Program Specification

(Bachelor)

Program:	**Bachelor of Science in Applied Mathematics**
Program Code (as per Saudi university ranking):	**054101**
Qualification Level:	**6**
Department:	**MATHEMATICS AND STATISTICS**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Program Specification:	New ☐ **updated*** ☒
Last Review Date:	**08/10/2024**

*Attach the previous version of the Program Specification.

Table of Contents

A. Program Identification and General Information

1. Program's Main Location:

Main Campus for the Male Section.

2. Branches Offering the Program (if any):

King Abdullah City for the Female Section.

3. Partnerships with other parties (if any) and the nature of each:

N.A.

4. Professions/jobs for which students are qualified

- **121117 Statistician Manager.**
- **134906 Manager of Weather Forecasting and Environment Control Station.**
- **211102 Astronomy Specialist.**
- **211201 Weather Forecasting Specialist.**
- **212003 Statistician.**
- **232001 Professional Trainer.**
- **331404 Statistician Assistant.**

5. Relevant occupational/ Professional sectors:

- **Insurance Industry:** Actuarial roles in life, health, and property insurance.
- **Finance and Banking:** Positions in investment banking, risk management, and financial analysis.
- **Pension and Retirement Planning:** Actuarial roles focused on pension funds and retirement schemes.
- **Consulting Firms:** Actuarial consulting and risk management services.
- **Data Science and Analytics:** Roles in statistical modeling and predictive analytics.
- **Investment Firms:** Portfolio management and market analysis.

6. Major Tracks/Pathways (if any):

Major track/pathway	Credit hours (For each track)	Professions/jobs (For each track)
N.A.		

7. Exit Points/Awarded Degree (if any):

exit points/awarded degree	Credit hours
Diploma of Science in Mathematics (Requirements: Students must complete a total of at least 66 credits, which includes 4 credits for the core course MAT1497 Field Training.)	**66**

8. Total credit hours: (142)

B. Mission, Objectives, and Program Learning Outcomes

1. Program Mission:

The mission of the undergraduate program in Applied Mathematics is to prepare students for participating in the economic and social development of the Kingdom of Saudi Arabia, and leading innovation in higher education in the field of Mathematics and its applications.

2. Program Goals:

G1. Demonstrate positive attitudes and uphold national and institutional values toward applied mathematics, contributing to the advancement of a dynamic and progressive society.

G2. Think critically, apply effective problem-solving strategies, and communicate applied mathematics concepts and their real-world implications clearly and confidently.

G3. Sustain and advance the core of mathematical knowledge in alignment with technological developments, providing a strong foundation for lifelong learning.

G4. Acquire a comprehensive set of professional skills to ensure a productive and rewarding career that effectively applies mathematics.

G5. Enhance students' creativity and innovation through active engagement in research

3. Program Learning Outcomes*

Knowledge and Understanding **Graduates will be able to:**	
K1	Understand the fundamentals of Mathematics as a rigorous living discipline in its own right.
K2	Describe and outline the development of the application of Mathematics as a language in a wide range of situations relevant to research and industry.
Skills **Graduates will be able to:**	
S1	Develop critical abilities of an analytical, creative and problem-solving nature.
S2	Design mathematical models of real-life problems.
S3	Develop critical skills with regard to literature searching, appraising and evaluating from a variety of sources and synthesizing the results.
S4	Make efficient use of computer technology and software in solving mathematical problems.
S5	Communicate mathematical ideas orally and in writing, with precision and clarity. Make efficient use of computer technology and software in solving mathematical problems.
Values, Autonomy, and Responsibility **Graduates will be able to**	
V 1	Evaluate and apply ethical considerations in mathematical decision-making and research, ensuring that their work adheres to professional standards and contributes positively to society.
V 2	Engage in self-evaluation of their learning and performance, striving for excellence and making informed, evidence-based decisions independently.
V 3	Work collaboratively in diverse teams, showing accountability for their roles and contributions, while also supporting the group's collective goals.

* Add a table for each track or exit Point (if any)

4.Program Learning Outcomes for the exit point	
Knowledge and Understanding **Graduates will be able to:**	
K'1	Explain fundamental mathematical concepts, including algebra, calculus, and statistics, and their significance in various contexts.
K'2	Identify important mathematical principles and demonstrate how they apply to real-world situations.
K'3	List different strategies for solving mathematical problems and select appropriate methods for specific scenarios.
Skills **Graduates will be able to:**	
S'1	Apply analytical reasoning to tackle mathematical problems effectively and draw logical conclusions.
S'2	Construct mathematical models to represent and solve practical problems in fields such as science, economics, and engineering.
S'3	Utilize mathematical software and tools to perform calculations, analyze data, and visualize mathematical concepts.
S'4	Articulate mathematical ideas and solutions clearly and effectively in both written and oral formats.
Values, Autonomy, and Responsibility **Graduates will be able to:**	
V'1	Recognize and consider the ethical implications of mathematical applications and data use in professional settings.
V'2	Demonstrate a commitment to continuous learning and professional development in mathematics and related disciplines.
V'3	Work effectively in teams to solve mathematical problems, valuing diverse perspectives and contributions.

C. Curriculum

1. Curriculum Structure

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	2	4	2.8%
	Elective	8	16	10.3%
College Requirements	Required	5	16	11.3%
	Elective	0	0	0%
Program Requirements	Required	24	84	59.2%
	Elective	2	6	4.3%
Capstone Course/Project		1	4	2.8%
Field Training/ Internship		1	4	2.8%
Others		2	6	4.3%

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Total		**45**	**142**	**100%**

* Add a separated table for each track (if any).

2. Program Courses

The bachelor's degree program in Applied Mathematics follows a two-semester system, requiring a minimum study duration of 4 years (full-time).

