
2- توصيف البرنامج



Program Specification

(Postgraduate Programs)

Program Name: **MSc in Mechanical Engineering**

Program Code (per the Saudi Standard Classification of Educational Levels and Specializations): **7**

Qualification Level: **Master Degree**

Department: **Mechanical Engineering**

College: **of Engineering**

Institution: **Al Imam Mohammed Bin Saud Islamic University**

Program Specification: **New** ☒ **updated*** ☐

Last Review Date: **write here**

*Attach the previous version of the Program Specification.

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A. Program Identification and General Information:

1. Program's Main Location:

Al Imam Mohammed Bin Saud Islamic University (IMSIU)
College of Engineering
Mechanical Engineering Department
Riyadh, Kingdom of Saudi Arabia

2. Branches Offering the Program (if any):

None

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:

- Partnership Arrangement:
- Type of Partnership:
- Duration of Partnership:

6. Professions/jobs for which students are qualified:

Design Engineer

Create and develop innovative solutions for various products, systems, or processes. Conceptualize designs, create models using computer-aided design (CAD) software, and construct and test prototypes. Use creativity and technical expertise to transform concepts into tangible products or systems.

Process Engineer

Optimize biological and chemical processes to improve the way a company produces a product. Manage overall operation of the manufacturing facility, factory, or plant, transforming raw materials into a finished product.

Project Engineer

Manage team during entire lifecycle of technical or engineering project. Ensure the design, consistency, and functionality of a project throughout its execution.

Sales Engineer

Specialize in furthering sales of technical and industrial products. Involved in all aspects of the sales process to identify areas of improvement. Typically work in business-to-business environments where implement strategies to influence other businesses to purchase their products.

Test engineer

Test system or product to guarantee it meets business needs and properly functions. Assess performance, service, regression, component, and function of system or product, working closely with the development team.

7. Relevant occupational/ Professional sectors:

Materials Engineering
Conventional/Renewable Energy
Manufacturing Engineering

8. Major Tracks/Pathways (if any):

Major track/pathway	Credit hours (For each track)	Professions/jobs (For each track)
1. Energy Systems Engineering		





2. Materials Engineering		
...		
9. Exit Points/Awarded Degree (if any):		
Exit points/Awarded degree		Credit hours
1. None		
10. Total credit hours: (30)		

B. Mission, Goals, and Program Learning Outcomes

1. Program Mission:

The Master of Science in Mechanical Engineering program seeks to provide advanced and accredited postgraduate studies by providing highly qualified science and engineering graduates in mechanical engineering and related disciplines (materials science, physical sciences, thermal sciences and energy...) with a deep understanding of current mechanical topics in many disciplines (currently, materials engineering and energy systems engineering), in addition to the precise skills that enable them to meet the needs of the labour market, and provide research services that support sustainable development in the Kingdom and contribute to building a knowledge economy.

2. Program Goals:

- PEO1-** Contribute to finding scientific and practical solutions to mechanical problems in the field of energy systems and advanced materials through in-depth studies and research.
- PEO-2** Provide graduates in general with specialized knowledge, scientific and technical expertise and research skills in mechanical engineering.
- PEO-3** Empower graduates with the skills necessary to work successfully in research and industrial development centers as well as in universities and research institutions.
- PEO-4** Prepare graduates to participate effectively in sustainable development and building a knowledge economy in the Kingdom of Saudi Arabia.
- PEO-5** Encourage professionals to develop their career positions through self-learning and postgraduate studies and prepare them to rise to senior leadership positions.

3. Program Learning Outcomes:*

Knowledge and Understanding:

By the completion of the program of M.Sc. in mechanical engineering (Energy Systems Engineering and Materials Engineering, the graduate at this level will have:

K1	In depth and specialized body of and understanding covering theories, principles, and concepts in main knowledge areas of mechanical engineering
K2	Critical knowledge and understanding of processes, materials, techniques, practices, conventions, and/or terminology relevant to mechanical engineering.
K3	Advanced knowledge and understanding of recent developments in mechanical engineering (Energy Systems Engineering and Materials Engineering).

