize analogies and different patterns.
- ❖ Create mathematical models for some problems in other areas of science or everyday life, and solve it using basic mathematical methods and software.

• Interpersonal Skills & Responsibility

- ❖ By completing the program, the student is expected to be able to:
- ❖ To study, learn and work independently.
- ❖ To work effectively in teams.

- ❖ To meet deadlines and manage time properly.
- ❖ To exhibit ethical behavior and respect different points of view.

- **Communication, Information Technology, Numerical**

- ❖ To present mathematics to others, both in oral and written form clearly and in a well-organized manner.

Admission Requirements

Students are admitted to this Program based on the following:

(a) Requirements for enrolment in the College of Science.
(b) Requirements set by the Department.
Male students: Having GPA 3/5 in the first common year, and at least grade C in MATH101 without failing in this course.
Female students: Having GPA 3.5/5 in the first common year, and at least grade B+ in MATH101without failing in this course.

Degree Requirements

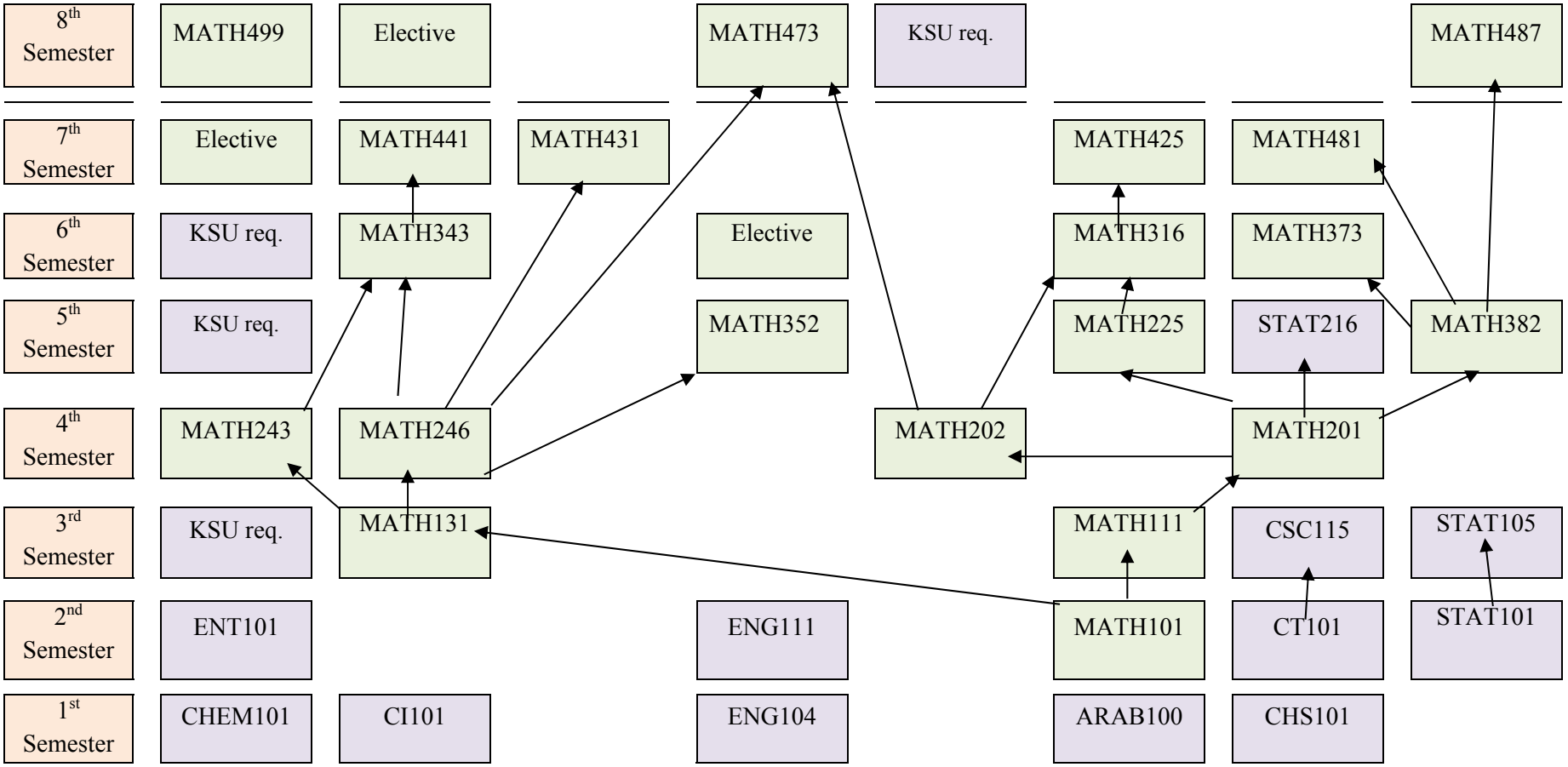
The student should complete successfully 136 credit hours in at least 8 semesters as mentioned in the Study Plan**.**

Study Plan

At the beginning of the academic year 1437-1438 H (2016-2017 G), the College of Science joined the Program of the Common Year in the University. This required the development of the Program Study Plan to be compatible with the new arrangement. The updated plan has passed through the official stages and it has been approved by the academic authorities in the Department, the College and the University. This Study Plan has become applicable to the new students starting from the academic year 1438-1439H (2017-2018 G).

General Scheme of the Study Plan:

Diagram of the Program of Bachelor of Science in Mathematics



1st Semester (Common First Year)					2ndSemester (Common First Year)				
Course Code	Course Title	Requisite		Credits .)	Course Code	Course Title	Requisite		Credits (Lect.- Exer.-
		Pre.	Co.				Pre.	Co.	
ENG 104	English Language	-	-	6	ENG 111	English Language	-	-	6
MATH 101	Differential Calculus	-	-	3	CI 101	University skills	-	-	3
ENT 101	Entrepreneurship	-	-	1	CT 101	Computer Skills	-	-	3
CHEM 101	General Chemistry	-	-	4	STAT 101	Introduction to Statistics	-	-	3
ARAB 100	Written skills	-	-	2	CHS 101	Fitness and healthy	-	-	1
Total of Credit Hours				16	Total of Credit Hours				16

3rd Semester					4th Semester				
Course Code	Course Title	Requisite		Credits (Lect., Exer.,	Course Code	Course Title	Requisite		Credits (Lect., Exer.,
		Pre.	Co.				Pre.	Co.	
STAT 105	Statistical Methods	STAT 101		4(3,2,0)	MATH 201	Differential and Integral Calculus	MATH 111	-	4(3,2,0)
CSC 115	Introduction to Programming With C++	CT 101	-	4(3,0,2)	MATH 202	Vector Calculus		MATH 201	4(3,2,0)
MATH 111	Integral Calculus	MATH 101	-	4(3,2,0)	MATH 243	Number Theory	MATH 131		4(3,2,0)
MATH 131	Foundations of Mathematics	OR	-	4(3,2,0)	MATH 246	Linear Algebra	MATH 131		4(3,2,0)
××× Elective University requirement course			-	2 (2,0,0)					
Total of Credit Hours				18	Total of Credit Hours				16

5th Semester					6th Semester				
Course Code	Course Title	Requisite		Credits (Lect., Exer.,	Course Code	Course Title	Requisite		Credits (Lect., Exer.,
		Pre.	Co.				Pre.	Co.	
STAT 21٦	Actuarial Probability	MATH 201		4(3,2,0)	MATH 316	Mathematical Methods	MATH202	-	4(3,2,0)
MATH 225	Introduction to Differential Equations	MATH 201		4(3,2,0)	MATH 343	Group Theory	MATH 243	-	4(3,2,0)
MATH 352	Numerical Analysis (1)	MATH 246	-	4(3,2,0)	MATH 373	Introduction to Topology	MATH 382	-	4(3,2,0)
MATH 382	Real Analysis (1)	MATH 201	-	4(3,2,0)	Elective Course*			-	s
××× Elective University requirement course			-	2 (2,0,0)	×××Elective University requirement course			-	2(2,0,0)
Total of Credit Hours				18	Total of Credit Hours				14+ s

7th Semester					8th Semester				
Course Code	Course Title	Requisite		Credits (Lect., Exer.,	Course Code	Course Title	Requisite		Credits (Lect., Exer.,
		Pre.	Co.				Pre.	Co.	
MATH 425	Partial Differential Equations	MATH 316	-	4(3,2,0)	MATH 473	Introduction to Differential	MATH 202	-	4(3,2,0)
MATH 431	Combinatorics and Graph Theory (1)	MATH 246	-	4(3,2,0)	MATH 487	Complex Analysis	MATH 382	-	4(3,2,0)
MATH 441	Rings and Fields	MATH 343	-	4(3,2,0)	MATH 499	Research Project	Completion of 100 credit hours	-	3(3,0,0)
MATH 481	Real Analysis (2)	MATH 382	-	4(3,2,0)	Elective Course*			-	6-s
Elective Course*			-	3	×××Elective University requirement course			-	2(2,0,0)
Total of Credit Hours				19	Total of Credit Hours				19-s

(Lect.,Exer., Pract.) : (Lecture, Exercise, Practical)

- The total of elective hours of the program is 9 credit hours.
- S: 2 or 3 or 4 credit hours.

Elective Courses

List of the Elective Courses ***(Student elects 9 credit hours)***

Course Code	Course Title	Pre-requisite	Co-requisite	Credits (Lect.,Exer., Pract)
MATH 379	Foundations of Euclidean and Non-Euclidean Geometry	MATH 202 + MATH 246	-	4(3,2,0)
MATH 391	History of Mathematics	-	-	2(2,0,0)
MATH 426	Modeling in Mathematical Biology	MATH 225	-	3(3,0,0)
MATH 433	Combinatorics and Graph Theory (2)	MATH 431	-	4(3,2,0)
MATH 436	Mathematical Logic	MATH 131	-	4(3,2,0)
MATH 442	Applications of Algebra	MATH 441	-	4(3,2,0)
MATH 453	Numerical Analysis (2)	MATH 352	-	4(3,2,0)
MATH 456	Introduction to Mathematical Programming	MATH 246	-	3(2,٢,0)
MATH 466	Dynamical Systems and Chaos	MATH 316	-	4(3,2,0)
MATH 482	Multivariable Calculus	MATH 246 + MATH 481	-	3(2,2,0)
PHYS 101	General Physics (1)	-	-	4(3,0,2)
PHYS 102	General Physics (2)	-	-	4(3,0,2)
ECON 101	Principles of Microeconomics	-	-	3(3,0,0)
ECON 102	Principles of Macroeconomics	ECON 101	-	3(3,0,0)
MGT 101	Management and Business Principles	-	-	3(3,0,0)
ACTU 371	Financial Mathematics	MATH 111 OR MATH 106		4(3,2,0)
CSC 202	Computer Programming with MATLAB	CSC 115	-	3(2,0,2)
STAT 328	Statistical Packages	STAT 105	-	3(2,0,2)
IE 222	Industrial Operations Analysis (1)	-	-	3
A basket full of three courses		9 credit hours		
ACCT 201	Principles of Accounting and Financial Reporting	-	-	3(3,0,0)
FIN 200	Principles of Finance	ACCT 201	-	3(3,0,0)
ACTU 262	Actuarial Corporate Finance	FIN 200	-	3(3,0,0)

List of the Elective Courses of the University Requirements

(Student elects 8 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect., Exer., Pract.)
IC 100	Studies in the Biography of the Prophet	-	2(2,0,0)
IC 101	Introduction of Islamic Culture	-	2(2,0,0)
IC 102	Islam and Building up the Society	-	2(2,0,0)
IC 103	Economic System in Islam	-	2(2,0,0)
IC 104	Political system in Islam	-	3 (2,0,1)
IC 105	Human Rights	-	3 (2,0,1)
IC 106	Islamic Jurisprudence	-	2(2,0,0)
IC 107	Ethics of Occupation	-	2(2,0,0)
IC 108	Contemporary Issues	-	2(2,0,0)
IC 109	Woman and Her Developmental Role	-	2(2,0,0)

List of Service Courses to Other Specializations and Colleges.