Level	Course Code	Course Title	Required or Elective	Pre-Requisite /Co-Requisite Courses	Credit Hours	Type of requirements (Institution, College, or Program)
Level 1	MAT 1101	Calculus (1)	Required	None	4	College
	PHY 1101	General Physics (1)	Required	None	4	College
	CHM 1101	General Chemistry (1)	Required	None	4	College
	ENG 1140	English 1	Required	None	2	College
		University Requirement 1	Elective	None	2	Institution
		University Requirement 2	Elective	None	2	Institution
Level 2	MAT 1102	Calculus (2)	Required	MAT 1101	4	Program
	MAT 1151	Foundation of Mathematics	Required	None	4	Program
	STA 1103	Probability & Statistics (1)	Required	/MAT 1102	3	Program
	MAT 1155	Euclidean and Analytic Geometry	Required		3	Program
	ENG 1195	English 2	Required	ENG 1140	2	College
		University Requirement 3	Elective	None	2	Institution
Level 3	MAT 1203	Calculus (3)	Required	MAT 1102	4	Program
	MAT 1223	Linear Algebra	Required	None	4	Program
	MAT 1225	Introduction to Number Theory	Required	MAT 1151	3	Program
	STA 1106	Probability & Statistics (2)	Required	STA 1103 /MAT1203	4	Program
	MAT 1241	Math Software	Required	MAT 1102 /MAT 1223	3	Program
Level 4	MAT 1231	Introduction to Diff. Equations	Required	MAT 1102 /MAT 1223	4	Program
	MAT 1251	Combinatorics and Graphs	Required	MAT 1102 MAT 1223	4	Program
	MAT 1253	Introduction to Operations Research	Required	MAT 1223	3	Program
	CS 1249	Computer Program. for science	Required	MAT 1241	3	Program
		University Requirement 4	Elective		2	Institution
		University Requirement 5	Required		2	Institution
Level 5	MAT 1311	Real Analysis	Required	MAT 1203	4	Program
	MAT 1332	Mathematical Methods	Required	MAT 1203 MAT 1231	4	Program
	MAT 1341	Numerical Analysis (1)	Required	MAT 1231 CS 1249	4	Program

	AFM 1235	Financial Mathematics (1)	Required	MAT 1102	3	Program
		Free Course 1	Elective		3	Institution
Level 6	MAT 1315	Introduction to Topology	Required	MAT 1311	3	Program
	MAT 1321	Modern Algebra	Required	MAT 1223 MAT 1225	4	Program
	MAT 1334	Introduction to Partial Differential Equations	Required	MAT 1332	4	Program
		Elective Course (1)	Elective		3	Program
		University Requirement 6	Elective	None	2	Institution
		University Requirement 7	Elective	None	2	Institution
Level 7	MAT 1412	Complex Variables	Required	MAT 1311	4	Program
	MAT 1442	Numerical Analysis (2)	Required	MAT 1341 MAT 1334	3	Program
	MAT 1461	Introduction to Cryptography and Coding	Required	MAT 1321	3	Program
	MAT1463	Modeling and Simulation	Required	MAT1334	4	Program
		University Requirement 8	Elective	None	2	Institution
		University Requirement 9	Elective	None	2	Institution
Level 8		Elective Course (2)	Elective		3	Program
	MAT 1497	Field Training	Required		4	Program
	MAT 1499	Research Project	Required		4	Program
		University Requirement 10	Elective	None	2	Institution
		Free Course 2	Elective		3	Institution

LIST OF ELECTIVE COURSES

Course Code	Course Name	Credit Hours	Prerequisites
MAT 1444	Introduction to Numerical Optimization	3	MAT 1253 MAT 1341
MAT 1465	Discrete Simulation	3	STA 1106
AFM 1335	Financial Mathematics (2)	3	AFM 1235
AFM 1345	Actuarial Mathematics	3	AFM 1235
MAT 1382	Advanced Euclidean Geometry	3	MAT 1155
MAT 1384	Introduction to Differential Geometry	3	MAT 1203 MAT 1155
MAT 1491	Selected Topics in Applied Mathematics (1)	3	
MAT 1493	Selected Topics in Applied Mathematics (2)	3	
STA 1203	Mathematical Statistics	3	STA 1106
STA 1321	Introduction to Regression	3	STA 1106
STA 1351	Introduction to Stochastic Processes	3	STA 1106, MAT 1223
ME 1222	Fluid Mechanics	3	MAT 1334
PHY 1102	General Physics (2)	3	PHY 1101
PHY 1250	Modern Physics	3	PHY 1101
PHY 1312	Quantum Mechanics (1)	3	PHY 1101
CS 1449	Oriented Object Programming	3	CS 1249

University Requirements courses from (1) to (10)

University Requirements courses (1)-(10) should be chosen from the following packages and the following appropriate rules indicated inside the table:

Packages	Course Code	Course Name	Credit Hours	Rules
Islamic knowledge and values	QUR 1001	Quran	2	The student chooses two courses, one of which should be the Quran course.
	HAD 1001	Studies in the Sunnah	2	
	JRS 1001	Objectives of Shariah	2	
	IDE 1001	Creed	2	
	JR 1001	Jurisprudence of Worship and Family	2	
Historical, national, and social knowledge and values	HST 1001	Studies in the Prophet's biography	2	The student chooses two courses.
	HST 1002	National History	2	
	SOS 101	Voluntary Work Skills	2	
	CUL 1001 CIS 101	Jurisprudence of Rights and Duties	2	
	GEO 1011	Environment and Sustainable Growth	2	
Professional skills and labor market	RHB 1001	Work Value and Ethics	2	The student chooses two courses.
	BUS 1001	Innovation and Entrepreneurship	2	
	EDM 1001	Leadership Skills	2	
	FIN 1001	Financial Planning Skills	2	
	ENG 1001	English Language Skills	2	
Communicative and personal skills	BC 1001	Communications Skills	2	The student chooses two courses, one of which should be the Linguistic Skills.
	ARB 1001	Linguistic Skills	2	
	ART 1001	Editing and Speech Skills	2	
	PSY 1001	Mental Health	2	
	BIO 1001	General Knowledge of Health Care	2	
Academic skills	TCM 1001	University Education Skills	2	The student chooses two courses.
	RHE 1001	Reading Skills	2	
	IT 1001	Technical Skills	2	
	EDP 1001	Thinking Skills	2	
	STA 1001	Basics of Statistics	2	

