Program Specification

(Postgraduate Programs)

Program Name:	**Ph.D. in Chemistry**
Program Code (as per the Saudi Standard Classification of Educational Levels and Specializations):	**053101**
Qualification Level:	**Doctorate**
Department:	**Chemistry**
College:	**Science**
Institution:	**King Khalid University**
Program Specification:	New ☐ updated* ☒
Last Review Date:	**1/7/1444H**

*Attach the previous version of the Program Specification.

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A. Program Identification and General Information:

1. Program's Main Location:

College of Science, Main Campus, Alfaraa, Abha, Saudi Arabia

2. Branches Offering the Program (if any):

No branch offers this program.

3. System of Study:

☐ Coursework & Thesis ☐ Coursework

4. Mode of Study:

☐ On Campus ☐ Distance Education ☐ Other .....(specify)

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

Up to date, the program has no official partnerships. However, the program has collaborations with the following bodies:

- Saudi Food and Drug Agency, Riyadh, Saudi Arabia
- Laboratories at the Municipality of Abha Province, Saudi Arabia
- Poison Control and Medical Forensic Chemistry Center, Asir Region, Saudi Arabia

6. Professions/jobs for which students are qualified:

According to the Saudi Standard Classification of Occupations:

- Higher Education Professor (231001)
- Industrial Chemist (211302)
- Chemist (211301)

7. Relevant occupational/ Professional sectors:

- **Petrochemical and Energy Industry:**
  - Analytical Chemist
  - Process Chemist
  - Environmental Chemist
- **Pharmaceuticals and Healthcare**
  - Medicinal Chemist
  - Clinical Research Associate
- **Government and Regulatory Agencies**
  - Environmental Chemist
  - Forensic Scientist
  - Scientific Advisor or Policy Analyst

8. Major Tracks/Pathways (if any):		
Major track/pathway	**Credit hours** (For each track)	**Professions/jobs** (For each track)
N/A		

9. Exit Points/Awarded Degree (if any):	
Exit points/Awarded degree	Credit hours
N/A	

10. Total credit hours: (42)

B. Mission, Goals, and Program Learning Outcomes

1. Program Mission:
To prepare qualified academicians and researchers with advanced knowledge and skills in the field of chemistry to contribute to community development.

2. Program Goals:
I. To possess deep specialized knowledge in chemical sciences and understanding of emerging developments. II. To prepare scientists for contributing to solving scientific problems in academia and industry. III. To conduct high-impactful scientific research that contributes to the development and prosperity of society. IV. To uphold integrity, autonomy, and responsibility in research and professional practice while fostering collaboration and community engagement.

3. Program Learning Outcomes:*	
Knowledge and Understanding:	
K1	To outline a specialized knowledge and advanced understanding of contemporary chemistry.
K2	To describe comprehensive accurate knowledge and understanding of various chemical processes and techniques as well as material chemistry with practices.
K3	To recognize current advanced knowledge and understanding of recent developments, emerging issues and challenges in a chemical discipline acquired from original research and scientific activities
Skills:	
S1	To solve key challenges in highly complex contexts in one or more disciplines in chemistry.

S2	To apply novel and highly advanced processes, techniques, tools, instruments, and/or materials to deal with highly complex, emerging, and challenging practical activities in chemistry.
S3	To evaluate emerging chemical concepts, principles, and theories; and develop highly advanced research or inquiry methodologies to generate original knowledge in one or more disciplines in chemistry.
S4	To communicate in numerous forms to disseminate and promote original knowledge and new insights, and to adapt highly advanced information and communication technologies to support research and innovations in chemistry.
Values, Autonomy, and Responsibility:	
V1	To demonstrate high levels of integrity and professional and academic values while dealing with and promoting emerging ethical and professional issues, research, and knowledge in chemistry and related applications.
V2	To acquire continuously professional experiences, and make academic and/or professional strategic decisions, with substantial autonomy in chemistry and related applications.
V3	To collaborate professionally and proactively leading groups in various research projects in chemistry while assuming full responsibility for the work.
V4	To efficiently reinforce professional relationships in chemistry, a relevant knowledge-based society, and quality of life.

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

C. Curriculum:

1. Curriculum Structure:

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Course	Required (R)	26	0	0
	Elective (E)	9 (7+2)	21 (21+0)	50%
Graduation Project (if any)	-	-	-	-
Thesis (if any)	Required	1	21	50%
Field Experience(if any)	-	-	-	-
Others (.....)	-	-	-	-
Total		36	42	100%

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

2. Program Courses:

2.1. Required and elective courses assigned in the study plan

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Contact hours	Type of requirements (Institution, College, or Program)
	7000CHEM	Laboratory Safety	R	-	0	1	Program