Course Code	Course Title	Pre-requisite	Credits (Lect., Exer., Pract.)	Specialization /College of
MATH 104	General Mathematics	MATH 101 **OR** MATH 150	3(3,0,0)	/Food and Agricultural Sciences- Architecture and Planning
MATH 106	Integral Calculus		3(3,0,0)	/Engineering- Computer and Information Sciences
MATH 107	Vectors and Matrices		3(3,0,0)	/Engineering
MATH 111	Integral Calculus		4 (3,٢,0)	STAT, OPER, PHYS, GPH
MATH 151	Discrete Mathematics		3(3,0,0)	/Computer and Information Sciences
MATH 200	Differential and Integral Calculus	MATH 111	3(3,0,0)	GPH/Computer and Information Sciences
MATH 201	Differential and Integral Calculus	MATH 111	4(3,2,0)	OPER, STAT
MATH 203	Integral and Differential Calculus	MATH 106 + MATH 107	3(3,0,0)	/Engineering
MATH 204	Differential Equations	MATH 200 ***OR*** MATH 201 ***OR*** MATH 203	3(3,0,0)	GPH/Engineering- Computer and Information Sciences
MATH 209	Differential Equations		4 (3,٢,0)	PHYS
MATH 244	Linear Algebra	MATH 111 ***OR*** MATH 106 ***OR*** MATH 107	3(3,0,0)	OPER, STAT/Engineering- Computer and Information Sciences
MATH 254	Numerical Methods	MATH 107 ***OR*** MATH 202 ***OR*** MATH 244) +(CSC 101 ***OR*** CSC 206 ***OR*** CSC 207)	3(3,0,0)	/Engineering
MATH 211	Calculus for Chemists	MATH 101 **OR** MATH 150	3(3,٢,0)	CHEM
MATH 205	Differential and Integral Calculus	MATH 106	3(3,2,0)	GPH/Computer and Information Sciences

Course Contents

MATH 101: Differential Calculus (E) 3 (3, 0, 0) credit hours

Set of Numbers and Inequalities, Properties of functions, and their combination, Inverse Functions, Trigonometric Functions, The Inverse Trigonometric Functions, Definition of Limit, Limits Laws, Limits Involving Infinity, Continuity of Functions, The Derivative and the Tangent Line Problem, Differentiation Rules, The Chain rule, Implicit Differentiation, Higher Order Derivatives, The Derivative of Inverse Functions, Extrema of Functions, The Mean Value Theorem, Increasing and Decreasing Functions, Concavity, Curve sketching, Optimization Problems

MATH 111: Integral Calculus (E) 4 (3, 2, 0) credit hours

Definition of definite integral and its properties, the anti-derivative, indefinite integral and the fundamental theorem of calculus. Change of variables. Integrals of natural and general exponential functions. Integrals of natural and general logarithmic functions. Derivatives and integrals of hyperbolic and inverse-hyperbolic functions. Techniques of integration: by parts, trigonometric substitutions, completing the square, integrals of rational functions, miscellaneous substitutions. Indeterminate forms, improper Integrals. Applications of integration: area, solids of revolution, arc length and surface of revolution, linear Motion, work, momentum and center of mass. Numerical integration. Polar coordinates, relation between polar and Cartesian coordinates, graphs of polar curves, area in polar coordinates. Parametric equations.

Prerequisite: MATH 101 OR MATH 150

MATH 131: Foundations of Mathematics 4 (3, 2, 0) credit hours

Basic mathematical logic, methods of proof, basics of set theory, mathematical induction, Cartesian product of sets, binary relations, partition of a set, equivalence classes, mappings (functions), equivalence of sets, countable sets, cardinal numbers, binary operations, homomorphism of algebraic systems, groups, rings, and fields.

Prerequisite: MATH 101 OR MATH 150

MATH 201: Differential and Integral Calculus (E) 4 (3, 2, 0) credit hours

Cartesian, cylindrical and spherical coordinate systems, Functions of two and three variables, limits and continuity, partial derivatives, the chain rule, extrema of functions of two variables, Lagrange multipliers, Double integrals, moments and center of mass, double integrals in polar coordinates, triple integrals, application of triple integrals, triple integrals in cylindrical and spherical coordinates, surface area, Sequences, infinite series, convergence tests, representation of functions by power series, Taylor and Maclaurin series, the binomial series.

Prerequisite: MATH 111

MATH 202: Vector Calculus (E) 4 (3, 2, 0) credit hours

Vectors in two and three dimensions, scalar and vector products, equations of lines and planes in 3-dimensional space, Surfaces of revolution and their equations in cylindrical and spherical coordinates, Vector valued functions of a real variable, curves in space, curvature, Rates of change in tangent and normal directions, directional derivatives, Gradient of a function, equations of normal and tangent space to a surface at a point, Vector fields, divergence, curl of a vector, line and surface integrals. Green's theorem, Gauss' divergence theorem, Stockes' theorem.

Co-requisite: MATH 201

MATH 225: Introduction to Differential Equations (E)4 (3, 2, 0) credit hours

Classification of Differential equations and their origins, Methods of solution of first order differential equations, orthogonal trajectories, Linear equations with constant coefficients and variable coefficients, Linear system of equations, power series solutions of linear differential equation of the second order with polynomial coefficients, Laplace transform and the convolution, Fourier's series.

Prerequisite: MATH 201

MATH 243: Number Theory 4 (3, 2, 0) credit hours

First and second principles of Mathematical Induction, Well-ordering principle. Divisibility, Euclidean Algorithm, Prime numbers and their properties, Linear Diophantine equations, Congruences and their properties, linear Congruences, The Chinese remainder theorem, Fermat's little theorem, Euler's theorem, Wilson's theorem, Arithmetic functions, Pythagorean triples, Some cases of Fermat's last theorem.

Prerequisite: MATH 131

MATH 246: Linear Algebra 4 (3, 2, 0) credit hours

Matrices and their operations, types of matrices, Elementary transformations, Determinants, elementary properties, Inverse of a matrix, Vector spaces, linear independence, finite dimensional spaces, linear subspaces, Inner product spaces, Linear transformation, kernel and image of a linear transformation, Eigen values and eigen vectors of a matrix and of a linear operator.

Prerequisite: MATH 131

MATH 316: Mathematical Methods (E) 4 (3, 2, 0) credit hours

Inner product space, sequences of functions and their modes of convergence, Strum-Liouville problem (ordinary and singular), self-adjoint differential operator, Fourier series, convergence in L^2, pointwise convergence, Orthogonal polynomials (Legendre, Hermite, Laguerre) and their properties, expansions of functions, Bessel functions, properties, orthogonality , Fourier transform, Fourier integral, applications.

Prerequisite: MATH 202 and MATH 225

MATH 343: Group Theory 4 (3, 2, 0) credit hours

Definitions and examples, subgroups, Lagrange's theorem, normal subgroups, Factor groups, homomorphisms, isomorphism theorems, automorphisms, Cayley's theorem and its generalization. Simple groups, permutation groups, Class equation. Group action on a set, p-groups, Cauchy's theorem, Sylow theorems, External and internal direct products of groups, Burnside's theorem. Dihedral groups, Quaternions, Groups of automorphisms of cyclic groups.

Prerequisite: MATH 246 and MATH 243

MATH 352: Numerical Analysis (1) 4 (3, 2, 0) credit hours

Numerical methods for nonlinear equations, Error and convergence, analysis, Direct & iterative methods for linear systems, Error analysis & iterative methods convergence, Interpolation & approximation Error analysis, Numerical differentiation & numerical integration & their error analysis .

Prerequisite: MATH 246

MATH 373: Introduction to Topology (E) 4 (3, 2, 0) credit hours

Topological spaces, examples, closure of a set, derived set, subspace topology, Bases, finite product topology, subbases, Metric spaces, examples, metrizability, R^n as a metrizable space, Continuous functions, characterization of continuous functions on topological and metric spaces, homeomorphisms, examples, topological property,Compact spaces, compactness in R^n limit point and sequentially compact spaces.

Prerequisite: MATH 382

MATH 379: Foundations of Euclidean and Non-Euclidean Geometry 4 (3, 2, 0) credit hours

Axiomatic methods and Axiomatic systems, Euclidean geometry: Euclid's postulates, Transformations in E^2 and E^3; translations, rotations, reflections, dialations and isometrics, The parallel postulates and non-Euclidean geometry, the hyperbolic plane, Affine geometry: Linear and affine transformations, isometrics, Finite affine planes, A brief introduction to projective geometry.

Prerequisite: MATH 202 and MATH 246

MATH 382: Real Analysis I (E) 4 (3, 2, 0) credit hours

Basic properties of the field of real numbers, completeness axiom, countable sets, Sequences and their convergence, monotone sequence, Bolzano-Weierstrass theorem, Cauchy criterion, Basic topological properties of the real numbers, Limit of a function, continuous functions and properties of continuity, uniform continuity, compact sets, The derivative of a function, mean value theorem, L'Hospital rule, Taylor theorem.

Prerequisite: MATH 201

MATH 391: History of mathematics (A &E) 2 (2, 0, 0) credit hours

Mathematics in Babylonia and Egypt, The Greek mathematics, History of mathematics in India and China, Mathematics in the Islamic age, Development of mathematics in Europe from the seventeenth century up to now.

MATH 425: Partial Differential Equations (E) 4 (3, 2, 0) credit hours

Classification and formation of PDE, First order equation, solution of the quasil-linear equation by Lagrange Method, Cauchy problem, Second order linear equation, classification, solution factorization of operator and by separation of variables, Cauchy problem, Laplace's equation, harmonic functions; Dirichlet, Neumann, and Mixed conditions; examples in Cartesian, polar, cylindrical, and spherical coordinates, Wave equation in one and two dimensions, solution by Fourier series , Heat equation in bounded and unbounded one-dimensional domain, solution by Fourier series and transform.

Prerequisite: MATH 316

MATH 426: Modeling in Mathematical Biology (E) 3 (3, 0, 0) credit hours

Introduction to compartments models: What is a Model, What is the goal of a Model, Examples: Foxe and Rabbits model, Brief introduction to Glucose Insulin model; Phase-Plane Analysis: Linear System, Population dynamics: Verhulst Model, A Predator-Prey Model, reaction kinetic; A basic epidemic model (SIR); Nonlinear Systems and Linearization, Qualitative Analysis of the General Population Interaction Model, Qualitative Analysis of the Epidemic Model, The Spruce Budworm Model, SI Model with treatment and Hopf Bifurcation, A cell population model, Parameter estimation, Project.

Prerequisite: MATH 225

MATH 431: Combinatorics and Graph Theory (1) 4 (3, 2, 0) credit hours

Basic counting principles, The inclusion-exclusion principle, The pigeonhole principle, Ordinary generating functions, Exponential generating functions, Homogeneous recurrence relations, Non-homogeneous recurrence relations, Basic concepts in graph theory, Eulerian graphs, Hamiltonian graphs, Trees, Planar graphs, Coloring, Chromatic polynomials.

Prerequisite: MATH 246

MATH 433: Combinatorics and Graph Theory (2) 4 (3, 2, 0) credit hours

Partitions of sets. Stirling numbers. Partitions of integers. Ferrer’s diagrams. Euler’s identity. Ordered sets. Dilworth’s theorem. Linear extensions. Combinatorial designs. Block designs. Latin squares. Connectivity of graphs. Blocks. Edge connectivity. Matching. Hall’s theorem. Directed graphs. Tournaments. Networks. Connectivity and networks.

Prerequisite: MATH 431

MATH 436: Mathematical Logic (E) 4 (3, 2, 0) credit hours

Propositional calculus. The deduction theorem for propositional calculus. Completeness and consistency of propositional calculus. Predicate calculus. First-order theorems. Consistency of first-order predicate calculus. Completeness theorem for predicate logic.

Prerequisite: MATH 131

MATH 441: Rings and Fields 4 (3, 2, 0) credit hours

Rings, group of units and groups of automorphisms of a ring. Ideals and factor rings Principal ring. Prime and maximal ideals. Field of quotients of integral domain. Characteristic of a ring. Direct sum of rings. Modules. Euclidean rings. Ring of polynomials. Roots of polynomials over a field. Field extensions. Finite and simple extensions of fields. Algebraic closure of a field. Splitting fields. Finite fields.

Prerequisite: MATH 343

MATH 442: Applications of Algebra 4 (3 ,2, 0) credit hours

Classical cipher systems, Steam ciphers, Introduction to cryptanalysis, Exponential ciphers and public keys, Introduction to codes, Linear codes, Perfect codes, Cyclic codes.

Prerequisite: MATH 441

MATH 453: Numerical Analysis (2) 4 (3, 2, 0) credit hours

Numerical methods for solving nonlinear systems: fixed point iteration, Newton and quasi Newton methods, Numerical methods for solving initial value problems in ODE: finite difference, multistep and predictor corrector methods; derivation of some methods, error analysis, stability and convergence, Rung-Kutta methods, Numerical methods for solving boundary value problems in ODE: finite difference methods for linear and nonlinear problems, error analysis and convergence, Collocation method, Applications (applicable problems solved by the computer).

Prerequisite: MATH 352

MATH 456: Introduction to Mathematical Programming 3 (2, 2, 0) credit hours

Modeling of real life optimization problems, Convex sets & polyhedra approach and geometrical approach, Exchange method & the structure of matrices, Simplex method & variants (2 phase; revised, degeneracy Blands rule etc), Duality theory and application, Transportation Problem, Networks & Flow problems.