* Include additional levels (if needed).
** Add a table for the courses of each track (if any)

3. Course Specifications:

Insert hyperlink for all course specifications using NCAAA template (**T-153**)

BSc-AM_Courses Specifications

4. Program learning Outcomes Mapping Matrix:

Align the program learning outcomes with program courses, according to the following desired levels of performance *(I = Introduced & P = Practiced & M = Mastered).*

Course code & No.	Program Learning Outcomes									
	Knowledge and understanding		Skills					Values, Autonomy, and Responsibility		
	K1	K2	S1	S2	S3	S4	S5	V1	V2	V3
MAT 1101	I	I	I		I					
PHY 1101		I					I	I		
CHM 1101		I					I			
ENG 1140		I					I	I		
MAT 1102	P	P								
MAT 1151	I					I	I	I	I	
STA 1103			I				I			
MAT 1155	I	I	I		I	I				
ENG 1195		P					P	P		
MAT 1203	M	M	M		M	I		I	I	I
MAT 1223	P		P	I		P				
MAT 1225	M	M	M		M			M	M	
STA 1106			P	M	M	M				
MAT 1241					I	M	M		P	M
MAT 1231	M	M	M	M		M	M	M		
MAT 1251			P	P	P	M		M	M	M
MAT 1253		I	M				M			
CS 1249		P	P		P		P	P	P	P
MAT 1311	P					P		P	P	
MAT 1332		M		P	P	P		P		
MAT 1341		M	M		M		M	M		M
MAT 1371	P	M	M	M	M		M	M	M	
MAT 1315	M	M	M	M						
MAT 1321		M			M	M	M		M	
MAT 1334	M	M	M	M	M	M	M	M	M	M
MAT 1412	M		M	M	M	M		M		
MAT 1442				M		M				
MAT 1461		P					M	M	M	
MAT1463	M	M	M	M	M	M	M	M	M	M
MAT 1497	M	M	M	M	M	M	M	M	M	M
MAT 1499	M	M	M	M	M	M	M	M	M	M
MAT 1444			M	M	M	M	M	M		
MAT 1465	P	M	M	M	M		M	M	M	
AFM 1335	M	M	M	M	M		M	M	M	
AFM 1345		M				M	M			M

MAT 1382	M	M				M	M			
MAT 1384	M	M	M			M	M		M	
MAT 1491	M	M	M			M	M			
MAT 1493	M	M	M	M					M	
STA 1203		M				M	M			
STA 1321		M				M	M			
STA 1351										
ME 1222		M				M		M		
PHY 1250		M				M		M		
PHY 1312		M				M		M		
CS 1449		M					M	M	M	M
University Requirements (1-10)						I		I	I	
Free courses (1-2)		P						P	P	

* Add a separated table for each track (if any).

5. Teaching and learning strategies applied to achieve program learning outcomes.

Describe teaching and learning strategies, including curricular and extra-curricular activities, to achieve the program learning outcomes in all areas.

To achieve program learning outcomes, a variety of teaching and learning strategies, such as lectures, tutorials, and laboratory sessions, will be utilized alongside curricular and extra-curricular activities. This approach aims to create an engaging learning environment that connects theoretical knowledge with real-world applications. By promoting collaboration, critical thinking, and ethical engagement, the program prepares graduates to address complex challenges and make meaningful contributions to their communities and industries. This comprehensive strategy ensures students are equipped to meet the Program Learning Outcomes in knowledge, skills, values, autonomy, and responsibility.

5.1. Teaching and Learning Strategies.

5.1.1. Active Learning Techniques

- **Collaborative Group Projects**: Students work in diverse teams to tackle complex mathematical problems. Each project requires them to analyze a real-world issue (e.g., climate modeling, economic forecasting) and develop solutions using mathematical concepts. This promotes analytical and problem-solving skills (S1) while enhancing teamwork and communication.
- **Peer Teaching Sessions**: Organize structured peer-led review sessions where students take turns explaining key concepts to their classmates. This method not only reinforces their understanding but also hones their ability to communicate mathematical ideas clearly and accurately (S4).

5.1.2. Project-Based Learning

- **Real-World Problem Solving**: Assign projects that require students to design mathematical models addressing current societal challenges, such as optimizing resource allocation in healthcare or predicting trends in social media. This approach integrates theoretical knowledge with practical application (S2).
- **Interdisciplinary Research Projects**: Encourage students to collaborate with peers from other disciplines (e.g., computer science, economics) to explore how mathematics can be applied across various fields, illustrating its versatility (K2). For example, a project might involve statistical analysis of economic data to forecast market trends.

5.1.3 Technology Integration

- **Software Training Workshops**: Offer hands-on workshops on using mathematical software tools e.g., MATLAB, R, Python, SPSS. Students learn to apply these tools for data analysis, simulations, and visualizing mathematical concepts, thereby developing their proficiency in utilizing technology (S5).
- **Online Collaboration Platforms**: Utilize platforms such as Google Workspace or Microsoft Teams to facilitate group work and discussions. Students can collaborate on projects, share resources, and provide peer feedback, enhancing their engagement and teamwork skills.

5.1.4. Inquiry-Based Learning

- **Research Assignments**: Assign students to conduct literature searches on specific mathematical topics, requiring them to critically appraise sources and synthesize findings into a cohesive report. This builds their research skills and ability to analyze diverse materials (S3).
- **Problem Posing and Exploration**: Create opportunities for students to formulate their own mathematical questions based on real-world scenarios. This approach encourages independent thinking and critical analysis (V2), allowing them to explore topics that pique their interest.

5.2. Curricular Activities

5.2. 1. Workshops and Seminars

- **Guest Lectures and Industry Panels**: Invite professionals from various fields to share their experiences and discuss how they use mathematics in their careers, including mathematical education subjects. This exposure helps students understand the relevance of their studies and the ethical considerations involved in applying mathematics (K2, V1).
- **Skill Development Workshops**: Provide workshops focused on specific skills, such as data visualization, mathematical programming, and ethical decision-making. These sessions can include case studies that prompt students to consider the societal impact of their mathematical work.