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Contact hours	Type of requirements (Institution, College, or Program)
Level 1	7001CHEM	Ethics of Scientific Research	R	-	0	1	Program
	7003CHEM	Chemistry Literature	R	-	0	1	Program
	7004CHEM	Research Rotation 1	R	-	0	3	Program
	7008CHEM-1	Chemistry Teaching	R	-	0	1	Program
	****CHEM	Elective Specialization Course 1	E	-	3	3	Program
	****CHEM	Elective Specialization Course 2	E	-	3	3	Program
Level 2	7005CHEM	Research Rotation 2	R	-	0	3	Program
	7501CHEM	Departmental Seminar 1	R	-	0	1	Program
	7511CHEM	Major Field Seminar 1	R	-	0	1	Program
	****CHEM	Elective Specialization Course 3	E	-	3	3	Program
	****CHEM	Elective Specialization Course 4	E	-	3	3	Program
Level 3	7006CHEM	Advanced Scientific Communication	R	-	0	1	Program
	7506CHEM	Departmental Seminar 2	R	-	0	1	Program
	7512CHEM	Major Field Seminar 2	R	-	0	1	Program
	7521CHEM	Research Group Seminar 1	R	-	0	1	Program
	7601CHEM	Pre-Dissertation Research 1	R	-	0	3	Program
	****CHEM	Elective Specialization Course 5	E	-	3	3	Program
	****CHEM	Elective Specialization Course 6	E	-	3	3	Program
Level 4	7007CHEM	Original Research Proposal	R	-	0	1	Program
	7507CHEM	Departmental Seminar 3	R	-	0	1	Program
	7513CHEM	Major Field Seminar 3	R	-	0	1	Program
	7522CHEM	Research Group Seminar 2	R	-	0	1	Program
	7531CHEM	Graduation Research Seminar 1	R	-	0	1	Program
	7602CHEM	Pre-Dissertation Research 2	R	-	0	3	Program
	7600CHEM	Ph.D. Dissertation	R	-	21	21	Program
	****CHEM	Elective Specialization Course 7	E	-	3	3	Program
Level 5	7508CHEM	Departmental Seminar 4	R	-	0	1	Program
	7514CHEM	Major Field Seminar 4	R	-	0	1	Program
	7523CHEM	Research Group Seminar 3	R	-	0	1	Program
	7532CHEM	Graduation Research Seminar 2	R	-	0	1	Program
	****CHEM	Applied Course 1	E	-	0	3	Program
Level 6	7505CHEM	Departmental Seminar 5	R	-	0	1	Program
	7515CHEM	Major Field Seminar 5	R	-	0	1	Program
	7524CHEM	Research Group Seminar 4	R	-	0	1	Program
	****CHEM	Applied Course 2	E	-	0	3	Program
Total	**36 courses**	-	-	-	**42**	**82**	-

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

2.2. Lists of Elective Courses

2.2.1. Elective Specialization Courses

2.2.1.1. Elective Specialization Courses in Organic Chemistry

Course code	Course title	Required/ Elective	Credit H	Contact H
7101CHEM	Physical Organic Chemistry	E	3	3
7102CHEM	Spectroscopic Organic Structure Determination	E	3	3

7103CHEM	Advanced Organic Chemistry I	E	3	3
7104CHEM	Advanced Organic Chemistry II	E	3	3
7105CHEM	Advanced Synthesis in Chemistry	E	3	3
7106CHEM	Selected Topics in Organic Chemistry	E	3	3

2.2.1.2. Elective Specialization Courses in Inorganic Chemistry

Course code	Course title	Required/ Elective	Credit H	Contact H
7201CHEM	Advanced Inorganic Chemistry I	E	3	3
7202CHEM	Advanced Inorganic Chemistry II	E	3	3
7203CHEM	Inorganic Chemistry Synthesis	E	3	3
7204CHEM	Advanced Radiation and Nuclear Chemistry	E	3	3
7205CHEM	Advanced Applications in Group Theory	E	3	3
7206CHEM	Selected Topics in Inorganic Chemistry	E	3	3

2.2.1.3. Elective Specialization Courses in Physical Chemistry

Course code	Course title	Required/Elective	Credit H	Contact H
7301CHEM	Quantum, Structure and Dynamics I	E	3	3
7302CHEM	Chemical Thermodynamics	E	3	3
7303CHEM	Chemical Kinetics and Reaction Dynamics	E	3	3
7304CHEM	Statistical Thermodynamics	E	3	3
7305CHEM	Quantum, Structure and Dynamics II	E	3	3
7306CHEM	Selected Topics in Physical Chemistry	E	3	3

2.2.1.4. Elective Specialization Courses in Analytical Chemistry

Course code	Course title	Required/ Elective	Credit H	Contact H
7401CHEM	Separation Techniques	E	3	3
7402CHEM	Spectroscopic Analytical Techniques	E	3	3
7403CHEM	Environmental Analytical Chemistry	E	3	3
7404CHEM	Advanced Electroanalytical Chemistry	E	3	3
7405CHEM	Bioanalytical Chemistry	E	3	3
7406CHEM	Selected Topics in Analytical Chemistry	E	3	3

2.2.2. Applied Courses

Course code	Course title	Required/ Elective	Credit H	Contact H
7008CHEM-3	Applied Physical Methods of Inorganic Chemistry	E	0	3
7009CHEM	Applied Separation Techniques	E	0	3
7010CHEM	Applied NMR Techniques	E	0	3
7011CHEM	Applied Statistical and Data Analyses	E	0	3
7012CHEM	Applied Physical Methods in Material Chemistry	E	0	3
7013CHEM	Applied Mathematics in Physical Chemistry	E	0	3
7014CHEM	Applied X-Ray Structure Determination	E	0	3
7015CHEM	Applied Mass Spectroscopy	E	0	3
7016CHEM	Applied Spectroscopic Methods of Structure Determination	E	0	3
7017CHEM	Applied Quantitative Methods of Computational Chemistry	E	0	3