Skills:



By the completion of the program of M.Sc. in mechanical engineering (Energy Systems Engineering and Materials Engineering, the graduate at this level will be able to:

S1	Apply specialized theories, principles, and concepts to solve problems in complex in advanced contexts in mechanical engineering.
S2	Critically assess and review to provide creative solutions to current issues and complex problems.
S3	Conduct advanced research using advanced techniques and materials and software, and process the obtained data.
S4	Communicate effectively with specialist and non-specialist audiences using various communication tools to deliver knowledge and research outcomes

Values, Autonomy, and Responsibility:

By the completion of the program of M.Sc. in mechanical engineering (Energy Systems Engineering and Materials Engineering, the graduate at this level will be able to:

V1	Demonstrate integrity, ethics, professional and academic values when dealing with various issues
V2	Plan professionally for learning and development to contribute in fostering community quality life.
V3	Manage effectively specialized tasks and activities in mechanical engineering with high autonomy
V4	Collaborate effectively in research groups and take high responsibility of the work.

* * 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	6	18	60
	Elective	2	6	20
Graduation Project (if any)				
Thesis (if any)			6	20
Field Experience(if any)				
Others (.....)				
Total		24	30	100

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

2. Program Courses:



Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College, or Program)
Year 1 Level 1	ME6601	Advanced Numerical Methods	R		3	
	ME6602	Experimental Methods and Data Analysis	R		3	
	ME6603	Scientific Research Skills for Engineering	R		3	
Materials Engineering Track						
Year 1 Level 2	ME6604	Advanced Engineering Materials	R		3	
	ME6605	Materials Classification and Selection	R		3	
	ME6606	Modern Manufacturing Processes	R		3	
Year 2 Level 3	ME661X	Elective Group 1	E		3	
	ME661X	Elective Group 1	E		3	
	ME6610	Thesis	R		3	
Year 2 Level 4	ME6610	Thesis	R		3	
Energy Systems Engineering Track						
Year 1 Level 2	ME6607	Advanced Fluid Mechanics	R		3	
	ME6608	Advanced Heat And Mass Transfer	R		3	
	ME6609	Advanced thermodynamics	R		3	
Year 2 Level 3	ME662X	Elective Group 2	E		3	
	ME662X	Elective Group 2	E		3	
	ME6610	Thesis	R		3	
Year 2 Level 4	ME6610	Thesis	R		3	

* Include additional levels (for three semesters option or if needed).

** Add a table for the courses of each track (if any)

GROUP (1)			GROUP (2)		
1	ME6611	Biomaterials & Biocompatibility	1	ME6620	Computational Fluid Dynamics & Heat Transfer
2	ME6612	Additive Manufacturing for Engineering materials	2	ME6621	Smart Renewable and Sustainable Energy





3	ME6613	Simulation of Advanced Materials and Processes		3	ME6622	Thermal Energy Storage
4	ME6614	Advanced Corrosion Engineering		4	ME6623	Combustion
5	ME6615	Mechanics of Thin Films		5	ME6624	Water Desalination
6	ME6616	Advanced tribology		6	ME6625	Energy Management
7	ME6617	Advanced Sensing Materials and Technology		7	ME6626	Micro and Nanoscale Fluid Transport Phenomena
8	ME6618	Materials failure analysis		8	ME6627	Advanced Energy Conservation
9	ME6619	Polymer & Polymer Composites		9	ME6628	HVAC Engineering

3. Course Specifications:

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

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
ME6601	P			P	P				P		
ME6602		P			P	P	P			P	
ME6603			I			I		I	I	I	
ME6604	P		P	P			P		P		
ME6605		P	P		P						P
ME6606		P	P		P	P	P			P	
ME6607	P	P		P		P	P		P		
ME6608	P		P	P		P	P			P	
ME6609	P		P	P		P	P				P
Thesis	P	P	P	P	P	P	M	M	M	M	M

* 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.

The main teaching and learning strategies adopted to achieve PLOs of CS master program can be described as follows:

1) In-class Lectures:



Instructors present knowledge and concepts in different topics related to Mechanical Engineering in the class rooms.

2) Class Exercises and Tutorials:

Courses materials are supported with tutorials and class exercises that help students in recognizing and mastering the course concepts and developing essential skills related to different topics in the field of Mechanical Engineering specially in material and energy engineering tracks.