5.2. 2. Field Experience

- **Field Experience Opportunities**: Collaborate with local businesses and research institutions to provide Field training for students. Internships allow students to apply mathematical theories in practical settings, gain experience, and develop professional ethics (V1).
- **Field Trips**: Organize visits to companies or research centers where mathematics plays a crucial role, such as data analytics firms or engineering companies. These visits help students see the practical application of their studies and foster connections with potential employers.

5.2. 3. Assessment and Feedback

- **Formative Assessments**: Implement regular quizzes, homeworks, Exams, presentations, and project reviews to provide ongoing feedback to students. This helps them assess their understanding and encourages self-evaluation of their learning (V2).
- **Portfolio Development**: Require students to create a portfolio documenting their projects, research papers, and reflections on their learning journey. This portfolio not only showcases their skills but also encourages reflective practice.

5.3. Extra-Curricular Activities

5.3.1. Math/Science Clubs

- **Study Groups and Tutoring Programs**: Establish student-led study groups and peer tutoring sessions. These initiatives create a supportive learning environment where students can collaborate on challenging topics and help each other succeed (V3).
- **Outreach Initiatives**: Organize community outreach programs, such as math tutoring for local high school students or workshops for underrepresented groups. This promotes responsible citizenship and ethical engagement with the community (V1).

5.3.2. Conferences and Competitions **or national specific exam**

- **Participation in Math Competitions**: Encourage students to enter national and international math competitions, fostering their analytical and creative problem-solving abilities (S1).
- **Academic Conferences**: Support students in attending and presenting at academic conferences, allowing them to share their research, network with professionals, and improve their communication skills (V3).

5.3.3. Leadership Development

- **Mentorship Programs**: Pair students with faculty or industry mentors who can provide guidance on academic and career choices. This helps students develop a sense of responsibility and ethical decision-making (V1).
- **Leadership Roles in Group Projects**: Assign students' roles within their project teams that allow them to take on leadership responsibilities. This encourages adaptability and the development of leadership skills necessary for professional success (V3).

6. Assessment Methods for program learning outcomes.

Describe assessment methods (Direct and Indirect) that can be used to measure the achievement of program learning outcomes in all areas.
The program should devise a plan for assessing Program Learning Outcomes (all learning outcomes should be assessed at least twice in the bachelor program's cycle and once in other degrees).

6.1. Direct Assessment Methods

6.1.1. Exams and Quizzes

Midterm and Final Exams: Each semester will include a midterm and a final exam. These assessments will test students' understanding of fundamental principles of mathematics (K1) and their ability to articulate mathematical concepts and apply them in various contexts (K2). The exams will consist of a mix of multiple-choice questions, problem-solving exercises, and theoretical questions, ensuring comprehensive coverage of the material.

Weekly homework/Quizzes: Short quizzes will be administered at the end of each week to evaluate students' grasp of recent topics. These quizzes will focus on analytical skills and problem-solving (S1), helping identify areas that may require further review before major exams.

6.1.2. Projects and Presentations

Mathematical Modeling Projects: In Year 2 and Year 4, students will work on projects that require them to design mathematical models addressing real-world problems, such as optimizing resource allocation in supply chains or analyzing population growth. Each project will culminate in a presentation, allowing students to demonstrate their communication skills (S4) and their ability to apply theoretical knowledge in practical scenarios (S2).

Research Papers: Assigned in last semester of Year 4, students will draft a research paper that involves conducting literature searches, critically appraising sources, and synthesizing findings related to a specific mathematical topic or application. This assessment will gauge their research abilities (S3) and understanding of the historical context and applications of mathematics (K2).

6.1.3. Laboratory Assessments

Mathematical Software Labs: In Levels 3&4, students will participate in lab sessions focused on using mathematical software tools such as MATLAB, and Python. Assessments will include practical assignments where students demonstrate their ability to utilize these tools for data analysis, simulations, and mathematical modeling (S5). Lab reports will be graded based on accuracy, creativity, and clarity of presentation.

6.1.4. Peer and Self-Assessment

Peer Reviews: Throughout the program, students will engage in peer reviews for group projects and presentations. This method encourages collaborative learning and accountability while allowing students to practice critical evaluation (V3).

Self-Reflection Journals: Students will maintain journals (personal records) throughout the program to document their learning experiences, ethical considerations, and self-evaluations of their performance (V2). These journals will be submitted at the end of each academic year for assessment, focusing on personal growth and reflection.

6.2. Indirect Assessment Methods

6.2.1. Surveys and Questionnaires

Student Feedback Surveys: At the end of each semester, students will complete surveys assessing their learning experiences, perceived skill development, and the effectiveness of instructional methods. The feedback collected will be used to adjust the curriculum and teaching strategies. In addition, they will assess their ability regarding all PLOs.

Exit Surveys: Conducted during graduation, these surveys will ask students to reflect on their overall educational experience and how well the program prepared them for their careers, particularly regarding ethical behavior (V1) and their ability to self-evaluate (V2).

6.2.2. Focus Groups

Alumni Focus Groups: Organized every two years, these focus groups will involve recent graduates discussing the relevance of the skills and knowledge gained in the program to their professional lives. Insights from these discussions will help evaluate the program's effectiveness and inform future curriculum development.

6.2.3. Course Evaluations

End-of-Semester Evaluations: Conducted regularly at the end of each semester, these evaluations will assess course content, teaching effectiveness, and overall student satisfaction. The results will provide indirect insights into the achievement of learning outcomes and inform potential improvements.

6.3. Assessment Plan Overview Cycle Structure

6.3.1. Assessment Frequency:

Each PLO will be assessed at least twice throughout the program, with one additional assessment conducted in related degrees, ensuring a comprehensive evaluation including mapping PLOs to courses.

Year 1: Introductory courses, such as Calculus and Linear Algebra, will assess foundational knowledge (K1, K2) and analytical skills (S1). Direct assessments will include quizzes, exams, and a group project on mathematical concepts.