2.2.3. Complementary Courses

Course code	Course title	Required/ Elective	Credit H	Contact H
7100CHEM	Special Topics in Organic Chemistry	E	0	3
7200CHEM	Special Topics in Inorganic Chemistry	E	0	3
7300CHEM	Special Topics in Physical Chemistry	E	0	3
7400CHEM	Special Topics in Analytical Chemistry	E	0	3

3. Course Specifications:

Insert hyperlink for all course specifications using NCAAA template (T-104)

https://drive.google.com/drive/folders/11J5nMd_pA0n_DbQxs1TRi6OOZFx_MlOR?usp=drive_link

4. Program learning Outcomes Mapping Matrix:

Align the program learning outcomes with the program's courses according to the desired performance levels.
(I = Introduced, P = Practiced, M = Mastered).

Course code & No.	Program Learning Outcomes										
	Knowledge and understanding			Skills				Values, Autonomy, and Responsibility			
	K1	K2	K3	S1	S2	S3	S4	V1	V2	V3	V4
7000CHEM	P	P	P	P	P			P	P	P	P
7001CHEM	P	P	P	P	P			P	P	P	P
7003CHEM	P	P	P		P	P		P	P	P	P
7004CHEM	P	P	P	P	P	P	P	P	P	P	P
7008CHEM-1	p	P	P	p	p	P		P	p		
7005CHEM	P	P	P	P	P	P	P	P	P	P	P
7501CHEM		P	P	P	P	P			P		P
7511CHEM	P		P	P	P			P	P	P	P
7006CHEM	P	P	P	P	P			p	P	p	P
7506CHEM		P	P	P	P	P			P		P
7512CHEM	P		P	P	P			P	P	P	P
7521CHEM	P		P	P	P	P			P		P
7601CHEM		P	P	P	P				P		P
7007CHEM	P		P	P	P	P		P		P	
7507CHEM		P	P	P	P	P			P		P
7513CHEM	P		P	P	P			P	P	P	P
7522CHEM		P	P	P	P	P			P		P
7531CHEM		P	P	P	P	P			P		P
7602CHEM		P	P	P	P				P		P
7600CHEM	P	P	P	P	P			P	P		
7508CHEM		P	P	P	P	P			P		P

Course code & No.	Program Learning Outcomes										
	Knowledge and understanding			Skills				Values, Autonomy, and Responsibility			
	K1	K2	K3	S1	S2	S3	S4	V1	V2	V3	V4
7514CHEM		P	P	P	P			P	P	P	P
7523CHEM		P	P	P	P	P			P		P
7532CHEM		P	P	P	P	P			P		P
7505CHEM		P	P	P	P	P			P		P
7515CHEM	P		P	P	P			P	P	P	P
7524CHEM		P	P	P	P	P			P		P
7101CHEM	M	M	M	M	M	M	M	M	M	M	M
7102CHEM	M	M	M	M	M	M		M	M	M	
7103CHEM	M	M	M	M	M	M	M	M	M	M	M
7104CHEM	M	M	M		M	M	M		M	M	
7105CHEM	M	M	M	M	M	M	M	M	M	M	M
7106CHEM	M	M	M	M	M	M		M	M	M	
7201CHEM	M	M	M	M	M	M		M	M	M	
7202CHEM	M	M	M	M	M	M		M	M	M	
7203CHEM	M	M	M	M	M	M		M	M	M	
7204CHEM	M	M	M	M	M	M				M	
7205CHEM	M	M	M	M	M	M		M	M	M	M
7206CHEM	M			M					M		
7301CHEM	M		M	M	M	M		M		M	
7302CHEM	M	M	M	M	M			M	M	M	
7303CHEM	M	M	M	M	M	M	M	M	M	M	M
7304CHEM	M	M	M	M	M	M		M	M	M	
7305CHEM	M		M	M	M	M	M	M		M	
7306CHEM	M	M	M	M	M			M	M	M	M
7401CHEM	M			M				M	M	M	
7402CHEM	M	M	M	M	M			M	M	M	M
7403CHEM	M	M	M	M	M		M			M	M
7404CHEM	M			M	M			M	M	M	
7405CHEM	M	M		M	M	M	M	M	M	M	
7406CHEM	M	M		M	M			M	M	M	M
7008CHEM-3	P	P	P	P	P	P		P	P		
7009CHEM	P	P	P	P		P	P	P	P		P
7010CHEM	P	P	P	P	P	P		P	P	P	
7011CHEM	P			P		P			P	P	P
7012CHEM	P	P	P	P	P	P			P	P	P
7013CHEM	P		P	P	P			P	P		
7014CHEM	P	P	P	P	P	P			P	P	P
7015CHEM	P	P		P		P		P	P	P	
7016CHEM	P	P	P	P	P	P		P	P	P	

Course code & No.	Program Learning Outcomes										
	Knowledge and understanding			Skills				Values, Autonomy, and Responsibility			
	K1	K2	K3	S1	S2	S3	S4	V1	V2	V3	V4
7017CHEM	P		P	P	P	P		P		P	

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

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

Describe teaching and learning strategies to achieve the program's learning outcomes in all areas.