3) Brainstorming:

This strategy is used in some courses to develop students' skills related to critical thinking, analysis, working on teams to accomplish a common goal.

4) Problem Solving:

This strategy is used in the majority of courses to contribute in developing the critical thinking and problem solving skills.

5) Team Project:

This strategy plays crucial role in improving the team work, communication and other skills as well achieving the learning outcomes of Mechanical Engineering Master program.

6) Research Seminar and presentation:

This strategy is adopted by some courses to help students to recognize advanced concepts, research directions, and develop essential skills for achieving the learning outcomes related to communication, continuous professional development, and others.

7) Research Thesis:

At the end of the ME Master program, students should work on a research thesis related to specific topic in the field of ME in either material engineering or energy systems engineering. This gives the students to develop their research skills and obtain advanced knowledge in the field of study. The master thesis assists students to develop professional skills in the field of ME and pursue research works toward PhD degree in this field.

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).

The program has adopted direct and indirect assessment procedures to measure program learning outcomes (PLOs). In direct assessment, course learning outcomes (CLOs) are enabled in each core course. All CLOs of each core course are mapped with PLOs, so an achievement level of each PLO can be estimated. The direct assessment include the followings:

1) Quizzes/Assignments

Quizzes and assignments (written and lab) are used in many courses to assess the students' achievement level of the learning outcomes.

2) Written Exams

Almost all courses use written exams to assess students' achievement of intended learning outcomes.

3) Lab Exams and Assignments

Some courses use lab exams and assignments to assess the achievement level of relevant learning outcomes.

4) Group Project

This method is used in some courses to assess the achievement level of learning outcomes related to communication, team work, and other skills.

5) Seminar and Oral Presentation





This method is used to assess the achievement level of learning outcomes related to professional development, communication, and other skills.

6) Thesis Defense

This method is used at the graduation level of the ME Master program to assess the achievement level of learning outcomes.

In indirect assessment, exit survey is used to analyze PLOs. The exit survey is designed in such a way that at least one question is linked to one PLO. At the end of every semester, the graduate students are required to fill exit survey which is completely anonymous. After one cycle, exit survey is evaluated and necessary action plan is prepared to implement in next cycle.

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)

Completion of Master's thesis is required for the master's degree in ME. Under the direction of the thesis supervisor, who is a faculty member specialized in ME's track field, the student will investigate a topic of current research interests in the field of Mechanical Engineering and prepare a master's thesis on that topic.

At the **third level** of study, the student registers for the thesis course and contact the thesis supervisor to conduct his research works and write the master thesis required for graduation.

Arrangements for thesis registration and the supervisor assignment are made by the academic advising unit in ME department in collaboration with the research unit at the college and other relevant units in the university.

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)

In ME department, the supervisors propose research ideas for master thesis. Students can select one of proposed ideas or propose his own research proposal and contact the department to assign potential supervisor. After the department council approval, the supervisor is assigned officially to assist the student to conduct research and write the master thesis in certain area of Mechanical Engineering.

After finalizing the thesis and obtaining the approval from the supervisor, the student can submit the master thesis for the examination committee.

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)

The student is expected to defend the outcomes of the research work and deliver a thesis in a format determined by the program. Students are encouraged, as part of the thesis preparation, to submit related publications as conference presentations or to peer-reviewed journals. Students must comply with all rules and regulations governing research postgraduate studies in Al Imam Mohammed Bin Saud Islamic university.



H. Student Admission and Support:

1. Student Admission Requirements:

Admission Requirements for the Master in ME program can be described as follows:

▪ **General University Admission Requirements:**

1. Applicant should be a Saudi citizen or, if non-Saudi, have an official grant for graduate studies.
2. Applicant should be a university (bachelor) degree holder from a Saudi or any accredited university.
3. Applicant should be of good behavior, fair reputation and medically fit
4. Applicant should submit two letters of recommendations from professors who taught him.
5. Applicant, if employed, should provide employer's consent for studying. In cases that require it, consent submission can wait till registration period.