Year 2: Intermediate courses like Differential Equations and Probability will evaluate mathematical modeling (S2) and software proficiency (S5). Assessments will include projects and lab assignments.

Year 3: Advanced courses focusing on statistical methods and ethical considerations (V1) through research papers and peer evaluations.

Year 4: The Capstone course MAT1499 will assess literature search skills (S3) and will integrate knowledge and skills from the entire program, requiring students to complete a comprehensive project that synthesizes their learning. This final assessment will evaluate communication (S4), leadership in team settings (V3), and self-evaluation (V2) through presentations and reports.

Field Experience Assessment

In the program's final year, students must complete a field experience or internship related to their area of study. This practical component will allow students to apply their mathematical knowledge in real-world settings, reinforcing their understanding and enhancing their skill set.

6.3.2. Field Experience Evaluation:

Students will be assessed based on their performance in the field training (MAT 1497), including their ability to apply mathematical concepts to solve real-world problems. Evaluations will include supervisor assessments, which will focus on the student's analytical skills, problem-solving abilities, and ethical conduct (V1).

Students will submit a final report detailing their internship experiences, the projects they worked on, and the mathematical techniques they employed. This report will be graded on clarity, relevance, and the integration of learned concepts.

6.3.2. Reflective Analysis:

Students will also submit a reflective analysis that evaluates their personal growth, learning outcomes from the experience, and their ability to critically assess their contributions and responsibilities (V2). This analysis will encourage students to connect their practical experiences back to the theoretical frameworks studied throughout the program.

D. Student Admission and Support:

1. Student Admission Requirements

Admissions occur only once during the summer vacation through the Unified E-Admission Portal for public universities in the Riyadh region, with no admissions for the second semester. Students can apply to IMSIU University via this portal, allowing them to complete their applications electronically and select their academic major based on their qualifications, grades, and preferences without needing to visit the university.

Admission into the program will be granted based on the student's GPA. The Deanship of Admission and Registration oversees the admissions process.

Eligibility Requirement is stated in IMSIU Undergraduate Study and Examination.

Please note that the Deanship for Registration provides an admission guide, available via the link **Admission 1446 .**

2. Guidance and Orientation Programs for New Students

(Include only the exceptional needs offered to the students of the program that differ from those provided at the institutional level).

The Applied Mathematics Program provides a comprehensive orientation for new students, conducting an orientation week at the commencement of each semester. During this week, students can meet fellow newcomers, current student leaders, faculty, and staff; familiarize themselves with the campus; learn about student services and academic programs; and address their individual needs. They receive m QR codes of university policies and brochures designed to enhance their understanding of the university environment, including program, services, facilities, rights, and responsibilities.

Alongside the orientation week, an orientation meeting takes place at the start of each semester. This meeting includes all new students and key faculty members, such as the College Dean, program manager, and academic advisor. It is designed to share important academic information and offers a platform for students to ask questions.

To further assist students with exceptional needs, the program offers tailored support through specialized academic advising sessions that focus on individualized learning strategies and effective resource utilization. A peer mentoring system is established to connect new students with upperclassmen who can offer guidance specific to coursework and project challenges. Additionally, workshops on time management and study techniques are organized to facilitate navigation of the rigorous curriculum. Finally, access to specialized tutoring services ensures that students facing unique academic challenges receive the ultimate support necessary for their success.

3. Student Counseling Services

(Academic, professional, psychological, and social)
(Include only the exceptional needs offered to the students of the program that differ from those provided at the institutional level).

The Applied Mathematics Program offers specialized counseling services that address academic, professional, psychological, and social needs, tailored specifically for the program's students.

1. **Academic Counseling**: In addition to standard institutional support, students have access to focused academic counseling sessions that cater to the unique challenges of the applied mathematics curriculum. Advisors provide targeted strategies for managing coursework and research projects.
2. **Professional Development**: Students receive personalized career counseling that includes workshops on industry trends specific to mathematics and applied fields. This program also facilitates networking opportunities with professionals in the industry.
3. **Psychological Support**: The program offers dedicated mental health resources, including workshops on stress management and resilience tailored to the demands of rigorous academic study, ensuring students can maintain their well-being.
4. **Social Support Services**: To foster a sense of community, the program organizes social events and peer support groups that are specifically designed for students within the applied mathematics program, promoting collaboration and camaraderie.

4. Special Support

(Low achievers, disabled, gifted, and talented students).

The Applied Mathematics Program (via the head of the department) and the University of Imam Mohammad Ibn Saud Islamic university provide care and support for the low achievers and the disabled students. Furthermore, the deanship for academic affairs has established a **Center Special Needs Services** (CSNS). As for the underachieving students, they are identified and provided with remedial programs to help them overcome the difficulties hindering their progress into the program. These students are distributed among the academic advisors at the department and are given due interest. They are met on a regular basis by their academic advisors who are asked by the academic advising coordinator (after the coordination with the CSNS) to make an appointment. During these meetings, the students are provided with advice, and guidance to help the students make decisions, related to registration decisions, deletion, addition, grievance or even transfer to another program. Furthermore, the program has established the Student Academic Support Center (SASC) that offers several specialized courses for underachieving students, so that they can finish graduation requirements and catch up with their colleagues. These students are also offered several programs, lectures, and workshops on selected topics in which they can develop and strengthen their knowledge and language skills. This process of following up these underachieving students continues until their graduation.

Both program and institution pay due attention to students of special needs (e.g., disabled students). They are provided with special care. Their special needs are considered for access to the building, especially during the exams.

For the gifted and talented students, the university has established a department for creativity and talent to identify and to develop the abilities of these students named **Department of Gifted and Talented Care. T**his is achieved through holding several extracurricular activities to attract and to encourage talented students to develop their abilities and gifts.
In addition, Psychological and Social Counseling Unit, at the Deanship of Student Affairs, units.imamu.edu.sa/administrations/csu/Pages/About.aspx is a vital part of the Deanship of Student Affairs, aiming to provide psychological and social support to students. The unit offers

comprehensive services that contribute to enhancing the mental health and academic well-being of students.