Knowledge and Understanding

Teaching and Learning Strategies Applied

PLO	Teaching & Learning Strategies
K1: To outline a specialized knowledge and advanced understanding of contemporary chemistry.	Direct instruction (e.g., advanced lectures, guest seminars); integration of recent research publications.
K2: To describe comprehensive accurate knowledge and understanding of various chemical processes and techniques as well as material chemistry with practices.	Experiential and direct instruction (e.g., lab-based instruction, demonstrations).
K3: To recognize current advanced knowledge and understanding of recent developments, emerging issues and challenges in a chemical discipline acquired from original research and scientific activities.	Independent learning and research-based instruction (e.g., scientific journals, student-led discussions).

Skills

Teaching and Learning Strategies Applied

PLO	Teaching & Learning Strategies
S1: To solve key challenges in highly complex contexts in one or more disciplines in chemistry.	Indirect instruction (e.g., case-based learning, simulations).
S2: To apply novel and highly advanced processes, techniques, tools, instruments, and/or materials to deal with highly complex, emerging, and challenging practical activities in chemistry.	Experiential learning (e.g., lab projects, advanced instrument handling).
S3: To evaluate emerging chemical concepts, principles, and theories; and develop highly advanced research or inquiry methodologies to generate original knowledge in one or more disciplines in chemistry.	Research-guided learning, supervised investigation.
S4: To communicate in numerous forms to disseminate and promote original knowledge and new insights, and to adapt highly advanced information and communication technologies to support research and innovations in chemistry.	Interactive and independent learning (e.g., technical writing workshops, digital presentations).

Values, Autonomy, and Responsibility

Teaching and Learning Strategies Applied

PLO	Teaching & Learning Strategies
V1: To demonstrate high levels of integrity and professional and academic values while dealing with and promoting emerging ethical and professional issues, research, and knowledge in chemistry and related applications.	Interactive instruction and role-playing discussions on ethics.
V2: To acquire continuously professional experiences, and make academic and/or professional strategic decisions, with substantial autonomy in chemistry and related applications.	Independent learning (e.g., internships, self-directed projects).
V3: To collaborate professionally and proactively leading groups in various research projects in chemistry while assuming full responsibility for the work.	Team-based learning, peer-led research projects.
V4: To efficiently reinforce professional relationships in chemistry, a relevant knowledge-based society, and quality of life.	Interactive and experiential learning (e.g., outreach activities, interdisciplinary seminars).

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 once in the program's cycle).

Knowledge and Understanding

Assessment Methods

PLO	Assessment Methods
K1: To outline a specialized knowledge and advanced understanding of contemporary chemistry.	Final exams, concept essays, literature analysis reports.
K2: To describe comprehensive accurate knowledge and understanding of various chemical processes and techniques as well as material chemistry with practices.	Lab reports, midterms, practical exams.
K3: To recognize current advanced knowledge and understanding of recent developments, emerging issues and challenges in a chemical discipline acquired from original research and scientific activities.	Research presentations, review articles, reflective journals.

Skills

Assessment Methods

PLO	Assessment Methods
S1: To solve key challenges in highly complex contexts in one or more disciplines in chemistry.	Problem-solving exercises, case reports.
S2: To apply novel and highly advanced processes, techniques, tools, instruments, and/or materials to deal with highly complex, emerging, and challenging practical activities in chemistry.	Project evaluations, lab performance rubrics.
S3: To evaluate emerging chemical concepts, principles, and theories; and develop highly advanced research or inquiry methodologies to generate original knowledge in one or more disciplines in chemistry.	Thesis, project dissertation, oral defense.
S4: To communicate in numerous forms to disseminate and promote original knowledge and new insights, and to adapt highly advanced information and communication technologies to support research and innovations in chemistry.	Conference posters, research articles, multimedia presentations.

Values, Autonomy, and Responsibility

Assessment Methods

PLO	Assessment Methods
V1: To demonstrate high levels of integrity and professional and academic values while dealing with and promoting emerging ethical and professional issues, research, and knowledge in chemistry and related applications.	Ethical case evaluations, peer assessment, reflective essays.
V2: To acquire continuously professional experiences, and make academic and/or professional strategic decisions, with substantial autonomy in chemistry and related applications.	Internship evaluations, decision-making scenarios, project reports.
V3: To collaborate professionally and proactively leading groups in various research projects in chemistry while assuming full responsibility for the work.	Group project evaluations, leadership performance review.
V4: To efficiently reinforce professional relationships in chemistry, a relevant knowledge-based society, and quality of life.	Participation reports, peer feedback, community engagement reviews.

D. Thesis and Its Requirements (if any):

1. Registration of the thesis:

(Requirements/conditions and procedures for registration of the thesis as well as controls, responsibilities and procedures of scientific guidance)

The program follows the university regulations

2. Scientific Supervision:

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

1) After passing the comprehensive exam and proposal approval, the department appoints a thesis supervisor (and assistant if needed), following department and college council recommendations and relevant university regulations.
2) At each semester's end, the supervisor submits an electronic report on the student's progress to the department head.
3) The supervisor(s) prepare the student for thesis defense through a trial presentation and discussion of results.

