

# Information Technology for Engineers

| <b>Course Title: Information Technology for Engineers</b> |  |
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| Description   | This course provides a comprehensive overview of computational tools and techniques for engineering applications. It begins with Numerical Calculations using NumPy, covering array and matrix operations, solving linear equations, and performing numerical differentiation and integration. The course then delves into Data Visualization, using Matplotlib and Seaborn to create 2D and 3D plots, real-time visualizations, and report-ready graphs. Students will explore Data Analysis and Manipulation with pandas, learning to clean, process, and analyze experimental or simulation data with descriptive statistics. Practical applications are emphasized in Solving Engineering Problems with Python, featuring case studies in areas like heat transfer and fluid mechanics, along with solving differential equations and optimization problems using SciPy. The course also introduces SymPy for symbolic mathematics, engineering system simulations, and basic image analysis using OpenCV. Finally, it includes an introduction to Excel VBA Programming for automating and enhancing spreadsheet tasks. |
| Semester  | Spring 2025  |
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| Instructor  | Dr. Nasraldeen Khleel  |
| Credit Hours  | 4  |
| Attendance Requirement                                    | Students are required to attend at least 60% of the scheduled classes to be eligible for the course signature  |
| Examination   | The examination is written, and students will receive some theoretical questions and some practical tasks from the studied material  |

## Topics and Schedule

| <b>Lecture #</b> | <b>Topic</b>   |
|------------------|--|
| Lecture 1        | Numerical Calculations with NumPy: Introduction to arrays operations   |
| Lecture 2        | Numerical Calculations with NumPy: Solving linear equations, Introduction to matrix operations   |
| Lecture 3        | Numerical Calculations with NumPy: Eigenvalues and eigenvectors  |
| Lecture 4        | Numerical Calculations with NumPy: Numerical differentiation and integration   |
| Lecture 5        | Data Visualization for Engineering: Using Matplotlib and Seaborn for plotting  |
| Lecture 6        | Data Visualization for Engineering: Plotting 2D and 3D graphs relevant to engineering problems   |
| Lecture 7        | Data Visualization for Engineering: Real-time data visualization and customization for reports   |
| Lecture 8        | Data Analysis and Manipulation: Introduction to pandas for tabular data, Cleaning and processing experimental or simulation data   |
| Lecture 9        | Data Analysis and Manipulation: Descriptive statistics and basic data analysis   |
| Lecture 10       | Solving Engineering Problems with Python: Case studies of heat transfer, structural analysis, and fluid mechanics. Solving differential equations with SciPy. Engineering optimization problems              |
| Lecture 11       | Introduction to SymPy for symbolic mathematics: Simulating simple engineering systems (e.g., pendulum, electrical circuits). Introduction to OpenCV or similar tools for basic image analysis in engineering |
| Lecture 12       | Excel Visual Basic for Applications (VBA) programming  |

- [Lecture notes](#)
- [Exercises](#)
- [Midterm Exam Questions](#)

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