**Ministry of Higher Education and Scientific Research**

**Scientific Supervision and Evaluation Authority**

**Department of Quality Assurance and Academic Accreditation**

***Academic program description for colleges and institutes***

**University:** Diyala

**College/Institute:** College of Engineering

**Scientific Department:** Chemical Engineering

**File filling date:** 2020

**Department Head Name:** Prof. Ahmed Daham Wiheeb

**Signature:**

**Date:**

**Scientific Associate Name:**

**Signature:**

**Date:**

The file has already been checked from Quality Assurance and University Performance Division.

**Name of the Director of the Quality Assurance and University Performance Division:**

**Signature:**

**Date:**

**Dean's endorsement Signature Date:**

**Academic Program Description**

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| This academic program description provides a brief summary of the most important characteristics of the program and the learning outcomes expected of the student to achieve, proving whether he has made the most of the available opportunities. It is accompanied by a description of each course within the program. |

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| **1. The educational institution:** University of Diyala  **2. Scientific Department:** Chemical Engineering  **3. The name of the academic or professional program**  **4. The name of the final certificate:** Bachelor of Chemical Engineering  **5. Academic system:(Annual / courses / other):** Courses  **6. Accredited Accreditation Program:**  **7. Other external influences:**  **8. Description preparation date:** 2020 |
| **9. Academic Program Objectives**  (1) Accomplishing the university’s goals within the field of chemical engineering;  (2) gives a sound education in the basics of chemical engineering;  (3) develop the skills and confidence necessary to solve, based on engineering and scientific principles, problems in the biochemical, chemical and other industries;  (4) continue to find graduates of high caliber;  (5) Providing education compatible with the needs of the labor market linked to the Syndicate of Chemical Engineers. |

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| The program provides opportunities for students to develop and display knowledge, understanding, qualities, skills and other characteristics in the following areas: -  1- Knowledge and understanding:  a- The necessary facts, concepts, principles and theories of chemical engineering, and an understanding of the constraints facing the engineer in making the right decision.  B- Basic mathematics, science and technology  C - ideas and concepts of management.  2- Awareness and understanding: -  A- Ethics and professionalism of the profession.  B - The impact of engineering activities on society and civilization.  c- Compatibility with future issues.  3- Cultural capabilities: -  A- Solve industrial problems that may be limited by known or unknown circumstances.  b- Analyzing and discussing the available data or conducting specific experiments to obtain more data.  c- Design units and processes and make the necessary improvements.  The ability to apply new technologies.  C - Possessing a holistic view of industrial engineering problems, taking into consideration cost, safety, quality, environmental impacts, and the ability to assess and manage risks.  4- Practical skills: -  A - Using multiple technologies and devices with software related to the specialty.  B - Using laboratory equipment to find data.  C - Developing and providing a safe work environment.  5- Transferable skills: - | |
| 1. Applying mathematical skills to practical problems. 2. Oral and written communication skills. 3. Use information and communicate effectively. 4. Control over time and resources. 5. Work in one team. 6. To be creative, especially in designs. 7. Practical in problem analysis 8. Extracting information from published sources. | |

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| **10. Required program outcomes and methods of teaching, learning and assessment**  A- Cognitive goals  1- Necessary facts, concepts, principles and theories of chemical engineering  2- Understand the constraints facing the engineer in making the right decision  3 - Basic Mathematics and Science  4- Techniques used  5- Ideas and concepts of management  B - Skills objectives of the program  1 - Ethics and professionalism of the profession.  2 - the impact of engineering activities on society and civilization.  3 - Compatibility with future issues |

**Teaching and learning methods:**

Traditional methods of education and modern and electronic methods

**Evaluation methods:**

Daily and monthly exams, reports, homework, and commitment to lecture time

C- Emotional and value goals.

1. Solve industrial problems that may be limited by known or unknown circumstances.
2. Analyzing and discussing the available data or conducting specific experiments to obtain more data.
3. Design units and processes and make the necessary improvements.
4. The ability to apply new technologies and possess a holistic view of industrial engineering problems and take

Considering cost, safety, quality, environmental impacts, and the ability to assess and manage risks.

D- Transferred general and rehabilitative skills (other skills related to employability and personal development).

1. Applying mathematical skills to practical problems
2. Oral and written communication skills, effective use of information and communication.
3. Controlling time and resources and working within one team
4. The ability to design and be practical in analyzing problems and extracting information from sources published.