3. Thesis Defense/Examination:

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

1) Once the thesis is completed, the supervisor submits a report and a thesis copy electronically to the department head to initiate the discussion process.
2) The student uploads the thesis following the Deanship of Graduate Studies' guidelines to begin committee formation.
3) For doctoral dissertations, the student must have at least one peer-reviewed publication from their thesis.
4) The discussion committee is formed by the Deanship of Postgraduate Studies, based on department and college recommendations.
5) Committee members assess the thesis's suitability using a standard form. If approved, the thesis proceeds to discussion.
6) After the defense, the committee submits a signed report within a week, including their final decision and recommendations.

H. Student Admission and Support:

1. Student Admission Requirements:

PhD Admission Requirements:

1. The applicant must hold a Master's degree in Chemistry or a closely related discipline from a Saudi university, or from another recognized university/college, with a minimum grade of Very Good (3.75 out of 5, or equivalent).

2. The applicant must pass one of the following English language proficiency tests:

- TOEFL (IBT): minimum score of 61

- IELTS (Academic): minimum band score of 5
- STEP: minimum score of 83

Exemption from this requirement may be granted to applicants who obtained their Master's degree from an English-speaking country, provided that the degree was awarded within the last five years.

3. The applicant must provide two academic recommendation letters from faculty members who have previously taught or supervised the applicant.

4. The applicant must successfully complete any remedial or prerequisite courses assigned by the department.

5. The university or the college reserves the right to impose additional admission requirements as deemed necessary.

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).

PhD Student Guidance and Orientation:

- **Assigned Supervisory Team:** Each new student is assigned one or two faculty members as main and co-supervisors based on the student's research topic, covering a major and minor specialization (e.g., organic, inorganic, physical, or analytical chemistry).
- **Early Research Planning:** Supervisors provide structured guidance from research initiation to advanced phases, including customized research plans and timelines.
- **Continuous Evaluation:** Supervisors conduct regular progress evaluations and mentor students in developing problem-solving, analytical, and communication skills.
- **Outcome-Based Training:** The program focuses on building professional expertise, critical thinking, scientific communication, and independent learning aligned with the expected thesis outcomes.
- **Final Presentation and Examination:** Students present their thesis work in the sixth semester, followed by oral evaluation by a committee to assess specialization knowledge and research contributions.

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)

Exceptional Services Offered at the Program Level:

1. Academic Counseling

- Each doctoral student is assigned a scientific advisor who provides guidance on program-specific requirements.

- Faculty office hours (5 weekly) ensure academic supervision and scientific support.
- Personalized academic assistance is provided by faculty for course-related issues.
- Students have full access to the study plan and course details.
-

2. Professional Counseling

- Faculty offer tailored career advice and research guidance within the field.
- Complete departmental contact info is provided to support mentorship and networking.

3. Psychological Counseling

- Faculty identify academic stress and provide basic support or referrals.
- Office hours serve as a safe space for discussing academic-related psychological concerns.

4. Social Counseling

- Orientation efforts support social integration and peer connections.
- Open communication with faculty helps students feel engaged and supported.

4. Special Support:

(Low achievers, disabled, and talented students).

1. Low Achievers

- **Academic follow-up:** Regular monitoring and academic advising through extended faculty office hours.
- **Remedial support:** Customized support plans including tutoring sessions and additional resources.
- **Motivational guidance:** Faculty encourage goal-setting and confidence-building strategies.

2. Students with Disabilities

- **Flexible learning options:** Adjusted teaching methods, extended deadlines, and alternative assessment formats.
- **Coordination with disability services:** Faculty collaborate with the university's support unit for tailored accommodations.

3. Talented Students

- **Research involvement:** Opportunities to assist in faculty research projects and attend specialized workshops.
- **Advanced learning tracks:** Encouragement to take part in conferences, or competitions.
- **Recognition and mentoring:** Personalized mentoring to nurture leadership, creativity, and innovation.

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	0	8	-	4	4	**8**
Associate Professor	0	12	-	6	6	**12**
Assistant Professor	0	16	-	8	8	**16**
Technicians and Laboratory Assistant	8	0	-	4	4	**8**
Administrative and Supportive Staff	4	0	-	2	2	**4**
Others (specify)	-	-	-	-	-	-

