Ministry of Higher Education and Scientific Research
Supervision and Scientific Evaluation Authority
Department of Quality Assurance and Academic Accreditation

Academic Program Description Form for Colleges and Institutes
Academic Year

University: Shatt Al-Arab
College/Institute: Engineering
Scientific Department: Civil
Date of Form Completion: 01/09/2024

Signature   **Signature**
Name of Head of Department:

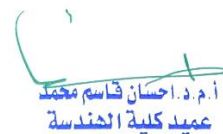Asst. Lecturer Nabeel Najm Abdullah   **Name of Scientific Assistant:** Dr. Jawad Kadhim

Reviewed by:
Quality Assurance and University Performance Division
Name of Division Director: Dr. Jasem Mohsen Yasser

Signature:

الدكتور
جاسم محسن ياسر
Dr.Jasim Al-Battat

جامعة شط العرب
كلية الهندسة
العمادة
SHATT AL-ARAB UNIVERSITY

أ.م.د. احسان قاسم محمد
عميد كلية الهندسة

Dean's Approval

TEMPLATE FOR COURSE SPECIFICATION

COURSE SPECIFICATION

Introduction to advanced mathematical solutions that students face when studying various engineering topics and using numerical analysis methods. It includes solving algebraic equations using numerical methods and Taylor series, how to perform derivation and integration using numerical methods, solving differential equations using numerical methods, finding the mathematical model for a set of points, interpolation and induction.

1. Teaching Institution	Shatt Al-Arab University -Eng. College
2. University Department/Centre	Civil Engineering Department
3. Course title/code	Numerical Analysis CE321
4. Modes of Attendance offered	Class attendance
5. Semester/Year	2nd semester / 3th year
6. Number of hours tuition (total)	90 hrs
7. Date of production/revision of this specification	2024
8. Aims of the Course	
The course aims to identify the following: 1- Numerical solution of algebraic equations. 2- Taylor series 3- Differentiation and integration by numerical methods 4- Numerical solution of differential equations 5- Finding the mathematical model for a set of points, interpolation and induction	

9· Learning Outcomes, Teaching, Learning and Assessment Method

   A- Knowledge and Understanding
A1-Preparing applied engineers in the field of civil engineering who are
   distinguished by a high level of knowledge and analytical creativity in line with

the solid standards adopted globally in ensuring quality and academic accreditation of corresponding engineering programs while adhering to the ethics of the engineering profession.

A2- Enabling knowledge and understanding of practical applications according to the course objectives.

A3- The ability to build a mathematical model to represent various engineering processes.A3-

B. Subject-specific skills

B1 - The ability to know and understand the mathematical model of the problem through the differential equation and its solution

B2 - The ability to think about solving any problem.

B3 - The ability to solve problems using analytical methods for differential equations.

B4 - The ability to gain experience in dealing with initial problems and boundary conditions.

Teaching and Learning Methods

• Readings, self-learning, panel discussions.
• Exercises and activities in the lecture.
• Homework.
• Directing students to some websites to benefit and develop their capabilities.
• Conducting seminars to explain and analyze a specific issue and find solutions to it

Assessment methods

• Interacting within the lecture.
• Homework and reports.
• Short exams (quizzes).
• Semester and final exams.

C. Thinking Skills

C1- Attention: Arousing the students' attention by implementing one of the applied programs on the display screen in the hall.

C2- Response: Follow up the student's interaction with the material displayed on the screen.

C3- Attention: Follow up on the interest of the student who interacted more with the presented material, by increasing this interaction by requesting other programs and applications to display.

C4 - Forming the direction: meaning that the student is sympathetic to the presentation and may have an opinion about the direction of the presented topic and defend it.

C 5- Formation of value behavior: meaning that the student reaches the top of the emotional ladder, so that he has a stable level in the lesson and does not become lazy or fidgety.

Teaching and Learning Methods

- The usual theoretical presentation method using the writing board and depending on the style (how and why) of the subject and according to the curriculum of the subject.
- The theoretical presentation method using the (data show) device and depending on the method (how and why) of the subject and according to the subject curriculum.
- The method of laboratory display using special devices for measuring the different properties of the substance under experiment.

Assessment methods

- Direct questions in a manner (how and why) for the subject during the theoretical and practical lecture.
- Sudden exams during the theoretical and practical lecture.
- Quarterly exams for the theoretical and practical side.
- Final exams for the theoretical and practical side.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1- Develop the student's ability to perform the duties and deliver them on time

D2 - Logical and programmatic thinking to find programmatic solutions to various problems

D3 - developing the student's ability to dialogue and debate

D4 - Develop the student's ability to deal with modern technology, especially the Internet

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	6	Introduction to Numerical Methods	Numerical solution of algebraic equations	Theoretical + Practical	Class work
2	6	Knowing what numerical methods and approximate solution are and how to calculate the error in the approximate solution	Numerical solution of algebraic equations	Theoretical + Practical	Class work and quiz
3	6	Applying the bisection, fixed point, Newton-Raphson and modified Newton methods in solving algebraic equations	Numerical solution of algebraic equations	Theoretical + Practical	Class work
4	6	Applying the bisection, fixed point, Newton-Raphson and modified Newton methods in solving algebraic equations	Numerical solution of algebraic equations	Theoretical + Practical	Class work and quiz

5	6	Solving a set of simultaneous algebraic equations numerically	Numerical solution of algebraic equations	Theoretical + Practical	Class work
6	6	Solving a set of simultaneous algebraic equations numerically	Numerical solution of algebraic equations	Theoretical + Practical	Class work
7	6	Applying Taylor series in approximating functions	Taylor Series	Theoretical + Practical	Class work
8	6	Performing the differentiation of functions numerically	Numerical Derivation and Integration	Theoretical + Practical	Class work and quiz
9	6	Performing the integration of different functions numerically	Numerical Derivation and Integration	Theoretical + Practical	Class work
10	6	Applications of numerical differentiation and integration	Numerical Derivation and Integration	Theoretical + Practical	Class work
11	6	Applying the Euler, Runge-Kutta and finite difference methods in solving ordinary differential equations	Numerical Solution of Differential Equations	Theoretical + Practical	Class work
12	6	Applying the finite difference method in solving partial differential equations	Numerical Solution of Differential Equations	Theoretical + Practical	Class work and quiz
13	6	Applying the finite difference method in solving partial differential equations	Numerical Solution of Differential Equations	Theoretical + Practical	Class work
14	6	Finding the curve that fits a set of points Performing interpolation and induction in approximating functions	Finding the Mathematical Model for a Set of Points, Interpolation and Induction	Theoretical + Practical	Class work
15	6	Finding the curve that fits a set of points Performing interpolation and induction in approximating functions	Finding the Mathematical Model for a Set of Points, Interpolation and Induction	Theoretical + Practical	Class work

11. Infrastructure	
1- Required reading: · Books	Numerical Analysis by Richard L. Burden

· COURSE MATERIALS · OTHER	
2. Key references (sources)	
A- Recommended books and references (scientific journals, reports ,....	Numerical Analysis of Ordinary Differential Equations and Its Applications
B- Electronic references, websites	Reputable websites. Libraries sites in some international universities.

12. Course development plan
Adding new subjects to the curricula within the development of the course by no more than 5%. Adding new references