E. Faculty and Administrative Staff:

1. Needed Teaching and Administrative Staff

Academic Rank	Specialty		Special Requirements / Skills (if any)	Required Numbers		
	General	Specific		M	F	T
Professor	Mathematics	Applied Mathematics	Expertise in applied mathematics	2	5	18
Associate Professor	Mathematics	Applied Mathematics	Research experience in mathematical modeling	6	9	15
Assistant Professor	Mathematics	Pure/Applied Mathematics	Knowledge of data analysis	10	12	22
Lecturer	Mathematics	Mathematics	Teaching experience in mathematics	10	2	22
Teaching Assistant	Mathematics	Mathematics	Support for courses and labs	8	6	14
Technicians and Laboratory Assistant	Educational Background	A bachelor's degree in mathematics, Applied Mathematics, Statistics, or a related field.	Technical skills for lab support	1	1	2
Administrative and Supportive Staff	Educational Background	Bachelor's degree in administration, Business, Education, or a related field is preferred.	Office management and coordination skills	2	2	4

Others (specify)	Higher Education Administration	familiarity with quality assurance frameworks and standards (e.g., ISO, NCAAA, ASIIN, ABET).	Quality assurance in high education	1	1	2

F. Learning Resources, Facilities, and Equipment:

1. Learning Resources

Learning resources required by the Program (textbooks, references, and e-learning resources and web-based resources, etc.)

The planning and acquisition of these resources are vital for ensuring that students receive a comprehensive and effective education. The department follows a structured approach to identify and procure the necessary textbooks, reference materials, and digital resources to support the curriculum.

Step 1: Course Committee Formation

For each course, faculty committees are responsible for:

- Course Description: Drafting a clear syllabus.
- Learning Resources:
  - Required Textbooks: Essential texts for course completion.
  - Essential References: appropriate Journals for understanding.
  - Recommended Materials: Additional readings and resources.
  - Electronic Materials: Utilizing platforms like Blackboard for course delivery.
- Other Resources: Software and professional standards relevant to the course.

Step 2: Compilation and Submission Committees submit their resource lists to the Department Head for review.

Step 3: Approvals

The Department Council approves the resources, and the Department Head requests procurement through the University Central Library and IT Deanship.

Required Learning Resources

- **Textbooks:** Core and advanced texts in applied mathematics.
- **Reference Materials:** Access to journals, reports, and databases.
- **Electronic Resources:** Blackboard for course management and supplementary online courses.
- **Software:** MATLAB, and statistical tools for practical applications.

2. Facilities and Equipment

(Library, laboratories, classrooms, etc.)

For the planning and acquisition resources for library, laboratories, and classrooms, the department proceeds as follows:

a. **Classrooms**

- **Lecture Halls:** Equipped with audiovisual systems, smart boards, and comfortable seating for large groups.
- **Seminar Rooms:** Smaller classrooms for discussions, group work, and interactive learning sessions.

a. Laboratories

- **Mathematics Computer Lab:** Equipped with computers that have mathematical and statistical software installed (e.g., MATLAB, Python, R, SPSS) for data analysis, modeling, and simulations.
- **LaTeX Support:** Ensure that all computers have LaTeX editors (e.g., TeXShop, Overleaf) installed to facilitate the preparation of mathematical documents and presentations.

b. Library

- **Mathematics Section:** A well-stocked section with textbooks, reference books, research journals, and online resources related to applied mathematics.
- **Study Areas:** Quiet study spaces, group study rooms, and access to computers (open Lab) for research and collaboration.
- **Online Database Access:** Subscriptions to journals and databases relevant to mathematics and applied sciences via (DSL)

c. Collaboration Spaces

- **Group Study Rooms:** Spaces for students to collaborate on projects and study together.
- **Common Areas:** Informal areas for students to meet and discuss work, equipped with seating and whiteboards.

d. Technology and Equipment

- **Computers and Software:** Access to computers with necessary software for mathematical modeling, data analysis, and simulations.
- **Projection and Audio-Visual Equipment:** For presentations and lectures.

e. Office Spaces

- **Faculty Offices:** Spaces for faculty members to meet with students, conduct research, and prepare course materials.
- **Administrative Offices:** For program coordinators and administrative staff to manage program logistics and student services.

f. Research Facilities

- **Research Labs:** Specialized spaces for faculty and senior students to conduct research (in particular, to complete the capstone research project MAT1499), equipped with necessary tools and technologies.
- **Collaboration with External Institutions:** Access to local research institutions, businesses, and organizations for internships and applied projects and Field Training.

g. Online Learning Facilities

- **Learning Management System (LMS):** A robust platform (e.g., Blackboard) for delivering course materials, managing assessments, and facilitating online discussions.
- **Virtual Classrooms: T**ools for conducting online classes and webinars to support remote learning.

h. Extracurricular Spaces

- **Mathematics/Science Clubs:** Dedicated spaces for student organizations and extracurricular activities related to mathematics.

- **Event Spaces:** Areas for hosting guest lectures, workshops, and conferences.

3. Procedures to ensure a healthy and safe learning environment

(According to the nature of the program)

Procedures for a Healthy and Safe Learning Environment

- Physical Safety: Ergonomic classrooms, emergency plans, and equipment maintenance.
- Health and Well-Being: Access to mental health resources, wellness activities, and peer support.
- Inclusivity: Diversity training, anonymous feedback channels, and mentorship programs.
- Reporting Mechanisms: Designated contacts and simple incident reporting.
- Continuous Improvement: Regular surveys for feedback.

G. Program Quality Assurance:

1. Program Quality Assurance System

Provide a link to the quality assurance manual.

The Quality Assurance Manual-College of Science is stated according to on SQMAA and SMQES that represent internal quality assessment processes. This system is carried out by Vice-Rectorate for Institutional Development and Community Engagement through the Deanship for Development and Quality. The procedures follow the directives of ETEC and related practical template and forms, see ETEC-Quality Documents and Accreditation Templates.