F. Learning Resources, Facilities, and Equipment:

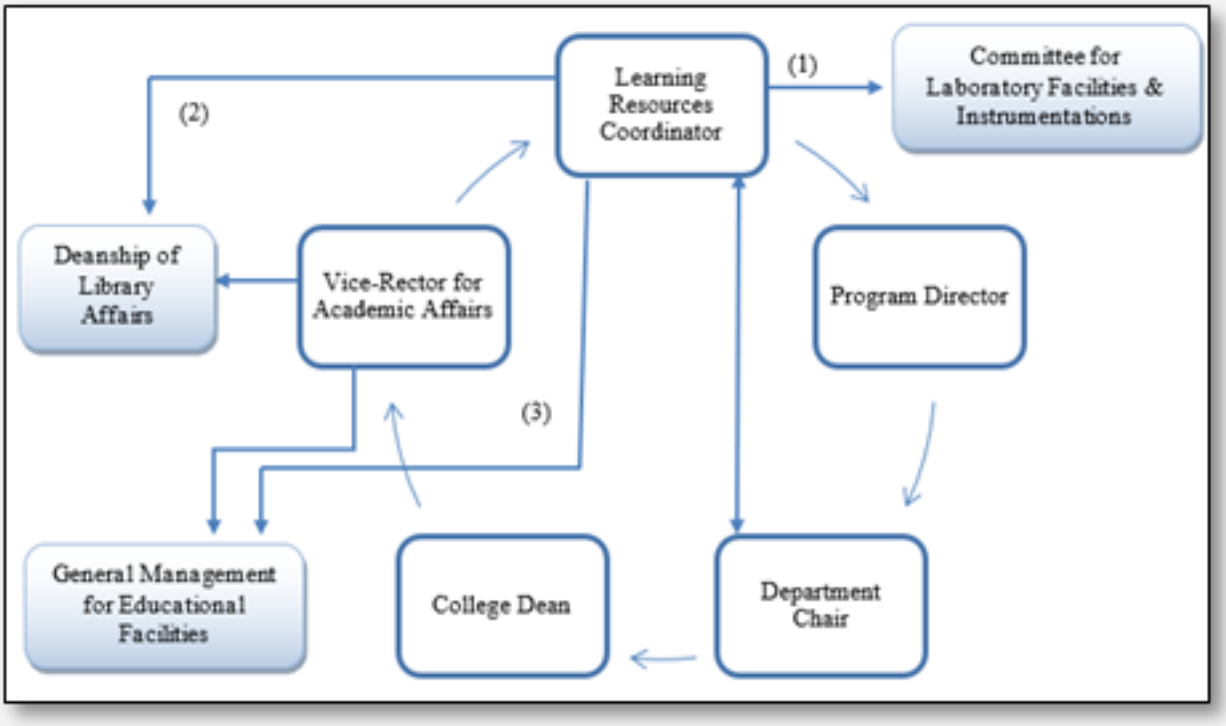
1. Learning Resources:

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

Integrated Workflow Table: Learning Resources & Planning/Acquisition Processes

Stage	Action / Process	Responsible Party	Approval / Follow-up
1	Adoption of relevant **textbooks** recommended by KKU, Academic Department, and Curriculum Committee.	Faculty & Academic Departments	Submitted to Curriculum Committee
2	Curriculum Committee reviews appropriateness of required and recommended **textbooks**.	Curriculum Committee	Feedback sent to Departments & Faculty
3	Faculty prepare list of **textbooks** for their courses.	Individual Faculty Members	Submitted to Curriculum Committee
4	Evaluation of adequacy of library, laboratory, and classroom resources (textbooks, references, materials).	Curriculum Committee & Postgraduate Committee	Recommendations forwarded to Departmental Board

5	Consultation with concerned departments and faculty regarding resource needs.	Faculty & Departments	Approval sought from Departmental Board, Curriculum Committee, College Board
6	Writing laboratory manuals and textbooks by faculty; reviewed with independent advice; updated every 2–3 years.	Faculty Authors	Reviewed & approved by Curriculum Committee & College Board
7	Requests for new/improved resources included in annual course reports; committees inspect and compare with recent materials.	Faculty & Resource Committees	Approval by Departmental Board, Curriculum Committee, Higher Academic Councils
8	Required resources discussed in Departmental Board meetings.	Departmental Board	Sent to Dean or responsible Vice Deans
9	Posting of approved courses and materials on Blackboard.	Faculty / IT Support	Continuous monitoring
10	Survey evaluation of faculty members on adequacy of learning resources.	Quality & Evaluation Committees	Data reviewed by Curriculum Committee & College Board



2. Facilities and Equipment:

(Library, laboratories, classrooms, etc.)

Distinct evidences were collected for all reviewed criteria, including adequacy and appropriateness of learning resources in terms of program description, checklists, rules, and privacy policies, as well as services with procedures for the management of resources and reference materials that include library services, links to KKU electronic resources, E-learning facilities and Tamkeen YouTube channel.

Evidences for Program Resources, Facilities, and Support:

Criteria / Area	Evidences & Practices	Notes / Gaps
Learning Resources (General)	- Adequacy and appropriateness ensured through: program description, checklists, rules, privacy policies. - Procedures for management of resources and references include: library services, KKU electronic resources, E-learning facilities, Tamkeen YouTube channel.	Resources are diverse and updated; overall efficient.
Library & Digital Resources	- Updated library resources, sufficient and accessible. - Saudi Digital Library (SDL) digital reserve available. - Central library: open **6 days/week (male)**, **2 days/week (female)**. - Terminal libraries (branches): open **5 days/week** for both genders. - **Online access** (Central & SDL): available 24/7 for all students with e-support.	Limited physical access for female students; reliance on digital access important.
Teaching Laboratories	- Adequate equipment and materials provided. - Regular maintenance plan. - Yearly requests from teaching staff for supplies. - Instrument maintenance forms available for reporting malfunctions.	Systematic supply and maintenance, but depends on staff reporting.
Orientation & Training	- Orientation for new students in **first week of Semester 1**, led by faculty. - Regular technical training and workshops for personnel (E-training, technical support).	Strength in continuous training.
Classrooms & Laboratories	- Sufficient number assigned for PhD students. - Requires improvement as student numbers grow.	Anticipated shortage with program expansion.
Technical Staff	- Currently only **4 male** and **7 female technicians** supporting **26 chemical laboratories**. - Several technicians left last year.	Major gap – urgent need for more qualified technicians.

	- Insufficient number of trained staff for operations and lab preparation.	
Continuous Evaluation	- Ongoing assessment of resources and facilities. - Focus areas: E-learning platforms, Blackboard training (staff & students), improvements to system. - Workshops on Zoom platform for professional remote activities.	Active improvement cycle in place.

3. Procedures to ensure a healthy and safe learning environment:

(According to the nature of the program)

1) A departmental safety committee oversees lab and facility safety.
2) Safety equipment (e.g., fire extinguishers, showers, guide marks) is installed and regularly maintained.
3) Safety manuals and risk-reporting forms are accessible to all students electronically.
4) Mandatory training in safety, firefighting, and first aid is provided to students and staff.
5) Hazardous chemical waste is routinely inspected, classified, and safely stored for disposal.
6) Evacuation drills for toxic material incidents are conducted, with clear protocols issued by the university's Occupational Safety and Health Administration.

G. Program Quality Assurance:

1. Program Quality Assurance System:

Provide a link to the quality assurance manual.

The development of QAS for doctoral studies considers the following guidelines:

- **Education Quality Policy and Goals**
  - Establish a quality culture based on clear policies and goals.
  - Appoint QAS managers.
  - Ensure policies and goals are publicly accessible.
- **Quality Assurance in Program Design**
  - Apply methodologies for program design, approval, implementation, review, and improvement.
  - Include processes for program elimination, and for handling suggestions and complaints.
- **Student-Centered Development of Programs**
  - Encourage student learning through program design and improvement.
  - Promote external training placements and student mobility.
- **Quality Assurance of Staff (TRS & AdSS)**
  - Ensure proper admission, management, and training of teaching & research staff (TRS) and administrative & service staff (AdSS).

- Enable staff to perform their duties effectively.

- **Quality Assurance of Resources and Services**
  - Guarantee that material resources and services are well-designed, approved, managed, reviewed, and improved.
  - Ensure alignment with supporting effective student learning.
- **Monitoring and Improvement through Results**
  - Collect and analyze program results.
  - Focus on learning outcomes, labour market access, and stakeholder satisfaction.
  - Use results to review and improve programs.
- **Transparency and Accountability**
  - Regularly publish up-to-date information on programs.
  - Provide clear reports and render accounts related to educational activities.

2. Program Quality Monitoring Procedures:

- **Regular Curriculum Review:**
  Periodic evaluation and updating of course content and program outcomes to align with recent scientific advances and labor market needs.
- **Advisory and Supervisory Oversight:**
  Continuous monitoring of students' research progress by assigned supervisors, with progress reports submitted each semester.
- **Internal and External Evaluation:**
  Regular program audits by internal quality units and external academic reviewers to ensure adherence to national and institutional standards.
- **Student Feedback Mechanisms:**
  Collection and analysis of student evaluations for courses, supervision, and lab safety to inform improvements.
- **Graduate Tracer Studies:**
  Follow-up studies on graduates' career outcomes to assess program effectiveness in preparing students for academic and professional roles.
- **Benchmarking:**
  Comparison of program standards and practices with similar national and international PhD programs to maintain competitiveness and excellence.
- **Research Output Monitoring:**
  Tracking of student publications, conference presentations, and thesis quality to ensure research productivity meets expected outcomes.
- **Faculty Performance Appraisal:**

Annual evaluation of faculty performance in teaching, supervision, and research, with feedback used for development planning.

3. Procedures to Monitor Quality of Courses Taught by other Departments:

N/A

4. Procedures adopted to ensure consistency between the program's sections (male and female sections, if any).

N/A

5. Assessment Plan for Program Learning Outcomes (PLOs):

To ensure the continuous improvement of the PhD in Chemistry program, a structured assessment plan is implemented to evaluate the achievement of Program Learning Outcomes (PLOs).

1. Stakeholder-Based Assessment Tools

a. Employer Survey

- Objective: Assess graduate readiness, research competence, and problem-solving abilities in real-world contexts.
- Method: Annual survey distributed to employers of recent graduates.
- Focus: Professional knowledge, communication, independent research ability, and ethical practice.
- Outcome Use: To align research training and soft skills development with market needs.

b. Graduating Student Survey

- Objective: Evaluate students' perception of how well the program supported their achievement of the PLOs.
- Method: Conducted in the final semester before thesis defense.
- Focus: Research skills, critical thinking, communication, and lifelong learning preparedness.
- Outcome Use: To identify gaps in academic support and supervision processes.

c. Alumni Survey

- Objective: Assess long-term impact of the program on professional development and research engagement.
- Method: Biennial follow-up survey targeting alumni 1–5 years post-graduation.
- Focus: Continued education, employment outcomes, and use of research skills in the field.
- Outcome Use: To evaluate the sustainability and effectiveness of PLOs over time.

d. Faculty Survey

- Objective: Gather faculty perceptions on students' achievement of PLOs.