Prerequisite: MATH 246

MATH 466: Dynamical Systems and Chaos (E) 4 (3, 2, 0) credit hours

Dynamical systems, regular and irregular behavior of nonlinear dynamical systems, existence and uniqueness theorems; linear ODEs with constant and periodic coefficients, Floquet theory; linearization and stability analysis, Nonlinear oscillations and the method of averaging; perturbation methods; bifurcation theory and normal forms; phase plane analysis for

autonomous systems, Hamiltonian dynamics, chaotic systems, Chaotic motion, Lyapunov exponents functions, Poincare maps, including horseshoe maps and the Melnikov method.

Prerequisite: MATH 316

MATH 473: Introduction to Differential Geometry (E) 4 (3, 2, 0) credit hours

Theory of curves in space, Regular curves, Arc Length and reparametrization, natural parametrization, Serret-Fernet apparatus, existence and uniqueness theorem for space curves, Bertrand curves, Involutes and evolutes, Local theory of surfaces: Simple surfaces, coordinate transformations, tangent vectors and tangent spaces, First and second fundamental forms, Normal and geodesic curvatures, Weingarten map, principal, Gaussian and mean curvatures, Geodesics, equations of Gauss and Codazzi-Mainardi.

Prerequisite: MATH 202 and MATH 246

MATH 481: Real Analysis II (E) 4 (3, 2, 0) credit hours

Riemann Integrations: the definition, Darboux theorem, Riemann sums, the fundamental theorem. Sequences and series of functions: uniform convergence for the sequences and series of functions, power series. Lebesgue measure: Borel $\sigma-$algebra, outer measure, Lebesgue measurable sets, Properties of Lebesgue measure. Lebesgue integral: simple functions, measurable functions, definition of Lebesgue integral, Monotone convergence theorem, bounded convergence theorem, the relation between Lebesgue and Riemann integrals.

Prerequisite: MATH 382

MATH 482: Multivariable Calculus (E) 4 (3, 2, 0) credit hours

Define norms, inner product on general vector spaces, linear transformations and their properties, basic concepts of topology in the Euclidian space, Continuous functions on the Euclidian space and their properties, differentiability in R^n and its properties, chain rule and other rules, higher order derivatives and Taylor's, Theorem, maxima and minima, quadratic forms, Lagrange multiplier method, Inverse and implicit function theorems in higher dimension, Integration of function of n variables, Fubini Theorem and change of variable formula.

Prerequisite: MATH 246 and MATH 481

MATH 487: Complex Analysis (E) 4 (3, 2, 0) credit hours

Complex numbers, Cartesian and polar representation of complex numbers, powers and roots of complex numbers, Limits and continuity of a complex fun, Analytic functions, Cauchy-Riemann equations, harmonic functions. Exponential, trigonometric, hyperbolic functions and logarithmic functions, Complex integration, contour integrals, Cauchy's theorem, Cauchy's formula, Bounds on analytic functions, Series representation of analytic functions, Taylor and Laurent series, power series, Zeros and singularities, Residue theory, Applications to real and improper integrals.

Prerequisite: MATH 382

MATH 499: Research Project 3 (0, 0, 3) credit hours

The student should prepare a research project under the supervision of a faculty member. This procedure involves three main steps:

- Choosing the subject matter of the project.
- Locating relevant references and studying them.
- Writing up the research project and presenting it.

Prerequisite: Completion of 100 credit hours

Bachelor of Science in Actuarial and Financial Mathematics

In response to the new job market demand of highly qualified graduates in the financial and actuarial field, and to keep up with the strategic directions of international universities in this field, the Department of Mathematics established a new multidisciplinary bachelor program in Actuarial and Financial Mathematics. This program was started for male and female students in 1435 H (2014 G).

Program Mission

To provide skills and basic concepts of actuarial and financial mathematics within a high caliber program that produces competitive graduates capable of meeting the developmental needs of the Kingdom in all domains relevant to actuarial science.

Program Objectives

(1) To equip and train students in the domain of mathematical modeling and its applications in financial and economic analysis.

(2) To qualify graduates for jobs in insurance and financial sectors, ministries and government departments.

(3) To train students for passing the examinations for fellowships of international professional societies, such as the Society of Actuaries (SOA) and the Casualties Actuarial Society (CAS).

(4) To provide graduates with academic orientation with a world class education for local or international graduate programs in Financial and Actuarial Mathematics.

Admission Requirements

Students are admitted to this Program based on the following:

1. GPA greater than 4.
2. Degree higher than B+ in Math 101
3. Competition based on the following criteria:

0.25 x Score of the aptitude test required by KSU + GPA x 6 + 1.5 x (score in Math 101).

Degree Requirements

Students must successfully complete a minimum of 144 credit hours. The expected duration of the program is nine semesters.

Study Plan

The program is being taught in English and as a multidisciplinary program, this program will engage some others departments/colleges in its studying plan. Principally the department of Statistics and Operational Research of the College of Science will play a crucial role in this way. Moreover, the courses from departments of Finance, accounting, and Economics of the College of Business Administration will introduce students to some basic concepts of Finance and Economics. The courses from Computer Science College will prepare students to some IT technics and programming skills necessary for the program. The co-up program of this bachelor is considered in the last semester after validation of all previous courses. The training is requested to be realized in an insurance company or financial institution.

General Scheme of the Study Plan:

Requirement Type	Course Title	Prerequisites	Credit Hours
Common First Year	ENG 104 or 105 or 106 English Language		6
	MATH 101 Differential Calculus		3
	STAT 101 Introduction to statistics		3
	ARAB 100 Written skills		2
	CT 101 Computer Skills		3
	CI 101 University Skills		3
	CHS 101 Fitness and healthy culture		1
	CM 101 General Chemistry		4
	ENG 104 or 105 or 106 English Language		6
	ENT 101 Entrepreneurship		1
Total			**32**

University Requirements	
Students choose 8 credit hours from courses in Islamic Culture	**8**

Requirement Type	Course Title	Pre/Co requisites	Credit Hours
Mathematics Department Requirements	MATH 106 Integral Calculus	MATH 101	3(3+2+0))
	MATH 132 Logic Mathematics		3(3+2+0)
	MATH 206 Multi-variable Differential and Integral Calculus	MATH 106	4 (3+2+0)
	MATH 240 Introduction to Linear Algebra	MATH 132	4(3+2+0)
	MATH 280 Introduction to Real Analysis	MATH 206	4(3+1+0)
	ACTU 262 Actuarial Corporate Finance	FIN 200	3 (3+0+0)
	MATH 380 Stochastic Processes	MATH 280 & STAT 216	4(3+2+0)
	ACTU 371 Mathematics of Finance	MATH 106	4(3+2+0)
	ACTU 372 Actuarial Mathematical Models (1)	ACTU 371	4 (3+2+0)
	ACTU 471 Financial Derivatives	ACTU 371	3(3+0+0)
	ACTU 472 Actuarial Mathematical Models (2)	ACTU 372	3(3+0+0)
	ACTU 473 Models of Financial Economics	ACTU 471	4(3+2+0)
	ACTU 474 Risk Theory	MATH 380 & ACTU 372	3(3+0+0)
	ACTU 475 Credibility Theory and Loss Distribution	ACTU 474	4(3+2+0)
	ACTU 483 Lab Financial Mathematics	Complete 123 credit hours	1(0+0+2)

	ACTU 484 Lab Actuarial Mathematics	Complete 123 credit hours	1(0+0+2)
	ACTU 498 Field Training	Complete 138 credit hours	6
Total			**58**

Requirement Type	Course Title	Prerequisites	Credit Hours
Compulsory Requirements from Other Departments	ACCT 201: Principles of Accounting and Financial Reporting		3(3+0+0)
	FIN 200 Principles of Finance	ACCT 201	3(3+0+0)
	ECON 101 Principles of Microeconomics		3(3+0+0)
	ECON 102 Principles of Macroeconomics	ECON 101	3(3+0+0)
	CSC 115 Introduction to Programming with C++	CT 140	4(3+0+2)
	STAT 105 Statistical Methods	STAT 101	4(3+2+0)
	STAT 328 Statistical Packages	CSC 115	3(2+0+2)
	STAT 332 Regression Analysis	STAT 328	3(2+0+2)
	STAT 216 Actuarial Probability	Co-requisites Math 206	4(3+2+0)
	STAT 336 Time Series and Forecasting	STAT 332	3(2+0+2)
	OPER 441 Modeling and Simulation	MATH 380	4(3+2+0)
Total			**37**

Students must successfully complete 9 credit hours to be chosen from this list.			
Requirement Type	Course Title	Prerequisites	Credit Hours
	MATH 204Differential equations	MATH 106	3 (3+2+0)
	MATH 251Optimization techniques	MATH 280 & MATH 204	3 (3+2+0)
	MATH 254Numerical methods	CSC 115 & MATH 240	3(3+2+0)
	FIN 220 Investment Essentials	FIN 200	3(3+0+0)
	FIN 240 Principles of Risk & Insurance	FIN 200	3(3+0+0)
	ECON 201 Microeconomics analysis	ECON 102	3(3+0+0)
	STAT 340Theory of Statistics (1)	STAT 216	3(2+2+0)
	ACTU 476 Insurance Mathematics	MATH 380	3(3+0+0)
	ACTU 477 Pension mathematics	ACTU 472	3 (3+0+0)
	ECON 414 Islamic Banking Services	ACTU 371	3 (3+0+0)

Studying Plan distributed according to the semesters

1st Semester		
Course	Course Title	Credits
ARAB 100	Writing Skills	2
CM 101	General Chemistry	4
ENG 104 or ENG105 or ENG106	English Language	6
MATH 101	Differential Calculus	3
ENT 101	Entrepreneurship	1
Total		16

2nd Semester		
Course	Course Title	Credits
CT 101	Computer Skills	3
CI 101	University Skills	3
ENG 111 Or ENG112 Or ENG112	English Language	6
CHS 150	Health and Fitness (2)	1
STAT 101	Introduction to Statistics	3
Total		16

3rd Semester		
Course	Course Title	Credits
MATH 106	Integral Calculus	3(3+2+0)
STAT 105	Statistical Methods	4(3+2+0)
MATH 132	Logic Mathematics	3 (2+2+0)
ACCT201	Principles of Accounting and Financial Reporting	3 (3+0+0)
ECON 101	Principles of Microeconomics	3(3+0+0)
	University Requirement	2
Total		18

4th Semester		
Course	Course Title	Credits
MATH 206	Multi-variable Differential and Integral Calculus	4(3+2+0)
CSC 115	Introduction to programming with C++	4(3+0+2)
STAT 216	Actuarial Probability	4(3+2+0)
FIN200	Principles of Finance	3(3+0+0)
ECON 102	Principles of Macroeconomics	3(3+0+0)
	University Requirements	2
Total		20

5th Semester		
Course	Course Title	Credits
ACTU371	Financial Mathematics	4(3+2+0)
MATH 240	Introduction to Linear Algebra	4(3+2+0)
MATH 280	Introduction to Real Analysis	4(3+2+0)
STAT 328	Statistical Packages	3(2+0+2)
ACTU 262	Actuarial Corporate Finance	3(3+0+0)
Total		18

6th Semester		
Course	Course Title	Credits
ACTU372	Actuarial Mathematical Models (1)	4(3+2+0)
MATH 380	Stochastic processes	4(3+2+0)
STAT 332	Regression Analysis	3(2+0+2)
ACTU 471	Financial Derivatives	3(3+0+0)
Elective Course		3
Total		17

7th Semester		
Course	Course Title	Credits
ACTU473	Models of Financial Economics	4(3+2+0)
ACTU474	Risk theory	3(3+0+0)
ACTU472	Actuarial Mathematical Models (2)	3(3+0+0)
STAT 336	Time Series and Forecasting	3(2+0+2)
	University Requirement	2(2+0+0)
Elective Course		3
Total		18

8th Semester		
Course	Course Title	Credits
ACTU475	Credibility theory and loss distribution	4(3+2+0)
ACTU483	Lab Financial Mathematics	1(0+0+2)
OPER 441	Modeling and Simulation	4(3+2+0)
ACTU 484	Lab Actuarial Mathematics	1(0+0+2)
	University Requirement	2(2+0+0)
Elective Course		3
Total		15

9th Semester		
Course	Course Title	Credits
ACTU498	Field Training	6
Total		6

Jobs Opportunities

- **SAMA (Saudi Arabian Monetary Authority):**
  General Department of Insurance Control, Economic Research Department and Banking control Department.
- **Companies:**
  Insurance companies, banks, ARAMCO, SABIC, international insurance companies for students professionally certified by international societies of actuarial.
- **Others:**
  Ministry of Finance, Ministry of Economy and Planning, Ministry of Commerce and investment, Public Pension agency, General Organization for Social Insurance.

Course Contents

MATH 101: Differential Calculus 3 (3+0+0) credit hours

The concept of limit, computation of limits, continuity and its consequences, limits involving infinity, formal definition of limit, the concept of derivative, computation of derivatives (power rule, higher order derivatives, acceleration), the product and quotient rules, the chain rule, derivatives of exponential and logarithmic functions, implicit differentiation and inverse trigonometric functions, the mean value theorem, indeterminate forms and L'Hopital's rule, maximum and minimum values, increasing and decreasing functions, concavity and the second derivative test, optimization, related rates.

MATH 106: Integral Calculus 3 (3+1+0) credit hours

Definition of Definite Integral and its Properties, the Anti-derivative, Indefinite Integral and the Fundamental Theorem of Calculus. Change of Variables, Integrals of natural and general exponential functions, Integrals of natural and general Logarithmic functions, Derivatives and Integrals of Hyperbolic and Inverse-Hyperbolic functions, Techniques of Integration: by parts, Trigonometric substitutions, Completing the square, Integrals of rational functions, Miscellaneous Substitutions, Indeterminate forms, Improper Integrals, Applications of Integration: Area, Solids of Revolutions, Arc length and Surface of Revolution, Linear Motion, Work, Momentum and Center of Mass, Numerical Integration, Polar coordinates, relation between polar and Cartesian coordinates, Graphs of polar curves, Area in Polar coordinates, Parametric Equations.

Prerequisite: MATH 101

MATH 132: Logic Mathematics 3(2+1+0) Credit hours

Mathematical Logic and Proof Methods, Sets and their Operations, Cartesian Product for Sets and its Properties, Binary Relations and their Properties, Functions, Set Equivalence and Countable sets.

MATH 206: Multi-variable Differential and Integral Calculus 4(3+1+0) Credit hours

Cartesian, cylindrical and spherical coordinate systems. Functions of two and three variables, limits and continuity, partial derivatives, the chain rule, extrema of functions of two variables, Lagrange multipliers. Double integrals, moments and center of mass, double integrals in polar coordinates, triple integrals, application of triple integrals, triple integrals in cylindrical and spherical coordinates, surface area. Sequences, infinite series, convergence tests, representation of functions by power series, Taylor and Maclaurin series, the binomial series.

Prerequisites: MATH 106

MATH 240 Introduction to Linear Algebra 4(3+1+0) Credit hours

Matrices and their operations, types of matrices. Elementary transformations. Determinants and their elementary properties. Inverse of a matrix. Linear systems of equations. Vector spaces, linear independence, finite dimensional spaces, subspaces. Inner product spaces. Linear transformations, kernel and image of a linear transformation. Eigenvalues and eigenvectors of a matrix and of a linear operator.

Prerequisites: MATH 132

MATH 280 Introduction to Real Analysis 4(3+1+0) credit hours

Bounded subsets of the real line; supremum and infimum, completeness axiom; convergent sequences, Cauchy criterion, subsequences; series of numbers, generalized tests of convergence; limits of functions, continuity on an interval, intermediate value property, extrema; differentiability, mean value theorem and its consequences, Taylor's theorem; Riemann integral; Uniform convergence of sequences and series of functions, tests for uniform convergence, power series.

Prerequisites: MATH 206

MATH 380 Stochastic Processes 4(3+1+0) credit hours

Axiomatic definition of probability, random variables and their probability distributions, relation with distribution functions. Expectations, conditioning with respect to a class of random variables. Stochastic processes, finite dimensional probabilities, independent processes. Discrete Markov chains, transition probabilities, recurrence, long term distributions. Continuous time Markov chains, Jump processes, birth-death processes, Poisson processes, Weiner processes.

Prerequisites: MATH 280, STAT 216

ACTU 262 Actuarial Corporate Finance 3(3+0+0) credit hours.

This course have Methods to evaluate financial alternatives and create financial plans. Corporate finance from the viewpoint of financial managers. The concept of net present value, suitably adapted to account for taxes, uncertainty, and strategic concerns. A large segment of the lessons cover capital budgeting decisions. Emphasis is placed on the interaction of taxes and the cost of capital and buying decisions. Dividend policy, the CAPM, and capital market efficiency, as they relate to the value-maximization objective of the firm. Definitions of key finance terms: stock company; capital structure, bond, stock, basic options (calls, puts); dividends; price to earnings ratio. Key finance concepts: financing companies; characteristics and uses of financial instruments. Sources of capital. Financial leverage and long/short term

financing policies. Characteristics of the principal forms of financial instrument. Structure of a stock company and the different methods by which it may be financed. Measures of financial performance: balance sheet; income statement; statement of cash flows; financial ratios (e.g. leverage, liquidity, profitability, market value ratios): the payback, discounted payback models; internal rate of return and profitability index models.

Prerequisite: FIN 200

ACTU 371 Financial Mathematics 4(3+1+0) credit hours

Interest rate. accumulation function, future value, current value, present value, net present value, equation of value, discount factor, discount rate, convertible m-thly, nominal rate, effective rate, inflation and real rate of interest, force of interest, Level annuity, finite term, level annuities, perpetuities, arithmetic progression annuities, geometric progression annuities, continuous varying annuities, loans, outstanding balance, amortization, sinking funds, price of the bond, redemption value, par value/face value, yield rate, coupon, coupon rate, term of bond, book value, amortization of premium, accumulation of discount, callable/non-callable. Yield rate/rate of return, dollar-weighted rate of return, time-weighted rate of return, current value, duration, convexity, spot rate, forward real risk-free rate, inflation rate, default risk premium, liquidity premium, and maturity risk premium rate, yield curve, stock price, stock dividend, liability, immunization, swap rate, market value of a swap, settlement dates, settlement period, counterparties, deferred swap, amortizing swap, accreting swap, interest rate swap net payments.

Prerequisites: MATH 106

ACTU 372 Actuarial Mathematic Models 4(3+1+0) credit hours

Introduction to life insurance and basic notations, Survival models, Life tables and Selection, Insurance Benefits, Annuities: life annuities, comparison of annuities, evaluating annuity functions, Premium calculation: present value of the future loss random variable, equivalence principle, Gross premium calculation, Profit, portfolio percentile premium principle, extra risks, Policy values: Policies with annual cash flows, cash flows at discrete intervals, continuous cash flows, policy alterations, retrospective policy value, negative policy values.

Prerequisites: ACTU 371

ACTU 471 Financial Derivatives 3(3+0+0) credit hours

Forward contract, prepaid forward contracts, outright purchase, fully leveraged, purchase.
payoff of long and short forward, net profit of long and short forward, marking to market, margin balance, maintenance margin, margin call, option Contracts: Call and put options, expiration date, strike price / exercise price, moneyness, European option, American option, Bermudan option, payoff and net profit of long and short option positions, swaps contract, Put-call parity, option spreads (bull, bear, box, ratio), collar, zero-cost collar, straddle, strangle, butterfly spread.

Prerequisites: ACTU 371

ACTU 472 Actuarial Mathematical models II 3(3+0+0) credit hours

Multiple state models: Kolmogorov's equations; numerical evaluation of probabilities; premiums; policy values and Thiele's differential equation; multiple decrement models; joint life and last survivor benefits; transitions at specified ages, Salary scale function; setting the DC contribution; the service table; valuation of benefits; funding plans, Interest rate risk: the yield curve; valuation of insurances and life annuities; diversifiable and non-diversifiable risk; Monte-Carlo simulation, Emerging costs for traditional life insurance: profit testing for traditional life insurance; profit measures.

Prerequisites: ACTU 371

ACTU 473 Models for Financial Economics 4(3+1+0) credit hours

One-period binomial model on a non-dividend-paying stock, principle of no-arbitrage, risk-neutral pricing formula, one-period binomial model on stocks, stock paying dividends continuously at a rate proportional to its price, currency, and futures contract, Multi-period setting for pricing European and American options, binomial model from market stock price data, Forward binomial tree, Cox-Ross-Rubinstein tree, lognormal tree. Black-Scholes model: lognormal distribution, probabilities and percentiles, means and variances, conditional expectations, analytic pricing formulas: cash-or-nothing calls and puts, asset-or-nothing calls and puts, ordinary calls and puts (the Black-Scholes formula), gap calls and puts, risk-neutral pricing formula using Monte-Carlo simulation, inverse transformation, path-independent and path-dependent options, Antithetic variate, stratified sampling, control variate, Black-Scholes formula to price exchange options, rate of appreciation, historical volatility, implied volatility, Option Greeks (Delta, Gamma, Theta, Vega, Rho, and Psi), Option elasticity, Sharpe ratio and instantaneous risk premium for both an option and a portfolio of options and the underlying stock, Black-Derman-Toy tree, interest rate caplets, floorlets and bond calls and puts.

Prerequisites: ACTU 471

ACTU 474 Risk Theory 3(3+0+0) credit hours

Definition of the notion of premium of an insurance policy and introduction of different methods for computing the premium, including the stop-loss reinsurance. Construction of individual and collective risk models for the aggregate loss of a portfolio of insurance policies when the number of claim of claims in known or unknown respectively, including the convolution formula, or by using moment generating function, introduction of computational methods of approximation including the normal and the normal power methods. Introduction to variant methods to generate new distributions from known ones, including scalar multiplication, power, exponentiation and limiting distributions.

Prerequisites: ACTU 372, MATH 380

ACTU 475 Credibility Theory and Loss Distributions 3(3+0+0) credit hours

Severity Models (Calculate the basic distributional quantities: moments, Percentiles, Generating functions, Describe how changes in parameters affect the distribution, Calculate various measures of tail weight and interpret the results to compare the tail weights). Frequency Models (For the Poisson, Mixed Poisson, Binomial, Negative Binomial, Geometric distribution and mixtures thereof) Aggregate Models (Compute relevant parameters and statistics for collective risk models. Evaluate compound models for aggregate claims. Compute aggregate claims distributions. Evaluate the impacts of coverage modifications: (Deductibles, Limits, Coinsurance), Calculate Loss Elimination Ratios, Evaluate effects of inflation on losses.

Construction of Empirical Models, Estimate the variance of estimators and confidence intervals for failure time and loss distributions. Estimation of decrement probabilities from large samples. Construction and Selection of Parametric Models, Estimate the parameters of failure time and loss distributions with censored and/or truncated data using maximum likelihood, Determine the acceptability of a fitted model and/or compare models, apply limited fluctuation (classical) credibility including criteria for both full and partial credibility. Perform Bayesian analysis using both discrete and continuous models, Apply Bühlmann and Bühlmann-Straub models and understand the relationship of these to the Bayesian model. Apply conjugate priors in Bayesian analysis and in particular the Poisson-gamma model.
Apply empirical Bayesian methods in the nonparametric and semiparametric cases.
Prerequisites: ACTU 474

ACTU 483 Lab Financial Mathematics 1(0+0+1) credit hours

This course will allow students to learn to use the MATLAB Financial Toolbox™. It provides functions for mathematical modelling and statistical analysis of financial data. Optimize portfolios of financial instruments, optionally taking into account turnover and transaction costs. The toolbox is used to estimate risk, analyses interest rate levels, price equity and interest rate derivatives, and measure investment performance. Time series analysis functions and an app let you perform transformations or regressions with missing data and convert between different trading calendars and day-count conventions.

Prerequisites: Complete 123 credit hours

ACTU 484 Lab Actuarial Mathematics 1(0+0+1) credit hours

R program in actual sciences and finance (package installation), Financial data for R Examples and Labs (historical data for some indices and stock), Preliminary R explorations in finance, (Using quantmod package tools to retrieve actuarial data and compute some statistics, Statistics of financial time series, Correlations, causalities and similarities (Pearson vs Kendall correlation): Causality, Clustering, K-means, ARMA, ARCH and GARCH models (autocorrelation in exchange rates for currencies), Neural Networks (Nnet) and Support Vector Machines (svm), Brownian motion, binomial trees and Monte Carlo simulations, Computational actuarial science, Portfolio optimization.

Prerequisites: Complete 123 credit hours

ACTU 498 Field Training 6 credit hours

A plan is prepared so that students are offered suitable training at the Saudi Arabian Monetary Fund, banks, or insurance organizations and companies.

Prerequisites: Complete 138 credit hours

STAT 105 Statistical Methods 4(3+1+0) credit hours

Some Statistical distributions - Sampling distributions - Central limit theorem - Chebychev's inequality - Interval estimation - Testing hypotheses (two populations case) - Introduction to experimental designs (CRD and RBD)- Analysis of variance (one and two ways) - Regression (simple) - Correlation (Pearson and Spearman) - Chi square tests and application - Some nonparametric tests.