▪ **Additional Requirements:**

6. A bachelor degree in Mechanical Engineering or another related field.
7. A minimum grade average of "Very Good" in the bachelor degree.
8. Submitting the obtained marks in Quantitative part of the GRE.
9. Obtaining the following minimum English language qualifications:

STEP	IELTS	PBT	CBT	IBI
80	5	510	180	64

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).

Academic advising is one the most important aspect in the educational processes. It allows students to discuss several issues related to their academic life while they are in the university.

The Academic advising unit managed by ME department assign advisors to formulate a program of study for students based on their background and interests.

The advisor performs a periodic review of the progress to ensure satisfaction of the program coursework requirements.

The department allocates office hours for each academic advisor and announces these hours to students via emails and other learning management systems (Blackboard).

Each student in the program is supervised the first day he is enrolled into the program by a dedicated advisor.

Advising tasks are mainly:

1. The selection of the courses in which students enrolled for each semester.
2. Guiding students who have social problems and help them to overcome these problems.
3. Advising students in the course withdrawal process.
4. Guiding students towards completion of the thesis.

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 department of Mechanical Engineering is prepared for students with special needs and physical disabilities to make sure they have access for all their needs in the department, such as:

- The lifts in the departments are big enough for students with wheelchair.
- The department offers some disable cars parking near to the department.
- There are some special toilets for disable students.



4. Special Support:

(Low achievers, disabled, and talented 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	1	4		5		5
Associate Professor	4	3		7		7
Assistant Professor	5			5		5
Technicians and Laboratory Assistants						
Administrative and Supportive Staff						
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.)

The Department has a textbook committee which is responsible for acquiring the textbooks for the Mechanical Engineering courses that are distributed free of cost to the students who register for the course.

The faculty also directly register themselves with leading publishers of engineering books and have their accounts with them. Through these publishers, they can get access to the online instructor resources, solution manuals and can order free inspection copies of the text and reference materials.

Other research literature can be accessed through the University's main library that has access to several well renowned engineering and sciences databases.

The Department has fully functional committees for Academic Planning and Curriculum Development, Laboratory Development and Textbook. Being a government-sector university, all big purchases are centralized. Therefore, all recommendations related to purchasing are passed on to the University's purchasing department through proper channel.

The textbook committee estimates the number of students who will likely register for each course and place orders in advance before the academic year begins. The textbook orders are placed once every year.



The textbooks are also periodically evaluated by the instructors as well as the students. If a textbook is not found suitable for the course or a better one becomes available, recommendation is made to the textbook committee by the instructor (or students) to change the textbook.

2. Facilities and Equipment:

(Library, laboratories, classrooms, etc.)

A comprehensive plan has been established to develop laboratories in Mechanical Engineering Department. However, some of the common labs of the program are shared with Mechanical Engineering Department like material testing, manufacturing, thermo-fluids, and control labs. These labs are already in functional condition. The rest of advanced Mechanical engineering labs will be established as per plan depending on the availability of funds.

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

(According to the nature of the program)

General health and safety arrangements are made by the college in collaboration with the university. The whole College of Engineering is designed based on standard safety rules and regulations. The teaching rooms, labs, and workshops are air conditioned to ensure indoor air quality and lighted according to the Norms to ensure healthy conditions. Also, each lab is equipped with first aid box for emergency use. The whole college is equipped with smoke detectors, which are regularly checked and monitored by maintenance department. Also, the university has a medical center, which is well prepared, to provide health services for faculty and students.

G. Program Quality Assurance:

1. Program Quality Assurance System:

Provide a link to the quality assurance manual.

<http://units.imamu.edu.sa/colleges/en/Engineering/studyprograms/Pages/default.aspx>

2. Program Quality Monitoring Procedures:

The program has adopted direct and indirect measures to review and monitor its quality. The direct procedure includes the assessment of course learning outcomes through exams, presentations, thesis seminars, thesis discussion etc. while, indirect procedure includes the assessment of survey results. The program is monitoring six types of surveys: course evaluation, student experience, exit, alumni, employer, and faculty satisfaction.