- Method: Annual survey completed by thesis supervisors and instructors.
- Focus: Research capability, critical thinking, ethical conduct, and scholarly communication.
- Outcome Use: To inform curriculum review, course improvement, and research supervision practices.

2. Assessment Schedule

- Annually: Employer and faculty surveys.
- Each Academic Year (Final Semester): Graduating student survey.
- Every Two Years: Alumni survey.

3. Data Analysis and Reporting

- Survey data are collected and analyzed by the program's quality assurance committee.
- Results are documented in the Annual Program Report (APR) and used in program review meetings.
- Action plans are developed to address identified weaknesses and enhance strengths.

4. Documentation and Link

A comprehensive PLOs Assessment Plan including survey tools, timelines, responsible personnel, and result analysis procedures is available here:
[Link to PLOs Assessment Plan]

6. Program Evaluation Matrix:

Evaluation Areas/Aspects	Evaluation Sources/References	Evaluation Methods	Evaluation Time
Effectiveness of teaching and assessment	Student, per Review, Program leaders	Program evaluation, Student-Faculty meeting	end of academic year
Extent of achievement of course/program learning outcomes	Program Leaders, Faculty, quality and development unit	Preparation of program Report -Peer consultation on teaching -Department Council discussions - Self-study report	At end of each study term
Quality of learning Resources	Student, Faculty, internal and external auditors.	Program evaluation Self-study report	At end of each study term At writing of self-study report

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.)

7. Program KPIs:*

The period to achieve the target (3) years.

No.	KPIs Code	KPIs	Targeted Level	Measurement Methods	Measurement Time
-2- TEACHING AND LEARNING	KPI-PG-01	Students' Evaluation of Quality of learning experience in the program	4.0/5	Survey	Annual
	KPI-PG-02	Students' evaluation of the quality of the courses.	4.5/5	Survey	Annual
	KPI-PG-03	Students' evaluation of the quality of academic supervision	4.8/5	Survey	Annual
	KPI-PG-04	Average time for students' graduation	8	Survey	Each Semester
	KPI-PG-05	Rate of students dropping out of the program	≤ 30%	Survey	Annual
	KPI-PG-06	Employers' evaluation of the program graduates' competency	4.0/5	Survey	Annual
-3- STUDENTS	KPI-PG-07	Students' satisfaction with services provided.	4.2 /5	Survey	Annual
-4- FACULTY MEMBERS	KPI-PG-08	Ratio of students to faculty members	1:1	Survey	Annual
-6- RESEARCH AND PROJECTS	KPI-PG-09	Percentage of publications of faculty members	100%	At least one research publication	Annual
	KPI-PG-10	Rate of published research per faculty member	20	Total number of refereed and/or published research to the total number of faculty members during the year)	Annual
	KPI-PG-11	Citations rate in refereed journals per faculty member	400	Total number of citations in refereed journals from published research for faculty members to the total published research	Annual
	KPI-PG-12	Percentage of students' publication	60%	Percentage of students who: a. published their research in refereed journals b. presented papers in conferences to the total number of students in the program during the year.	Annual

No.	KPIs Code	KPIs	Targeted Level	Measurement Methods	Measurement Time
	KPI-PG-13	Number of patents, innovative products, and awards of excellence	2 patent: 2 award	Number of: a. Patents and innovative products b. National and international excellence awards obtained annually by the students and staff of the program.	Annual

*including KPIs required by NCAAA

Additional KPIs:

Additional KPIs were suggested by the program to be used for assessment of the program goals and the achievement of its operational plan during the academic year 1445H.

Additional KPI		Targeted Level	Measurement Methods	Measurement Time
KPI-CHEM-1	Students' evaluation of teaching and assessment strategies used in the courses.	90%	Survey	Annual
KPI-CHEM-3	Percentage of students fulfilling "Satisfactory" requirement in seminar courses and pre-dissertation courses.	80%	Survey	Annual
KPI-CHEM-4	Percentage of graduates appointed by universities and research centers to the total number of graduates	35%	Survey	Annual
KPI-CHEM-5	Percentage of faculty participating in training courses and workshops related to teaching strategies.	80%	Survey	Annual
KPI-CHEM-6	Percentage of students' theses addressing solving problems in academia and industry.	90%	Survey	Annual
KPI-CHEM-7	Percentage of students who work under funded projects.	40%	Survey	Annual
KPI-CHEM-8	Percentage of faculty members provided community service activities.	80%	Survey	Annual
KPI-CHEM-9	Number of partnerships with local community organizations.	3	Survey	Annual
KPI-CHEM-10	Graduates' employability	50%	Survey	Annual

KPI-CHEM-11	Percentage of faculty members' distribution based on academic ranking	40:30:30	Analysis	Annual
KPI-CHEM-12	Proportion of faculty members leaving the program	<5%	Survey	Annual
KPI-CHEM-13	Satisfaction of beneficiaries with learning resources.	4.2/5	Survey	Annual
KPI-CHEM-14	Satisfaction of beneficiaries with research facilities and equipment	4.2/5	Survey	Annual

H. Specification Approval Data:

Council / Committee	**Committee of Plans & Curricula**
Reference No.	**17/1444**
Date	**06/01/1445**