Program review and its development is periodically assessed through the following processes:

- Course reports are submitted to the program manager every semester.
- The appropriate teaching staff committee oversees assessment and modification.
- Prepare and monitor the annual program report.
- Conduct and analyze survey's opinion of the students about the courses and the program.
- Conduct and analyze survey's opinion of the employers about the program.
- Program manager reviews the proposals submitted by the previous committees and makes appropriate decision after approbation of the department council.
- Monitor a global review for the development of the program periodically every five years if necessary.

All the previous processes follow the Teaching\Learning Quality Assurance Process Diagram:

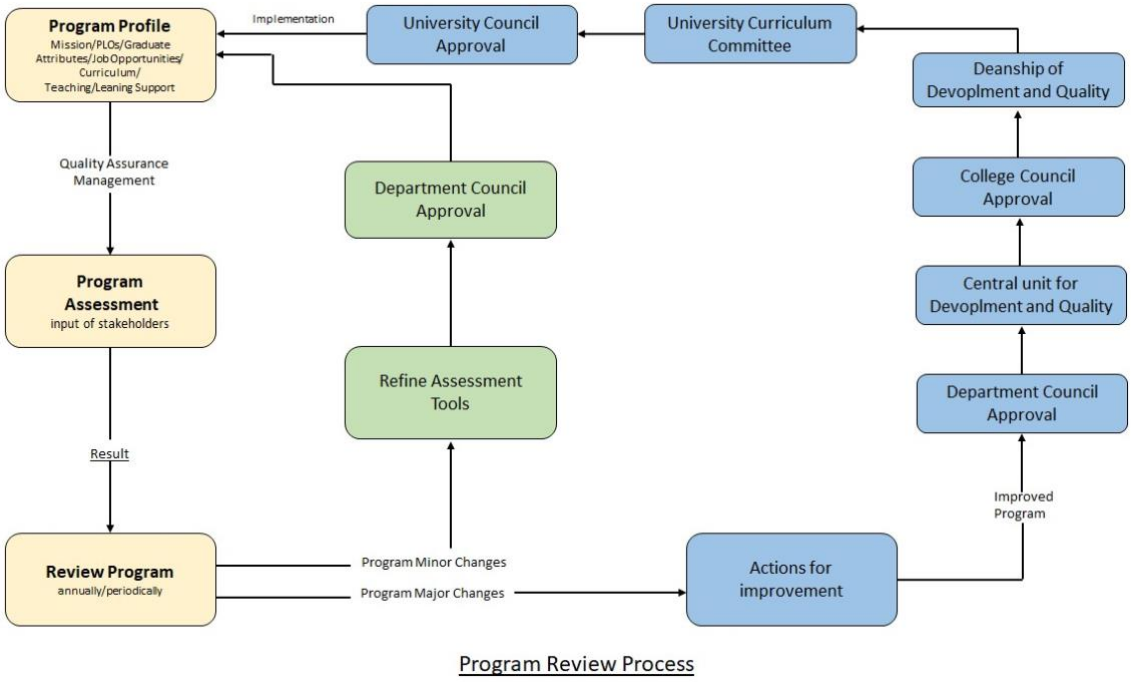

Figure 2 - Teaching\Learning Quality Assurance Process Diagram

2. Procedures to Monitor Quality of Courses Taught by other Departments

The key procedures to monitor the quality of courses in our program that are taught by other departments:

1. Course Approval and Evaluation

Prerequisite Checks: Review and approve course prerequisites to ensure they align with our program requirements.

Syllabus Review: Collaborate with other departments to assess syllabi for alignment with our learning objectives and educational standards.

2. Feedback Collection

Student Evaluations: Gather and analyze student evaluations to assess course quality, teaching effectiveness, and relevance to the curriculum.

Focus Groups: Conduct focus groups with students to obtain in-depth feedback about their experiences in these courses.

3. Monitoring and Assessment

Semesterly Course Evaluation (course report): Implement a regular review process to evaluate course effectiveness and alignment with program goals.

4. Data Analysis

Performance Metrics: Monitor student performance data, including grades and completion rates, to identify trends and areas needing improvement.

Impact Assessment: Analyze how well these courses prepare students for advanced coursework in applied mathematics.

5. Interdepartmental Collaboration

Regular Meetings: Hold meetings with relevant departments to discuss course quality, gather feedback, and collaborate on improvements.

Joint Committees: Participate in committees with other departments to address shared course offerings and ensure quality.

6. Continuous Improvement

Professional Development: Encourage faculty teaching these courses to participate in professional development opportunities.

Curriculum Updates: Work with departments to ensure course content is current and reflects industry trends and advancements.

7. Accreditation Compliance

Standards Alignment: Ensure that all monitored courses meet accreditation requirements and quality standards.

Documentation: Maintain detailed records of evaluations, feedback, and improvements made to courses.

8. Stakeholder Engagement

Advisory Board Input: Involve advisory boards in reviewing course relevance and quality.

Alumni Feedback: Seek insights from alumni regarding how well these courses prepared them for their careers or further studies.

3. Procedures Used to Ensure the Consistency between Main Campus and Branches (including male and female sections).

The students of both campuses are taught at the same time, in the same section, and by the same teacher. Furthermore, they have the same exams, homeworks, and required reports.

4. Assessment Plan for Program Learning Outcomes (PLOs),

The assessment plan focuses on achieving a "Mastered" level of performance as a key indicator of success and to ensure that we continually refine and enhance our program to meet educational objectives effectively. This ongoing process consists of seven distinct phases designed to systematically assess and enhance program learning outcomes.

Phases of Assessment

Phase 1. Data-Collection Methodology: Utilize both direct and indirect methods to gather relevant data (as detailed in Section C.6).

Phase 2. Benefits and Drawbacks: Analyze the advantages and disadvantages of each data-collection method to ensure effectiveness.

Phase 3. Evaluation of Methods: Assess the appropriateness of the selected data-collection methods for the specific learning outcomes.

Phase 4. Data Collection: Implement the chosen methods to gather data systematically.

Phase 6. Evidence Interpretation: Analyze and interpret the collected data to evaluate performance against learning outcomes.