Prerequisites: STAT 101

STAT 216 Actuarial Probability 4(3+1+0) credit hours

Set functions, Mutually exclusive events, Addition and multiplication rules, Independence of events, Combinatorial probability, Conditional probability, Bayes Theorem / Law of total probability, Random variables and distributions, Mode, median, percentiles, and moments, Variance and measures of dispersion (including coefficient of variation), Moment generating functions, Transformations, Joint probability functions and joint probability density functions, Joint cumulative distribution functions, Conditional and marginal probability distributions, Moments for joint, conditional, and marginal probability distributions, Joint moment generating functions, Variance and measures of dispersion for conditional and marginal probability distributions, Covariance and correlation coefficients, Transformations and order statistics, Probabilities and moments for linear combinations of independent random variables, Central Limit Theorem.

Corequisite: Math 206

STAT 328 Statistical Packages 3(2+1+0) credit hours

Using program code in a statistical software package (Excel – Minitab – SAS – SPSS - R - Maple - Matlab) to write a program for data and statistical analysis. Topics include creating and managing data files - graphical presentation - and Monte Carlo simulations.

Prerequisites: STAT 105, CSC 115

STAT 332 Regression Analysis 3(2+0+1) credit hours

Simple linear regression model - Multiple linear regression - Analysis of residuals and predictions – inference about the parameters - Stepwise regression - Some nonlinear regression models and data transformations - Student will use statistical computer packages such as R.

Prerequisites: STAT 328

STAT 336 Time Series and Forecasting 3(2+0+2) credit hours

Data sources: Historical data- the Web. Checking time series components: trend – seasonality - cyclical. Transformation: Differences method - Seasonal adjustment. Forecasting: How to forecast future - adequacy of a forecast - regression forecasting against time series forecasting - some adequacy measures (MAD - MSE - MAPE). Decomposition and smoothing of times series: moving averages - exponential smoothing. Box-Jenkins models ARIMA (p -d -q): Autocorrelation and partial autocorrelation functions - identification of appropriate model - dealing with seasonal time series - fitting models to real and simulated data sets. Diagnostic checks on the residuals. Case studies: training on how to analyze real life data sets using the statistical package MINITAB - write reports.

Prerequisites: STAT 332

OPER 441 Modeling and Simulation 4(3+1+0) credit hours

Random number generators - Monte Carlo techniques - Simulation design - Input modeling - Model validation - Analysis of simulation output - Evaluation of alternatives - Applications to various operations research models using simulation languages such as SLAM, GPSS and Arena.

Prerequisites: MATH 380

ACCT 201 Principles of Accounting and Financial Reporting 3(3+0+0) credit hours

The course aims at providing an understanding of accounting by focusing on the accounting system and principles and practices of financial accounting and preparing of financial reports in merchandising and services proprietorships, in addition, the course introduces the principles of financial reports analysis.

ECON 101 Principles of Microeconomics 3(3+0+0) credit hours

This course aims at provide the necessary theoretical background on microeconomics theory. It includes: Introduction: definition, methodology, tools of economics, and the economic problem; the price mechanism: basics of supply and demand, and the market analysis of consumer behavior, market demand, equilibrium, and elasticity, theory of production and costs, market structures, supply and demand for factors of production.

ECON 102 Principles of Macroeconomics 3(3+0+0) credit hours

This course provides the necessary theoretical background on macroeconomics theory. It also includes concepts of national income, the national accounts, determination of the semester of equilibrium of national income, money and banking, inflation, foreign trade, economic growth and development, introduction to the aggregate demand and aggregate supply model.

Prerequisites: ECON 101

FIN 200 Principles of Finance 3(3+0+0) credit hours.

The main topics covered in this course include: financial environment, interest rates and time value of money, financial reports and their analysis, capital budgeting, and risk and return.

Prerequisites: ACCT 201

CSC 115 Introduction to Programming with C++ 4(3+0+1) credit hours

Overall structure of a C++ program, Compiling: linking and running programs, Data types: Variables and constants, Operators: arithmetic, relational and Boolean, Expressions, input & output, Control structures (Decision): If statement, If-else statement, Switch statement, Control structures (Iterations), While loop, Do-while loop, For loop, Array: One dimension array, Two dimension array, Introduction to classes, Methods and message passing, Introduction to Inheritance and polymorphism.

Prerequisites: CT 101

Master's Programs

Since 1980 the Mathematics Department has offered a Master of Science Degree which requires, both, course study and a Thesis work. The aim of this Program is to provide the students with a strong mathematical background, and

at the same time to enable them to specialize in one of their chosen areas of interest in Mathematics. Many students had graduated from the Department through this option. Recently the Department introduced a Master's Program by courses only. This aims at providing the student with a broad background of a number of courses which makes it possible for him to work in more than one field, in addition to the possibility of continuing his postgraduate study for a Ph.D. degree. This Program is not for a new degree but a stream designed to renew the standard and course contents while reducing the role of the thesis work in the current Program. Therefore, the general aims of the previous program are retained. Moreover, this Program is expected to achieve the following added benefits:

- Provision of a broad spectrum of mathematical knowledge suitable for students whose graduate study ends with an M. sc. Degree. In particular for those candidates who are suppose to work in the field of education.
- In the presence of a successful Ph.D. program, the depth of mathematical knowledge furnished by the new program should provide students with the required background for successfully meeting the demands of the Ph.D. Program (such as the comprehensive examination).
- Enrolment of a bigger number of applicants without significantly increasing the Department's load of supervision commitments.
- The new program offers some recent specialties (such as discrete mathematics and computational mathematics) which bestow on the graduates a professional aura that should prove useful for employment in some applied fields like computer systems and digital communication.

Program Objectives

- Broadening the general mathematical skill of the students while offering them opportunity to gain in depth knowledge in a chosen branch.
- Preparing the students to study independently and acquainting themselves with scientific research processes.

- Raising the abilities of capable students to the standard required for commencing a Ph.D. program, and dealing with the frontiers of current mathematical research.
- Contributing to meet the requirements of the Kingdom for specialists in Mathematics in the fields of Education, Industry and Planning.

Admission Requirements

Beside the admission criteria stipulated in the unified graduate studies regulations for Saudi universities, the applicant must satisfy the following Department requirements:

- The applicant must hold a B.Sc. degree (Science or Education) in Mathematics with at least "very good" grade, (at least a GPA equal or equivalent to 3.75 out of 5).
- Full-time study.
- The applicant must have at least a score of 400 in GRE-Math subject test.
- The applicant must show proof of English language abilities through one of the following examinations:

No.	English test	Required score
1	TOEFL – IB	45 out of 120
2	TOEFL - PB	400 out of 677
3	IELTS	5 out of 9

Degree Requirements

The student must successfully complete 42 credit hours of M.Sc. courses in four semesters as follows:

- 35 hours of compulsory courses.
- 4 hours from optional courses.
- 3 hours for a research project.

Program Structure

42 Credit hours including a research project of three credit hours:

Number and Code of the course	Number & Type of Courses	Credit Hours
--	9 Core Courses	35
--	1 Elective Course	4
MATH 5991	Research Project	3
Total		42

Study Plan:

1. Core Courses:

Course Code	Course title
MATH5101	Ordinary Differential Equations
MATH5301	Introduction to Discrete Structures
MATH5391	Selected Topics in Mathematics
MATH5401	Group Theory and Modules
MATH5411	Introduction to Rings and Modules
MATH5501	Numerical Analysis
MATH5701	Geometry and Topology
MATH5801	Measure Theory
MATH5811	Functional Analysis

2. Elective Courses:

Course Code	Course title
MATH5121	Partial Differential Equations
MATH5141	Quantum Mechanics
MATH5311	Combinatorics
MATH5321	Ordered Sets
MATH5421	Algebra Rings and Modules
MATH5431	Algebraic Number Theory
MATH5511	Numerical Linear Algebra
MATH5521	Numerical Solutions of Ordinary Differential Equations

Course Code	Course title
MATH5711	Algebraic Topology
MATH5721	Differential Geometry
MATH5821	Complex Analysis
MATH5831	Advanced Functional Analysis

Program Schedule:

First Semester

Course Code	Course title	Credit hours
MATH5401	Group Theory and Modules	4
MATH5701	Geometry and Topology	4
MATH5801	Measure Theory	4
Total		12

Second Semester

Course Code	Course title	Credit hours
MATH5411	Introduction to Rings and Modules	4
MATH5501	Numerical Analysis	4
MATH5811	Functional Analysis	4
Total		12

Third Semester

Course Code	Course title	Credit hours
MATH5101	Ordinary Differential Equations	4
MATH5301	Introduction to Discrete Structures	4
	Elective course*	4
Total		12

Fourth Semester

Course Code	Course title	Credit hours
MATH5391	Selected Topics in Mathematics	3
MATH5991	Research Project	3
Total		6

* The student selects one 4 unit course from a list of 4 optional courses offered by the Department subject to its capabilities.

Course Contents

MATH5101 Ordinary Differential Equations 4(3+1)

Existence and uniqueness of solutions of linear systems. Stability Theory, Liapunov method. Two-dimensional autonomous systems, Poincare-Bendixson Theory. Second order linear differential equations: properties and zeros of the solutions. Sturm-Liouville theory: Linear

differential operators in L^2 space, eigen functions and eigen values of self-adjoint linear operators, orthogonal polynomials and eigen function expansions.

MATH5121 Partial Differential Equations 4(3+1) Elementary theory of distributions. Types of linear partial differential equations. Fundamental solutions of some linear differential operators such as the Laplacian, the heat, and the wave operators. Applications to solving non-homogeneous problems. Green's function and its application to boundary-value problems. Elliptic equations: Boundary-value problems for the Laplacian operators in n-dimensions, harmonic functions, the Dirichlet problem, existence and uniquness of solutions. Generalizations and applications. Solutions of parabolic and hyperbolic equations in Sobolev spaces. Generalized mixed problems.

MATH5141 Quantum Mechanics 4(3+1) Foundation of quantum mechanics and its mathematical tools. Energy spectra for some molecules. Dirac formulation of quantum Mechanics (fundamental concepts), elementary quantum systems (application of wave mechanics and uncertainty principle). Symmetries in quantum mechanics (groups matrix and its generators), operator algebra. Quantum theory of radiation. Quantum theory of damping (Langevin approach).

MATH5301 Introduction to Discrete Structures 4(3+1)

Graphs, Directed graphs, Basic definitions, Isomorphism of graphs, Subgraphs, Paths and cycles, Matrix representation of graphs, Connectedness, Bridges, Cut-vertices. Trees, Spanning trees, Weighted graphs and minimum spanning trees, Shortest paths, Eulerian circuits, Hamiltonian cycles, Tournaments, Applications. Planar graphs, Euler's Formula, Kuratowski's theorem. Graph coloring, Vertex coloring, Edge coloring, Map coloring, Chromatic polynomials. Ordered sets, Comparability and covering graphs, Dilworth theorem, Block designs, Latin squares, Orthogonal Latin squares, Finite geometries, Basic definitions and properties.

MATH5311 Combinatorics 4(3+1)

General counting methods, The inclusion-exclusion principle, Ordinary generating functions, Exponential generating functions, Recurrence relations, Linear recurrence relations, Homogeneous recurrence relations, Nonhomogeneous recurrence relations, Polya counting theory, Equivalence relations, Permutation groups, Burnside's Lemma, Inequivalent colorings, Cycle index, Polya's enumeration formula. Mobius inversion formula, Techniques of computing Mobius functions, Mobius functions for special lattices. The Pigeon-hole principle and its generalizations, Ramsey numbers, Ramsey theorem .

Prerequisite (MATH 5301)

MATH5321 Ordered Sets 4(3+1)

Basic definitions, Fundamental theorems, Chain decomposition, Linear extensions, Fixed points, Algorithmic aspects of chain decomposition, Cutsets, Fibers, Cutest and fiber decomposition, Drawing, The diagram, Algorithmic and structural aspects of linear extensions, Dimension, Jump number, Sorting, Linear extensions and probability, Single machine scheduling, Many machine scheduling, Order preserving maps, Structure and classification, Lattices, Free Lattices, Distributive Lattices, Planar Lattices.

Prerequisite (Mat 5301)

MATH5391 Selected Topics in Mathematics 3(3+0)

The course covers selected topics in mathematics suggested by the student's supervisor.

MATH5401 Group Theory and Modules 4(3+1)

Group action on a set, Series of groups, Solvable groups, Supersolvable groups, Polycyclic groups and nilpotenl groups, Semi-direct product and group extensions, Free groups, group presentations, Finite and algebraic field extensions, Normal and separable extensions, Galois extensions, Galois group and Artin's Theorm.

MATH5411 Introduction to Rings and Modules 4(3+1)

Modules, Module homomorphisms, Exact sequences, External direct product, Internal direct product, Complete direct sum, direct sum, Free modules, Projective and injective modules, Modules over principal ideal domain, Algebras, Tensor products, Localization, Primary decomposition, Integrally closed domains, Chain conditions, Noetherian and Artinian rings. Prerequisite (MATH5401)

MATH5421 Rings and Modules 4(3+1)

Ring Extensions, Dedekind domains, Hilbert and Nullstellensatz Theorem. Simple and primitive rings, The Jacobson radical of a ring, Semi-simple rings, Wedderburn-Artin theorem for semi-simple Artinian rings, Essential and small submodules, Singular submodules, Radical of a module, Primitive rings and density theorem, prime ideals and lower nilradical. Prerequisite (MATH5401) and (MATH5411)

MATH 5431 Algebraic Number Theory 4(3+1)

Number fields, Solvable and radical extensions, Abel's theorem, Kummer theorem, The ring of algebraic integers, Trace and norm, Discriminant and integral basis, Prime factorization of ideals, Norm of ideals, Quadratic and cyclotomic fields, Transcendence Bases, Linear Disjointness and Separability.

Prerequisite (MATH5401) and (MATH5411)

MATH5501 Numerical Analysis 4(3+1)

Floating point arithmetic and rounding errors, well-posed computation and convergence. Numerical methods for solving nonlinear equations with one variable: bisection, regula-falsi, functional iterative, Newton, secant and Aitken Δ^2. Error and convergence analysis for these methods, Special numerical methods for solving polynomials: evaluation of polynomials and their derivatives, Matrix and vector norms, convergence of vectors, Method for solvingsystem of nonlinear equations: Fixed point, Newton, finite difference Newton, quasi-Newton, steepest descent, Error and convergence analysis for these methods

MATH5511 Numerical Linear Algebra 4(3+1)

Eigenvalues and eigenvectors. Special matrices. Direct methods for solving system of linear equations. Analyzing the errors involved using these methods. Iterative refinement method.

Iterative methods for solving system of linear equations: Jacobi, Gauss-Seidel and SOR. Error and convergence analysis for these methods. Various methods for solving least square problems along with analytical and computational discussion. Numerical methods for the matrix eigenvalue problems: power and inverse power iteration, Jacobi, Givens, Householder, LR and QR. Singular value decomposition. Applications.

MATH5521 Numerical Solutions of Ordinary Differential Equations 4(3+1)

Multi-step methods for solving initial value problems in ODE: Euler, midpoint, trapezoidal, Simpson, Adam-Multon and other. Derivation these methods using Taylor expansion, integration and interpolation techniques. Error and convergence analysis for these methods: local and global errors, consistency and stability. Predictor corrector methods, error (Milne's device) and stability. Various Runge-Kutta methods: derivation of some of these methods. Error and stability of Runge-Kutta methods. Numerical solutions for solving system of first order ODE. Finite difference and shooting methods for solving linear and nonlinear boundary value problems in ODE. Error and convergence analysis for these methods. Applications.

MATH5701 Geometry and Topology 4(3+1)

Connected spaces, Path connected spaces, Connected components, Locally connected spaces, Quotient spaces, The separation axioms (Hausdorff, Regular, Normal). Differentiable manifolds, Submanifolds of IR^n and Classical Lie groups, Tangent spaces, Differentiable mappings between manifolds, Inverse and Implicit function theorems on manifolds.

MATH5711 Algebraic Topology 4(3+1)

Homotopy of paths, the fundamental group, The fundamental group of the circle, the punctured plane, S^n and surfaces, Covering spaces, lifting properties, The classification of covering spaces, universal cover and deck transformations, Chain complexes, simplicial homology, Homotopy invariance, Excision, Mayer-Vietoris sequence, Cellular homology.

MATH5721 Differential Geometry 4(3+1)

Definition and examples of manifolds, submanifolds, Immersions and submersions, Lie groups, Equivalence classes of curves and derivations, Tangent vectors, The tangent bundle of a manifold, Vector fields and flows, Lie derivatives and bracket, Differential forms, Integration on manifolds.

MATH5801 Measure Theory 4(3+1)

Rings, Algebra, σ-algebra, Monotone classes, Measure, elementary properties, outer measure, extension, completion and approximation theorems, Lebesgue's measure, Lebesgue-Stieltje's measure, measurable functions, integration with respect to a measure, the main theorems, the convergence of measurable functions, Radon-Nikodym theorem (absolutely continuous functions), Fubini-Tonelli theorem, L^P spaces: Holder and Minkowski inequalities, completeness of L^P spaces, L^P space as a Banach space, the dual of L^P space.

MATH5811 Functional Analysis 4(3+1)

Banach spaces: Basic properties and examples, convex sets, subspaces and quotient spaces, linear functional and the dual spaces, Hahn-Banach theorem, the uniform boundedness principle, the open mapping theorem and closed graph theorem, Hilbert spaces: the Riesz representation theorem, orthonormal bases, isomorphic Hilbert spaces, Operators on Hilbert spaces: Basic properties and examples, adjoints, projection, invariant and reducing subspaces, positive operators and the polar decomposition, self-adjoint operators, normal operators, isometric and unitary operators, the spectrum and the numerical range of an operator.

MATH5821 Complex Analysis 4(3+1)

Holomorphic functions, Cauchy-Riemann equations, power series, logarithmic function, Cauchy integral formula (general form), Analytic functions, zeros of holomorphic functions. Maximum principle, Liouville's theorem, fundamental theorem of algebra, open mapping theorem, Schwarz lemma, Mobius transformations, Rouche's theorem, Conformal mappings and Riemann's theorem, Topology on the space of holomorphic functions. Montel's theorem, Harmonic and subharmonic functions, Weirstrass's theorem, Mittag Leffler theorem, Introduction to several complex variables.

MATH5831 Advanced Functional Analysis 4(3+1)

Spectrum of an operator, compact linear operators and their spectral properties, spectral properties of bounded self-adjoint operators, positive operators, product of positive operators, square root of positive operator, projection operators: Theorem (positivity, norm), Theorem (partial order), Theorem (product of projections), Theorem (sum of projections), Theorem (difference of projections), Spectral family of a bounded self-adjoint operator, Banach algebras, Gelfand' mapping, spectral theorem for normal operators.

MATH5991 Research Project 3(3+0)

The student undertakes a supervised independent study and review of current research papers in an active branch of Mathematics .

Doctorate Program

This Program has been implemented by the Department since the first semester of the year 1414 H.

Program Objectives

- Providing the student with a broad knowledge of mathematics particularly the in - depth knowledge of the chosen branch.
- Equipping the student with the ability to pursue independent research in an active area of mathematics.

- Meeting the requirements of higher educational institutions and research centers for highly qualified mathematicians.
- Satisfying the aspirations of a growing number of M.Sc. degree holders in mathematics to obtain a higher qualification locally.
- Promoting the quality of the Department's performance and fostering its research activities.

Admission Requirements

In addition to the admission criteria stipulated in the Unified Graduate Studies Regulations for Saudi universities, the applicant must satisfy the following requirements:

1) The applicant must hold an M.Sc. degree (Science or Education) in Mathematics with a GPA of at least 3.75 out of 5.
2) The applicant must score at least 83% in the Standardized Test of English Proficiency (STEP) or at least 500 in TOEFL.
3) The applicant must score at least 75% in the aptitude test for graduates organized by the National Center for Assessment in Higher Education.
4) The applicant must pass the personal interview.

Degree Requirements

1. The Study for the degree is by thesis and courses.

2. The student must successfully complete a minimum of 18 credit hours of which a maximum of six can be selected from the M.Sc. course content lists which he/she has not previously studied.

3. The student must pass a comprehensive examination to be held accordance with the regulations and guidelines of the Graduate College. The examination must include Analysis, the specialization branch and a supporting branch. These branches are to be chosen with the consent of the Department Council.

4. The student must present a research thesis showing creativity and originality.

Study Plan

1. The Plan comprises 5 Tracks, namely;

- Track A: Algebra.

- Track B: Geometry and Topology.

- Track C: Analysis.

- Track D: Computational and Discrete Mathematics.

- Track E: Applied Mathematics.

2. The student must pass the common course MATH 690 (Advanced Topics in Mathematics).

3. Students at the same level in the same Track must study the same courses. These courses are assigned by the Department.

4. The Courses are taught in two semesters as follows:

First Semester

Three courses to be selected from the Track list and the M.Sc. lists (subject to stipulation 2 of the degree requirements).

Second Semester

Two courses from the Track list and MATH690 (Advanced Topics in Mathematics).

List of Courses

Track A: Algebra

MATH 641 Group Theory (II) (3 hours)

MATH 642 Ring Theory (II) (3 hours)

MATH 643 Algebraic Geometry (3 hours)

MATH 644 Algebraic Number Theory (3 hours)

MATH 645 Universal Algebra (3 hours)

Track B: Geometry and Topology

MATH 671 Analysis on Complex Manifolds (3 hours)

MATH 672 Variational Theory and Minimal Submanifolds (3 hours)

MATH 673 Lie Groups and Symmetric Spaces (3 hours)

MATH 674 Geometric Topology (3 hours)

MATH675 Algebraic Topology (3 hours)

MATH 676 Homotopy Theory (3 hours)

MATH 677 Topology of CW-Complexes (3 hours)

Track C: Analysis

MATH 681 Stochastic Differential Equations (3 hours)

MATH 682 Ergodic Theory (3 hours)

MATH 683 Complex Analysis (II) (3 hours)

MATH 684 The Theory of Distributions (3 hours)

MATH685 Harmonic Analysis (3 hours)

MATH686 Function Algebras (3 hours)

MATH 687 Geometric Function Theory (3 hours)

Track D: Computational and Discrete Mathematics

MATH 631 Lattice Theory (3 hours)

MATH 632 Coding Theory (3 hours)

MATH 633 Enumerative Combinatorics (3 hours)

MATH 634 Model Theory (3 hours)

MATH 651 Numerical Analysis (II) (3 hours)

MATH 652 Numerical Solutions of Partial Differential Equations (3 hours)

MATH 653 M Theory of Integer Programming (3 hours)

MATH 654 Dynamic Programming (3 hours)

MATH 655 Variational Inequalities (3 hours)

Track E: Applied Mathematics

MATH 611 Quantum Mechanics (II) (3 hours)

MATH 612 Methods in Fluid Dynamics (3 hours)

MATH 613 Topics in Deterministic and Non-deterministic Modeling (3 hours)

MATH 652 Numerical Solutions of Partial Differential Equations (3 hours)

MATH 684 The Theory of Distributions (3 hours)

COURSE CONTENTS

MATH 611 Quantum Mechanics (II)

Angular momentum, fundamental properties of Lie groups, the isospin groups, Quarks and SU3, Representations of the permutation group, Mathematical Excursion, field quantization, Quantum theory of relaxation, Quantum theory of scattering, the one center point interaction in three dimensions.

MATH 612 Methods in Fluid Dynamics

Basic equations of Compressible flow, Analytical and Computational methods of solving Navier-Stoke's equation, Boundary layer theory, Finite element methods for inviscid and viscous compressible flows.

MATH 613 Topics in Deterministic and Non-deterministic Modeling

Topics of interest in Mathematical Modeling.

MATH 631 Lattice Theory

Lattice Theory: Two Definitions of Lattices, Some algebraic concepts, Polynomials, Identities, and Inequalities, Free Lattices, Special elements, Distributive lattices: Characterization theorems, Congruence Relations, Boolean algebras, Topological Representation, Distributive lattices with pseudocomplementation, Modular and Semi-modular lattices: Modular lattices, semimodular lattices, partition lattices, complemented modular lattices, Equational classes of lattices.

MATH 632 Designs and Codes

Covering and Packing Designs and Codes, Skolem sequences and applications in Designs and Codes, Methods of finding Designs and Codes.

MATH 633 Enumerative Combinatorics

General counting methods, generating functions, recurrence relations, inclusion-exclusion principle, Polaya's enumeration formula, ordered sets, Mobius inversion formula, techniques for computing Mobius functions, Mobius functions for special lattices.

MATH 634 Model Theory

What is Model Theory?, Model Theory for sentential logic languages, models and satisfaction, theories and examples of theories, Elimination of quantifiers, Completeness and Compactness, Countable models of complete theories, Elementary extensions and elementary chains, Skolem functions and indiscernibles, Examples.

MATH 641 Group Theory (II)

Study of finite groups and infinite groups and their structures.

MATH 642 Ring Theory (II)

Study of some aspects of commutative and non-commutative rings.

MATH 643 Algebraic Geometry

Affine and projective varieties, Morphism, Rational maps, non-singular curves, Introduction to projective space, Riemann Roch's Theorem, Hurwicz's Theorem, embedding in projective space, Elliptic curves, classification of curves.

MATH 644 Algebraic Number Theory

Review of congruences and Chinese remainder theorem, Quadratic reciprocity, Dedekind domains, Integral ideals, Ideal class group, Norm and traces, Basis and discriminant computations, the arithmetic of number fields.

MATH 645 Universal Algebra

Concept of Lattices , Complete lattices, Equivalence relations and algebraic lattices, Closure Operators, Universal Algebras, Examples, Isomorphism algebras, Sub-algebras, Theorem of Birkhoff, congruences and Quotient Isomorphism Theorems, Direct products, Subdirect products, Varieties, Free algebras, Malcev conditions, Boolean algebras, Boolean rings, Ideals and Filters, Stone Duality.

MATH 651 Numerical Analysis (II)

Floating-point arithmetic and rounding errors: direct and iteration methods of solving systems of linear equations, Error estimates and convergence criteria. Iterative methods for the nonlinear operator equations: Fixed-point principle, Newton's Method, Kantorovich Method, Quasi-Newton's Method, Quasi-Newton's Method with error terms and estimates.

MATH 652 Numerical Solution of Partial Differential Equations

Finite Difference Methods: Elliptic, parabolic and hyperbolic equations, Accuracy, Consistency, Stability, Energy methods for stability, Hyperbolic systems, Boundary Conditions, Dissipation, Dispersion, Finite Element Methods: Elliptic equations, Ritz method, Galerkin method, Construction of basis function, Interelement continuity and patch test, Semi-discrete Galerkin methods for time dependent problems, Solution of systems of ordinary differential equations.

MATH 653 Theory of Integer Programming

Problems, algorithms and complexity, introduction to integer linear programming, Estimates in integer linear programming, the complexity of integer linear programming, totally unimodular matrices, recognizing total unimodularity, integral polyhedral and total dual integrality, Cutting planes, Further methods in integer linear programming.

MATH 654 Dynamic Programming

Basic theory relating to the functional equations of dynamic programming. Analytic and computational methods for one-dimensional and multi-dimensional problems, Lagrange multipliers and reduction of state dimensionality, Applications of dynamic programming in various fields.

MATH 655 Variational Inequalities

Basic Concepts. Formulation of the variational inequalities. Existence and Uniqueness results. Fixed point approach. Penalty method. Lagrange Multiplier Method. Error estimate for the finite element approximation. Applications. Linear Complementarity problems and its generalization. Equivalence among variational inequality problems. Unilateral problem and complementarity problem and their significance.

MATH 671 Analysis on Complex Manifolds

Vector Bundles, Almost Complex Manifolds, the Canonical Connection and Curvature of a Hermitian Holomorphic Vector Bundle, Sobolev Spaces, Differential Operators, Kaehler Manifold, Differential Operators on a Kaehler Manifold, The Hodge decomposition Theorem on compact Kaehler manifolds, Kodaira's vanishing theorem, Hodge manifolds.

MATH 672 Variational Theory and Minimal Submanifolds

The first and second variation of arc length, Jacobi fields conjugate points, comparison theorems of Morse and Rauch, Myer's theorem on compactness of Riemannian Manifolds, Variation of immersion, Normal variation, first and second variation of the area function, Minimal submanifolds, stability of minimal submanifolds, Index of minimal submanifolds, minimal submanifolds in spheres, complex submanifolds of a complex projective space.

MATH 673 Lie Groups and Symmetric Spaces

Lie Groups and their Lie-algebras, action of Lie groups on a smooth manifold, homogeneous spaces, Riemannian homogeneous spaces, the cannonical connection and Jacobi equations, two-point homogeneous spaces, Riemannian symmetric space, structure of orthogonal involutive Lie algebras, symmetric spaces and orthogonal involutive Lie algebras, curvature of symmetric spaces, Riemannian symmetric spaces of rank one.

MATH 674 Geometric Topology

Cohomology and duality theorems, deRahm's theorems, cup products and transversality theory of submanifolds.

MATH 675 Algebraic Topology

Extraordinary cohomology theories, K-Theory, fixed point theory.

MATH 676 Homotopy Theory

The fundamental problems: extension, homotopy, and classification, maps of the n-sphere into itself, filtered spaces, fibrations, homotopy and the fundamental group, spaces with base points, groups of homotopy classes, H-spaces, H's spaces, exact sequences of mapping functions; relative homotopy groups, the homotopy sequence, the operations of the fundamental group on the homotopy sequence, the Hurewicz map, the homotopy addition theorem, the Hurewicz theorems, homotopy relations in fiber spaces, fibrations in which the base or fiber is a sphere, elementary homotopy theory of Lie groups and their coset groups.

MATH 677 Topology of *CW*-Complexes

Cell-complexes, *CW*-complexes, homotopy properties of *CW*-complexes, cellular homology and cohomology.

MATH 681 Stochastic Differential Equations

Measure-theoretic background, Ito's integral, McShane's Integral, Ito's formula. Stochastic Differential Equations, existence and uniqueness of solutions, dependence on initial distributions, properties of solutions, solutions as Markov and diffusion processes, Generalization to Hilbert valued processes.

MATH 682 Erdogic Theory

Measure-preserving transformations. Recurrence. Ergodicity. The Ergodic Theorem. Mixing. Isomorphism and spectral invariants. Entropy. Bernoulli transformations. Topological Entropy.

MATH 683 Complex Analysis (II)

Mittag-Leffler Theorem. Weierstrass Theorem. Subharmonic functions. The domain of Holomorphy. Pseudoconvexity and plurisubharmonicity. Runge domain. The partial differentiation problem.

MATH 684 The Theory of Distributions

Test functions, semi-norms(locally convex spaces), the inductive limit topology of $C_0^{\infty}(\Omega)$, the topology on $D'(\Omega)$, the dual of $C_0^{\infty}(\Omega)$, the topology $E'(\Omega)$, the space of $s(IR^n)$, Tempered distributions, The Fourier transformation in $s(IR^n)$, the Paly-Wienner-Schwartz theorem, The Sobolev spaces $H^p(IR^n)$, some applications in partial differential equations.

MATH 685 Harmonic Analysis

Elements of the theory of topological groups, Integration on locally compact spaces, Invariant functional, Convolutions and group representation, Characters and duality of locally compact groups.

MATH 686 Function Algebras

Algebras of functions, the Silov boundary, Representations of the carrier space, Homomorphisms of certain function algebras into a Banach algebra, Direct sum decompositions and related results, completely regular commutative Banach algebras, the algebra $C(\Omega)$ for certain special Ω. The l_p -algebras, functions with absolutely convergent Fourier series, functions of class $C(n)$, Continuous functions of bounded variation, holomorphic functions of one variable, algebra of power series.

MATH 687 Geometric Function Theory

Zeros of analytic functions, Rouches theorem, The open mapping theorem, The maximum principle, Schwarz's Lemma, Caratheodory's inequality concerning the real part of an analytic function, Conformal mappings, Reflexion Principles, Mobius transformations (a detailed study), Schwarz-Christoffel transformation, Riemann mapping theorem (without proof), Univalent functions, Koee's constant, a general discussion on Bieberbach's conjecture and the integral representation of univalent functions in a disc (without proof), Some special classes of functions: star-like, convex, typically real.

MATH 690 Advanced Topics in Mathematics

The course covers recent research topics in Mathematics.

Facilities and Equipment

The Department has the following infrastructures to facilitate teaching and research activities:

Males' Branch in Deriya:

- Three computer laboratories containing 70 PCs: AA118 B4, AA119 B4 and 1B47 B4.
- A self-learning room 2B68 B4.
- Three video conference rooms:1A95 B4, 2A137 B4 and 1B21 B4.
- A library for faculty members 2A142 B4.

Females' Branch in Malaz:

- A computer laboratory containing 50 PCs: 2/A, B21
- Two video conference rooms: 2/1036 B15, 1/45 B21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Faculty Members

Male Faculty Members:

SN	Name, E-mail and Room	Specialization	Nationality	Scientific qualification	University of graduation	Academic rank
1.	Dr. Abdellatif H. Laradji alaradji@ksu.edu.sa http://faculty.ksu.edu.sa/67272 2B66 B4	Algebra Representation of Finite Groups	Algerian	Ph.D. 1993	Illinois USA	Professor
2.	Dr. Akhlaq A. Siddiqui asiddiqui@ksu.edu.sa 2A149 B4	Functional Analysis & Algebraic Topology	Pakistani	Ph.D.1996	Edinburgh UK	Professor
3.	Dr. Bessem Samet bsamet@ksu.edu.sa http://fac.ksu.edu.sa/bsamet 1A87 B4	Analysis	Tunisian	Ph.D.	Toulouse France	Professor
4.	Dr. Ibraheem Alolyan ialolyan@ksu.edu.sa http://faculty.ksu.edu.sa/alolyan 2A181 B4	Numerical Analysis	Saudi	Ph.D. 2004	Colorado USA	Professor
5.	Dr. Imed Toumi Bachar abachar@ ksu.edu.sa 2A176 B4	Potential Theory and Nonlinear	Tunisian	Tunis Tunis	Tunisia	Professor
6.	Dr. Mongi Ahmed Blel mblel@ksu.edu.sa 2A148 B4	Complex Analysis and Special functions	Tunisian	Doctorat d'etat 1992	Tunis Tunisia	Professor
7.	Dr. Messaoud A. Bounkhel bounkhel@ksu.edu.sa http://faculty.ksu.edu.sa/Dr.Messaoud_Bounkhel 2A184 B4	Optimization Mathematics and Control Theory	Algerian	Ph.D. 1999	Montpellier France	Professor
8.	Dr. Mhamed Eddahbi meddahbi@ksu.edu.sa http://fac.ksu.edu.sa/meddahbi 2B65 B4	Stochastic Analysis	Moroccan	Ph.D.	Morocco	Professor
9.	Dr. Mohammed A. Guediri mguediri@ksu.edu.sa http://faculty.ksu.edu.sa/mohguediri 2A124 B4	Differential Geometry	Algerian	Ph.D. 1995	Montpellier France	Professor
10.	Fathi Bouzaffour fbouzaffour@ksu.edu.sa http://fac.ksu.edu.sa/fbouzaffour 2A140 B4	Special Functions	Tunisian	Ph.D.	Tunisia	Professor
11.	Hasan Gadain hgadain@ksu.edu.sa http://fac.ksu.edu.sa/hgadain AA131 B4	Differential Equations	Sudanese	Ph.D. 2008	Putra Malaysia	Professor

SN	Name, E-mail and Room	Specialization	Nationality	Scientific qualification	University of graduation	Academic rank
12.	Dr. Mourad Ben Slimane mbenslimane@ksu.edu.sa http://fac.ksu.edu.sa/mbenslimane 1A83 B4	Analysis	Tunisian	Ph.D.1996	Ecole National Paris France	Professor
13.	Dr. Moustafa K. Damlakhi damlakhi@ksu.edu.sa http://faculty.ksu.edu.sa/57647 2A146 B4	Analysis (Partial Differential Equations)	Syrian	Doctorat d'etat,1982	Paris 11 France	Professor
14.	Mobariz Garayev mgarayev@ksu.edu.sa 2A183 B4	Functional Analysis	Azerbaijan	Dr. es Science	Baku Azerbaijan	Professor
15.	Dr. Nejmeddine Chorfi nchorfi@ksu.edu.sa 1B33 B4	Analysis	Tunisian	Ph.D.1998	Paris France	Professor
16.	Dr. Mohamed Jleli jleli@ksu.edu.sa http://faculty.ksu.edu.sa/74324 2A159 B4	Differential Geometry	Tunisian	Ph.D. 2004	Paris France	Professor
17.	Dr. Nabil Ourimi ourimi@ksu.edu.sa http://faculty.ksu.edu.sa/73047 2A150 B4	Complex Analysis	Tunisian	Ph.D. 1997	Marseille France	Professor
18.	Dr. Said Mesloub mesloub@ksu.edu.sa http://faculty.ksu.edu.sa/mesloub 2B78 B4	Partial Differential Equations	Algerian	Doctorat d'etat 1999	Constantine Algeria	Professor
19.	Dr. Sharief Deshmukh sharief d@ksu.edu.sa http://faculty.ksu.edu.sa/63187 2A122 B4	Differential Geometry	Indian	Ph.D. 1980	Aligarh India	Professor
20.	Dr. Souhail Chebbi schebbi@ksu.edu.sa http://faculty.ksu.edu.sa/72359 2B64 B4	Nonlinear Analysis	Tunisian	Ph.D. 1998	Sorbonne France	Professor
21.	Dr. T. M. G. Ahsanullah tmgal@ksu.edu.sa http://faculty.ksu.edu.sa/ahsanullah 2B80 B4	Fuzzy Topology and Topological Algebras	Bangladishi	Ph.D. 1984	Brussels Belgium	Professor
22.	Dr. Yousef A. Alkhamees ykhamees@ksu.edu.sa http://faculty.ksu.edu.sa/1500 2A182 B4	Algebra (Ring Theory)	Saudi	Ph.D. 1977	Reading UK	Professor
23.	Youssef Boudabbous yboudabbous@ksu.edu.sa http://fac.ksu.edu.sa/youdabbous 2A145 B4	Discrete mathematics	Tunisian	Ph.D.	France	Professor
24.	Dr. Ahmad H. Sharary ashararyl@ksu.edu.sa http://faculty.ksu.edu.sa/57119 2A177 B4	Algebra (Group Theory)	Palestinian	Ph.D. 1982	Middle East Technical University Turkey	Associate Prof.
25.	Dr. Ahmed A. M. Kamal akamal@ksu.edu.sa http://faculty.ksu.edu.sa/73646	Algebra	Egyptian	Ph.D. 1991	Cairo Egypt	Associate Prof.