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

Course coordinator is assigned to all courses taught by other departments. The responsibilities of course coordinator include:

- Arrange meeting with the instructor to note any specific requirement during the lectures
- Periodically discuss the status of the course and students' progress
- Periodically discuss the students' results
- Discuss deficiencies or requirements of the course with the instructor and inform to the program coordinator for specific action
- Collect course file material from the instructor at the end of semester
- Maintain the record of course file in the department



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

N/A (The program does not have any off campus course delivery plan.)

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

Master of Science in Mechanical Engineering Program will be periodically reviewed its Learning Outcomes (PLOs). For this, the program will adopt three loop review cycle of PLOs, as shown in Figure 1. In this, first loop consists of course level assessment of learning outcomes (CLOs); occurs each cycle of one year. The second loop contains curriculum level assessment of PLOs; occurs after every three years. The third loop contains program based assessment of Program Educational Objectives (PEOs); occurs after every six years. In the first loop, CLOs and their key performance indicators are reviewed and modified if the required attainment level is not achieved. In the second loop, PLOs and their key performance indicators are reviewed and modified if the required attainment level is not achieved. While in the third loop, PEOs are reviewed and rephrased, if necessary, in order to meet the program's vision and mission.

The following is the process that periodically reviews the PLOs including ways in which involvement takes place with the program's various constituencies.

- The quality committee in the department comes with a proposed revised tentative version for program educational objectives based on direct and indirect assessments.
- The quality committee submits the proposal to the department council which reviews and accepts or suggests amendments, if necessary
- The department council forwards suggested action plan for the modifications in PLOs to the College council for approval

The College council either approves the action plan or advises: (i) more feedback from relevant constituencies, (ii) review assessment procedures, (iii) reassess the allocation and sufficiency of resources and facilities, or (iv) review admission requirements and procedures.