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| Study stage: fourth year  Course: Unit operation (I) / Course code: Ch.E402  Course: 4 Credit with 90 hours: Theory (60 hr.) + lab. (30 hr.) |

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| 1. Personal development planning   Providing students with self-learning skills that enable them to update their scientific knowledge in specialization.   1. Admission criterion (setting regulations related to joining the college or institute)   Central acceptance from the Ministry of Higher Education and Scientific Research, according to the faculties' absorptive capacities.  The average for graduates of the preparatory school, the scientific branch.   1. The most important sources of information about the program. |

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| Curriculum Skills Outline | | | | | | | | | | | | | | | | | | |
| Please check the boxes corresponding to the individual learning outcomes from the program being evaluated | | | | | | | | | | | | | | | | | | |
| Stage | course name | Basic Or optional | Learning outcomes required from the program | | | | | | | | | | | | | | | |
| Cognitive | | | | Program specific objectives | | | | Emotional and value | | | | Transferred general and qualification skills (other skills related to employability and personal development) | | | |
| A | | | | B | | | | C | | | | D | | | |
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Fourth | Unit Operation (I) | Basic | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |  | ✓ | ✓ | ✓ | ✓ |

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| Evaluation method | Teaching method | subject | The output requirements | Hours | Week |
| Unannounced exams and self-assessment during the lecture | Lectures, presentations, and reports | Introduction to the unit operation | 1. Units Operation (physical). 2. Units Operation (chemical). 3. Raw materials, processes and products. 4. Basic principles of units operation. 5. The type of operations, the forces responsible for them, and the resistance for each type. | 4 | 1 |
| Unannounced exams and self-assessment during the lecture | Lectures, presentations, and reports | Momentum, mass and heat transfer | 1. Types of fluid flow 2. Molecular diffusion, Eddy motions. | 8 | 2-4 |
| Unannounced exams and self-assessment during the lecture | Lectures, presentations, and reports | Reynolds Analogy | 1. Reynolds' theory momentum, and heat transfer 2. Reynolds' developed theory of heat and mass. | 8 | 5-6 |
| Unannounced exams and self-assessment during the lecture | Lectures, presentations, and reports | Boundary layer | 1. How the boundary layer develops. 2. The boundary layer in the stratigraphic and turbulent flow. 3. Coefficient of friction in turbulent flow. 4. Application of the boundary layer theory in tube flow 5. The boundary layer in heat transfer. | 12 | 7-9 |
| Unannounced exams and self-assessment during the lecture | Lectures, presentations, and reports | Solid particles movement through fluids | 1. Free and aggregated sedimentation 2. The theory of the motion of molecules in a fluid 3. Equations of falling velocity 4. Sedimentation devices | 8 | 10-11 |
| Unannounced exams and self-assessment during the lecture | Lectures, presentations, and reports | The flow through the backed bed | 1. Darcy's equation and transmittance 2. Kozeny–Carman equation and its hypotheses. 3. Retained fluid | 8 | 12-13 |
| Unannounced exams and self-assessment during the lecture | Lectures, presentations, and reports | Fluidization | 1. Using Fluidization advantages and disadvantages 2. Types of Fluidization 3. Calculate the initial liquefaction speed 4. Arkin equation | 8 | 14-15 |

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| Curriculum Development Plan |
| Adding topics related to separation processes for products using nano-membrane techniques, as well as crystallization processes and types of crystallizers. |

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| Infrastructure | |
| 1. Martin R., Introduction to Particle Technology, Second edition, John Wiley & Sons, Ltd. 2008. 2. McCabe W.L., Smith J.C. & Harriott P., Unit Operations of Chemical Engineering, Fifth edition, McGraw Hill. 1993. | 1- Required prescribed books |
| 1. Coulson J.M. & Richardson J.F., Chemical Engineering, Volume 1, six edition, ELBS, Pergamum Press. 2002. 2. Coulson J.M. & Richardson J.F., Chemical Engineering, Volume 2, Fifth edition, ELBS, Pergamon Press. 2002. | 2 - main references (sources) |
|  | Recommended books and references (scientific journals, reports,) |
|  | Electronic references, websites...- |

***Instructor:*** Dr. Muwafaq Mahdi

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