SN	Name, E-mail and Room	Specialization	Nationality	Scientific qualification	University of graduation	Academic rank
	2B59 B4					
26.	Dr. Bader Alqhtani balqahtani1@ksu.edu.sa http://fac.ksu.edu.sa/balqahtani1 2B81 B4	Numerical Analysis	Saudi	Ph.D.	U. K	Associate Prof.
27.	Dr. Bander Almohsen balmohsen@ksu.edu.sa https://fac.ksu.edu.sa/balmohsen/home 2A154 B	Applied Mathematics	Saudi	Ph.D.	U. K	Associate Prof.
28.	Dr. Emad Elmahdy **eelmahdy@ksu.edu.sa** http://fac.ksu.edu.sa/eelmahdy 1B37 B4	Applied Mathematics	Egyptian	Ph.D.	Tanta Egypt	Associate Prof.
29.	Dr. Hocine Guediri hguediri@ksu.edu.sa http://faculty.ksu.edu.sa/Hocine-Guediri 2A175 B4	Functional and Complex Analysis	Algerian	Ph.D. 2001	Marseille France	Associate Professor
30.	Dr. Fawzi Ahmed Al-Thukair thukair@ksu.edu.sa http://faculty.ksu.edu.sa/Al-Thukair 2A174B4	Algebra (Number Theory)	Saudi	Ph.D. 1981	California USA	Associate Prof.
31.	Dr. Mohammad A. Alzohairi zohairi@ksu.edu.sa http://faculty.ksu.edu.sa/zohairi 2A127 B4	Discrete Mathematics (Combanatorics Theory)	Saudi	Ph.D. 1997	Ottawa Canada	Associate Prof.
32.	Dr. Mahfooz Alam mahfuzam@ksu.edu.sa http://faculty.ksu.edu.sa/67548 2A158 B4	Complex Analysis	Indian	Ph.D. 1978	Aligarh India	Associate Prof.
33.	Dr. Malik Talbi mtalbi@ksu.edu.sa 1A84 B4	Non commutative geometry	French	Ph.D. 2001	Lyon 1 France	Associate Prof.
34.	Dr. Mansour A. Alyazidi yazidi@ksu.edu.sa http://faculty.ksu.edu.sa/Alyazidi 2A153 B4	Approximation Theory	Saudi	Ph.D. 1989	Oregon USA	Associate Prof.
35.	Dr. Mohamad AL-Ghamdi almohamad@ksu.edu.sa http://fac.ksu.edu.sa/almohamad/home 2A126 B4	Financial Mathematics	Saudi	Ph.D.	Australia	Associate Prof.
36.	Dr. Mhamad Abdelwahed mabdelwahed@ksu.edu.sa http://fac.ksu.edu.sa/mabdelwahed 1A86 B4	Numerical Analysis	Tunisian	Ph.D.	France	Associate Prof.
37.	Dr. Mosaad A. Alabdullatif mosaadal@ksu.edu.sa http://faculty.ksu.edu.sa/Abdullatif 2B58 B4	Discrete Mathematics (Graph Theory)	Saudi	Ph.D. 1997	Keel UK	Associate Prof.
38.	Dr. Obaid Algahtani obalgahtani@ksu.edu.sa http://fac.ksu.edu.sa/obalgahtani/home 2A129 B4	Applied mathematics	Saudi	Ph.D.	KFU KSA	Associate Prof.

SN	Name, E-mail and Room	Specialization	Nationality	Scientific qualification	University of graduation	Academic rank
39.	Dr. Rizwan A. Butt rizwanbu@ksu.edu.sa http://faculty.ksu.edu.sa/67980 2A125 B4	Numerical analysis (Functional Analysis)	Pakistani	Ph.D. 1988	Leeds UK	Associate Prof.
40.	Dr. Salman A. Alsalman alsalman@ksu.edu.sa http://faculty.ksu.edu.sa/Dr.Al-Salman 2A173 B4	Algebra (Group Theory)	Saudi	Ph.D. 1973	Birmingham UK	Associate Prof.
41.	Dr. Wleed Allazkani wallazkani@ksu.edu.sa http://fac.ksu.edu.sa/wallazkani 1A91 B	Analysis	Syrian	Ph.D.	S.U	Associate Prof.
42.	Dr. Yousef S. Al-Shanaifi shanaifi@ksu.edu.sa http://faculty.ksu.edu.sa/1292 2A128 B4	Algebra (Commutative Rings Theory)	Saudi	Ph.D. 1990	Southampton UK	Associate Prof.
43.	Dr. Zafar Elahi F. Khawaja kzelahi@ksu.edu.sa http://faculty.ksu.edu.sa/khawaja 2A138 B4	Applied Mathematics (Fluid Dynamics)	Pakistani	Dr.Ing. 1977	Hanover Germany	Associate Prof.
44.	Dr. Khalid Alshaalan kshaalan@ksu.edu.sa http://fac.ksu.edu.sa/kshaalan/home 2B 60 B54	Algebra	Saudi	Ph.D.	KSU KSA	Assistant Prof.
45.	Dr. Bander Almutairi baalmutairi@ksu.edu.sa http://fac.ksu.edu.sa/baalmutairi 2A160 B4	Algebra	Saudi	Ph.D.	U. K	Assistant Prof.
46.	Dr. Borhen Halouani halouani@ksu.edu.sa http://faculty.ksu.edu.sa/Halouani.Borhen 2A157 B4	Complex Analysis	Tunisian	Ph.D. 2006	France	Assistant Prof.
47.	Dr. Fahad M. Alshammari fmobarak@ksu.edu.sa http://faculty.ksu.edu.sa/al-shammari 2A179 B4	Algebraic Geometry	Saudi	Ph.D. 2002	Arizona USA	Assistant Prof.
48.	Dr. Houcine Sadraoui sadrawi@ksu.edu.sa http://faculty.ksu.edu.sa/72481 2B62 B4	Functional Analysis	Tunisian	Ph.D. 1992	Bordo USA	Associate Prof.
49.	Dr. Moncef Booazi mbouaziz@ksu.edu.sa http://fac.ksu.edu.sa/mbouaziz 2A152 B4	Discrete mathematics	Tunisian	Ph.D.	Tunisia	Assistant Prof.
50.	Dr. Mostafa Bashar mbachar@ksu.edu.sa 2A180 B4	Applied mathematics: Biomathematics	Austrian	Ph.D. 1999	France	Associate Prof.
51.	Dr. Faisal Aldureiham **faldureiham@ksu.edu.sa** 2A178 B4	Differential Equations	Saudi	Ph.D. 2018	USA	Assistant Prof.
52.	Dr. Saleem Obaidat saleem@ksu.edu.sa http://faculty.ksu.edu.sa/73672 2A123 B4	Computational mathematics	Jordanian	Ph.D.2005	Institute of Mathematics and Informatics Bulgaria	Associate Prof.

SN	Name, E-mail and Room	Specialization	Nationality	Scientific qualification	University of graduation	Academic rank
53.	Dr. Shalan Alkarni shalkarni@ksu.edu.sa http://fac.ksu.edu.sa/shalkarni 2A144 B4	Algebra	Saudi	Ph.D.	USA	Assistant Prof.
54.	Dr. Tariq A. Al-Fadhel alfadhel@ksu.edu.sa http://faculty.ksu.edu.sa/alfadhel 2A172 B4	Analysis (Dynamical Systems)	Saudi	Ph.D. 2003	Illinois USA	Associate Prof.
55.	Dr. Maamoon Turkawi mturkawi@KSU.EDU.SA	Applied Mathematics	Syrian	Ph.D.	Marseille France	Assistant Prof.
56.	Dr. Nasser Bin Turki nassert@ksu.edu.sa http://fac.ksu.edu.sa/nassert/home 2A162 B4	Differential Geometry	Saudi	Ph.D.	U. K	Assistant Prof.
57.	Dr. Mansour Alshehri mhalshehri@ksu.edu.sa http://fac.ksu.edu.sa/mhalshehri 2A163 B4	Applied Mathematics	Saudi	Ph.D.	Australia	Assistant Prof.
58.	Dr. Aymen Ben Amira abenamira@ksu.edu.sa	Discrete mathematics	Tunisian	Ph.D. 2015	Tunisia	Assistant Prof.
59.	Dr. Ahmad Jello ajello@KSU.EDU.SA http://fac.ksu.edu.sa/ajello AA129/3	Applied Mathematics	Syrian	Ph.D.	S.U.	Assistant Prof.

Female Faculty Members:

SN	Name, E-mail, website and Room	Specialization	Nationality	Scientific qualification	University of graduation	Academic rank
1.	Dr. Ibtesam Bajunaid ibajunaid@ksu.edu.sa http://faculty.ksu.edu.sa/Ibajunaid/Pages/Home.aspx Room 5T036	Potential Theory	Saudi	Ph.D. 1999	King Saud University KSA	Associate Prof.
2.	Dr. Fairouz Tchier ftchier@ksu.edu.sa http://faculty.ksu.edu.sa/Tchier/default.aspx Room 5T055	Application of Algebra	Canadian	Ph.D. 1996	Lval University Canada	Associate Prof.
3.	Dr. Abir Alharbi abir@ksu.edu.sa http://faculty.ksu.edu.sa/abiralharbi Room 5T054	Applied Mathematics (Computational Mathematics)	Saudi	Ph.D. 1997	Florida Institute of Technology USA	Associate Prof.

SN	Name, E-mail, website and Room	Specialization	Nationality	Scientific qualification	University of graduation	Academic rank
4.	Dr. Haila Alodan halodan1@ksu.edu.sa http://fac.ksu.edu.sa/halodan1, Room 5T040	Geometry of Differentiable Manifolds	Saudi	Ph.D. 2001	King Saud University KSA	Associate Prof.
5.	Dr. Eyman Alahmadi ealahmadi@ksu.edu.sa http://fac.ksu.edu.sa/ealahmadi/home Room 5T340	Applied Mathematics	Saudi	Ph.D. 2012	The University of Manchester UK	Assistant Prof.
6.	Dr. Jawaher A. Al-Mufarrij jmufarrij@ksu.edu.sa http://faculty.ksu.edu.sa/jawaher Room 5T058	Fuzzy Topology	Saudi	Ph.D. 2009	King Saud University KSA	Assistant Prof.
7.	Dr.Hanan A. Alolayan Holayan@ksu.edu.sa http://faculty.ksu.edu.sa/9677 Room 5T035	Algebra	Saudi	Ph.D. 2001	King Saud University KSA	Assistant Prof.
8.	Dr. Reem Alhefthi raseeri@ksu.edu.sa http://faculty.ksu.edu.sa/reem/default.aspx Room 5T045	Functional Analysis	Saudi	Ph.D. 2014	King Saud University KSA	Assistant Prof.
9.	Reem A. Almahmud ralmahmud@ksu.edu.sa Room 5T061	Numerical Analysis	Saudi	Ph.D 2017		Assistant Prof.
10.	Dr. Sara Alzaid sarsalzaid@ksu.edu.sa http://fac.ksu.edu.sa/sarsalzaid/home Room 5T345	Differential Equations	Saudi	Ph.D. 2015	McMaster University Canada	Assistant Prof.
11.	Dr. Suad Alhemedan shemedan@ksu.edu.sa http://faculty.ksu.edu.sa/2796 Room 5T062	Potential Theory	Saudi	Ph.D. 2000	King Saud University KSA	Assistant Prof.
12.	Dr. Liana Topan ltopan.c@ksu.edu.sa http://fac.ksu.edu.sa/ltopanc/home , Room 5T049	Functional Analysis/Topology	Romanian	Ph.D. 2003	Bolyai University Romania	Assistant Prof.
13.	Dr. Ishrat Jahan ijahan@ksu.edu.sa http://faculty.ksu.edu.sa/64108 Room 5T056	Analysis (Special Functions)	Indian	Ph.D. 1987	Aligarh Muslim University India	Assistant Prof.

SN	Name, E-mail, website and Room	Specialization	Nationality	Scientific qualification	University of graduation	Academic rank
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15.	Dr. Fardous M. Toufic ftoufic@ksu.edu.sa http://faculty.ksu.edu.sa/2826 Room 5T046	Numerical Analysis	Saudi	Ph.D. 1988	University College London UK	Assistant Prof.
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