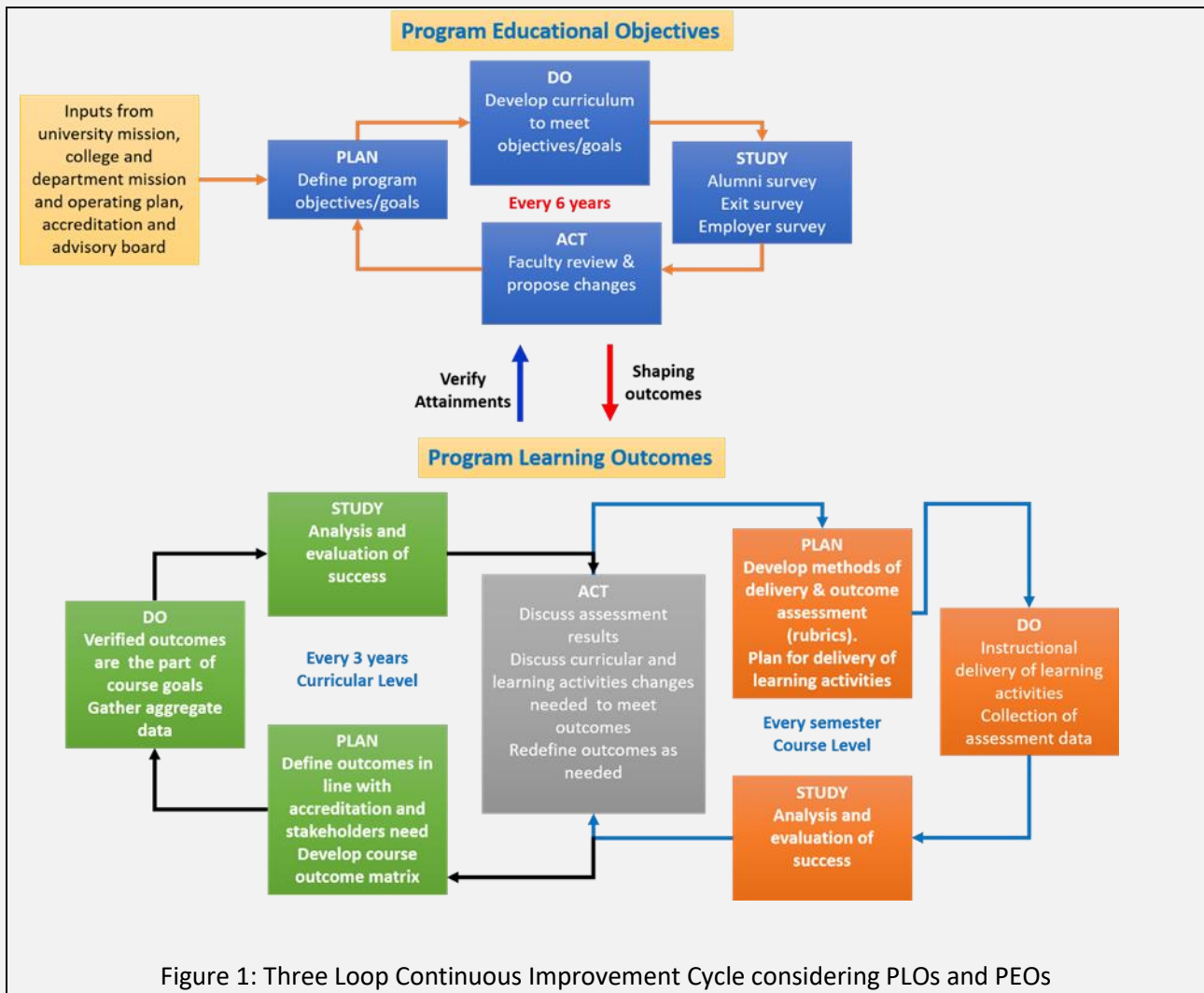


Figure 1: Three Loop Continuous Improvement Cycle considering PLOs and PEOs

6. Program Evaluation Matrix:

Evaluation Areas/Aspects	Evaluation Sources/References	Evaluation Methods	Evaluation Time
Teaching & exam assessment	Students, program leaders, external and/or internal reviewers	Course evaluation survey, student experience survey, and exit survey	At the end of semester, middle of the program, and at the end of graduation
Learning resources, curriculum, facilities	Alumni, Industrial advisory board	Alumni survey, interviews with alumni, advisory board meetings	Every academic year
Facilities and working environment	Students, Faculty	Student experience survey, Faculty satisfaction survey	Every academic year
Curriculum, program educational objectives	Alumni, Industrial advisory board, Employers	Alumni survey, advisory board meetings, employer survey	Every academic year



Evaluation Areas/Aspects	Evaluation Sources/References	Evaluation Methods	Evaluation Time
Teaching & exam assessment	Students, program leaders, external and/or internal reviewers	Course evaluation survey, student experience survey, and exit survey	At the end of semester, middle of the program, and at the end of graduation

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 (2) year(s).

No.	KPIs Code	KPIs	Targeted Level	Measurement Methods	Measurement Time
1	KPI PG-1	Students' Evaluation of Quality of learning experience in the program		Exit Survey	Every semester
2	KPI PG-2	Students' evaluation of the quality of the courses		Course evaluation survey	Every semester
3	KPI PG-3	Students' evaluation of the quality of academic supervision		Exit Survey	Every semester
4	KPI PG-4	Average time for students' graduation		Cohort analysis	Annually
5	KPI PG-5	Rate of students dropping out of the program		Cohort analysis	Annually
6	KPI PG-6	Employers' evaluation of the program graduates' competency		Employer survey	Annually
7	KPI PG-7	Students' satisfaction with the offered services		Student experience and exit surveys	Annually





No.	KPIs Code	KPIs	Targeted Level	Measurement Methods	Measurement Time
8	KPI PG-8	Ratio of students to faculty members		Student registration and administrative staff hiring record	Annually
9	KPI PG-9	Percentage of publications of faculty members		Statistics	Annually
10	KPI PG-10	Rate of published research per faculty member		Statistics	Annually
11	KPI PG-11	Citations rate in refereed journals per faculty member		Statistics	Annually
12	KPI PG-12	Percentage of students' publication		Statistics	Annually
13	KPI PG-13	Number of patents, innovative products, and awards of excellence		Statistics	Annually

*including KPIs required by NCAAA

H. Specification Approval Data:

COUNCIL /COMMITTEE	MECHANICAL DEPARTEMENT COUNCIL
REFERENCE NO.	15
DATE	9-12-2024