Phase 5. Reporting and Documentation: Compile and document findings, along with the analysis, to provide a comprehensive overview of results.

Phase 7. Improvement Identification: Use the insights gained from the assessment to pinpoint areas for program improvement and enhancement.

Continuous Improvement

At each cycle of assessment, we leverage the information obtained to document, analyze, and improve all components of the program. This process is guided by relevant key performance indicators (KPIs).

Assessment Stages

PLOs	Stage 1 (one year)	Stage 2 (one year)	Stage 3 (one year)	Stage 4 (one year)
K1	✓	✓		
K2	✓	✓		
S1	✓	✓		✓
S2		✓	✓	✓
S3		✓	✓	✓

S4		✓	✓	✓	
S5		✓	✓	✓	
V1			✓	✓	
V2		✓	✓	✓	
V3			✓	✓	

5. Program Evaluation Matrix

Evaluation Areas/Aspects	Evaluation Sources/References	Evaluation Methods	Evaluation Time
Leadership	Faculty, program leaders, administrative staff	Surveys, interviews	End of academic year
Effectiveness of Teaching & Assessment	Students, alumni, faculty	Classroom observations, surveys, focus groups	End of each semester
Learning Resources	Students, faculty, program leaders	Surveys, resource audits	Beginning of each semester
Services (e.g., advising, tutoring)	Students, administrative staff, faculty	Surveys, interviews	End of academic year
Partnerships (e.g., industry collaborations)	Employers, program leaders, alumni	Surveys, interviews, reports	End of academic year
Curriculum Relevance	Students, faculty, employers	Surveys, focus groups, course evaluations	End of each semester
Student Outcomes	Graduates, employers, faculty	Surveys, interviews	End of academic year
Alumni Success	Alumni, employers	Surveys, interviews	Annually
Resource Allocation	Faculty, administrative staff	Financial audits, surveys	End of academic year
Program Review and Improvement	Independent reviewers, faculty, program leaders	Reports, focus groups, surveys	Every four years

Evaluation Areas/Aspects (e.g., leadership, effectiveness of teaching & assessment, learning resources, services, partnerships, etc.)
Evaluation Sources (students, graduates, alumni, faculty, program leaders, administrative staff, employers, independent reviewers, and others.
Evaluation Methods (e.g., Surveys, interviews, visits, etc.)

Evaluation Time (e.g., beginning of semesters, end of the academic year, etc.)

6. Program KPIs*

The period to achieve the target (2) years.

No.	KPIs Code	KPIs	Targeted Level	Measurement Methods	Measurement Time
1	KPI-P-01	**Students' Evaluation of Quality of learning experience in the Program** (Average of the overall rating of final year students of the quality of learning experience in the program, satisfaction with the various services offered by the program (restaurants, transport, sports facilities, academic, vocational, psychological guidance...), student satisfaction with the adequacy and diversity of learning sources (references, periodicals, information databases... etc.) on a five-point scale in an annual survey.)	4.0 of 5.0	Annual student survey (5-point scale)	End of academic year
2	KPI-P-02	**Students' evaluation of the quality of the courses** (Average of students' overall rating for the quality of courses on a five-point scale in an annual survey.)	Average rating for (two semesters) of 4.0/5.0	Annual student survey (5-point scale)	End of each semester
3	KPI-P-03	**Completion rate** (The proportion of undergraduate students who completed the program in minimum time in each cohort)	85% completion in minimum time	Program records and tracking	Annually at graduation
4	KPI-P-04	**First-year students retention rate** (Percentage of first-year undergraduate students who continue at the program the next year to the total number of first-year students in the same year)	75% retention rate	Comparison of first-year enrollment to second-year enrollment	Annually after first-year completion
5	KPI-P-05	**Students' performance in the professional and/or national examinations** (Percentage of students or graduates who were successful in the professional and/or national examinations, or their score average and median (if any))	80% pass rate	Analysis of examination results	Annually after examination results are published
6	KPI-P-06	**Graduates' employability and enrolment in postgraduate programs** (Percentage of graduates from the program who within a year of graduation were: a. employed within 12 months, b. enrolled in postgraduate programs during the first year of their graduation to the total number of graduates in the same year.)	70% employed or enrolled	Graduate follow-up survey and employment records	12 months post-graduation
7	KPI-P-07	**Employers' evaluation of the program graduate's proficiency** (Average of the overall rating of employers for the proficiency of the program graduates on a five-point scale in an annual survey.)	Average rating of 4.0/5.0	Annual employer survey (5-point scale)	Annually after graduation

No.	KPIs Code	KPIs	Targeted Level	Measurement Methods	Measurement Time
8	KPI-P-08	**Ratio of students to teaching staff** (Ratio of the total number of students to the total number of full-time and full-time equivalent teaching staff in the program)	15:1 student-to-staff ratio	Program records	Annually
9	KPI-P-09	**Percentage of publications of faculty members** (Percentage of full-time faculty members who published at least one research paper during the year to total faculty members in the program.)	60% of faculty publishing	Faculty publication records	Annually
10	KPI-P-10	**Rate of published research per faculty member** (The average number of refereed and/or published research per each faculty member during the year (total number of refereed and/or published research to the total number of full-time or equivalent faculty members during the year).	1.5 publications per faculty member	Faculty publication records	Annually
11	KPI-P-11	**Citations rate in refereed journals per faculty member** (The average number of citations in refereed journals from published research per faculty member in the program (total number of citations in refereed journals from published research for full-time or equivalent faculty members to the total research published)	Average of 10 citations per faculty member	Citation analysis of published works	Annually
12	KPI-P-12	**Graduate Satisfaction with Career Preparation** (The average rating)	4.0 of 5	Annual graduate survey (5-point scale)	6 months post-graduation
13	KPI-P-13	**Assessment of Students' Research Skills** (The average rating)	4.0 of 5	Exit-survey	End of academic program

* Including KPIs required by NCAAA

H. Specification Approval Data:

Council / Committee	MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL
Reference No.	8/1446
Date	05/04/1446 (08/10/2024)

: