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| <br><b>OSTİM TEKNİK<br/>ÜNİVERSİTESİ</b><br>A N K A R A | <b>FACULTY OF ENGINEERING<br/>COURSE SYLLABUS FORM</b> | Doküman No      | MF.FR.003  |
|                                                                                                                                          |                                                        | Revizyon Tarihi | 13.11.2024 |
|                                                                                                                                          |                                                        | Revizyon No     | 01         |
|                                                                                                                                          |                                                        | Sayfa No        | 1 / 6      |

| CENG109-Programming and Computation 1 |                               |     |  |                                                                                                                     |      |
|---------------------------------------|-------------------------------|-----|--|---------------------------------------------------------------------------------------------------------------------|------|
| Course Code                           | Course Name                   |     |  | Semester                                                                                                            |      |
| CENG109                               | Programming and Computation 1 |     |  | Fall <input checked="" type="checkbox"/> Spring <input checked="" type="checkbox"/> Summer <input type="checkbox"/> |      |
| Hours                                 |                               |     |  | Credit                                                                                                              | ECTS |
| Theory                                | Practice                      | Lab |  | 3                                                                                                                   | 6    |
| 3                                     | 0                             | 0   |  |                                                                                                                     |      |

| Course Details                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| Department                    | Nanotechnology Engineering                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Course Language               | English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Course Level                  | Undergraduate <input checked="" type="checkbox"/> Graduate <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Mode of Delivery              | Face to Face <input checked="" type="checkbox"/> Online <input checked="" type="checkbox"/> Hybrid <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Course Type                   | Compulsory <input checked="" type="checkbox"/> Elective <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Lecturer(s)                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Course Objectives             | This course introduces fundamental programming concepts and computational thinking. It is designed to be language-agnostic, allowing instructors to teach using their preferred programming language, such as C or Python. The course covers basic programming constructs, problem-solving techniques, and introductory algorithms and data structures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Course Content                | This course introduces students to the fundamentals of programming, starting with an overview of programming concepts and setting up the development environment. Students will explore block-based programming using Scratch, progressing from basic to advanced concepts, including event-driven programming. The course transitions into foundational problem-solving techniques through pseudocode and flowcharts. Core programming principles such as variables, data types, mathematical expressions, arrays, control flow constructs, loops, and functions are covered in-depth. Advanced topics include recursion and an introduction to object-oriented programming (OOP), emphasizing classes, inheritance, and polymorphism through practical implementation. The course integrates hands-on projects and tutorials to reinforce learning, culminating in comprehensive reviews to prepare for mid-term and final assessments. |
| Course Method/Techniques      | Lecture <input checked="" type="checkbox"/> Question & Answer <input checked="" type="checkbox"/> Presentation <input type="checkbox"/> Discussion <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Prerequisites/Corequisites    | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Work Placement(s)             | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Textbook/References/Materials |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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- C: How to Program, International Edition H. Deitel, P. Deitel, Prentice Hall
- Introduction to Programming in Python: An Interdisciplinary Approach / Robert Dondero, Kevin Wayne, Robert Sedgewick

| Course Category                |                                     |  |            |                                     |
|--------------------------------|-------------------------------------|--|------------|-------------------------------------|
| Mathematics and Basic Sciences | <input checked="" type="checkbox"/> |  | Education  | <input type="checkbox"/>            |
| Engineering                    | <input checked="" type="checkbox"/> |  | Science    | <input type="checkbox"/>            |
| Engineering Design             | <input checked="" type="checkbox"/> |  | Health     | <input type="checkbox"/>            |
| Social Sciences                | <input type="checkbox"/>            |  | Profession | <input checked="" type="checkbox"/> |

| Weekly Schedule |                                                                                                                                                                                                                                                                                                                                                                  |                          |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| No              | Topics                                                                                                                                                                                                                                                                                                                                                           | Materials/Notes          |
| 1               | <b>Introduction to Programming</b> <ul style="list-style-type: none"> <li>· Introduction to the course and syllabus overview.</li> <li>· What is a program? What is a programming language?</li> <li>· Historical context and evolution of programming languages.</li> <li>· Tutorial on setting up the programming environment and IDE installation.</li> </ul> | Lecture notes, textbooks |
| 2               | <b>Scratch - Basics of Block-Based Programming</b> <ul style="list-style-type: none"> <li>· Introduction to Scratch or Blockly.</li> <li>· Understanding basic programming concepts using block-based programming.</li> <li>· Creating simple projects to illustrate basic concepts.</li> </ul>                                                                  | Lecture notes, textbooks |
| 3               | <b>Scratch - Advanced Concepts</b> <ul style="list-style-type: none"> <li>· Developing more complex projects using Scratch or Blockly.</li> <li>· Introduction to event-driven programming.</li> <li>· Transitioning from block-based to text-based programming.</li> </ul>                                                                                      | Lecture notes, textbooks |
| 4               | <b>Introduction to Pseudocode and Flowchart</b> <ul style="list-style-type: none"> <li>· Introduction to Pseudocode and Its Importance</li> <li>· Writing Algorithms in Pseudocode</li> <li>· Translating Pseudocode into a Programming Language</li> <li>·</li> </ul>                                                                                           | Lecture notes, textbooks |
| 5               | <b>Variables and Data Types</b> <ul style="list-style-type: none"> <li>· Understanding variables, constants, and data types.</li> <li>· Declaring and using variables in a chosen programming language.</li> <li>· Tutorial on variable declarations and type usage.</li> </ul>                                                                                  | Lecture notes, textbooks |
| 6               | <b>Mathematical Expressions</b> <ul style="list-style-type: none"> <li>· Arithmetic operators and their usage.</li> <li>· Writing and evaluating mathematical expressions.</li> </ul>                                                                                                                                                                            | Lecture notes, textbooks |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |
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|    | <ul style="list-style-type: none"> <li>· Understanding operator precedence.</li> <li>· Tutorial on constructing mathematical expressions.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |
| 7  | <b>Arrays</b> <ul style="list-style-type: none"> <li>· Introduction to arrays and their significance.</li> <li>· Declaring, initializing, and accessing array elements.</li> <li>· Tutorial on basic array operations.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                      | Lecture notes, textbooks |
| 8  | <b>Mid-Term</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |
| 9  | <b>Control Flow Constructs: sequence, selection, and repetition</b><br><b>Conditional Statements</b> <ul style="list-style-type: none"> <li>· In-depth look at if, else if, else statements.</li> <li>· Writing nested conditional statements.</li> <li>· Tutorial on using conditional statements to solve problems.</li> </ul>                                                                                                                                                                                                                                                                                                                       | Lecture notes, textbooks |
| 10 | <b>Loops</b> <ul style="list-style-type: none"> <li>· Introduction to loops: while, for, and do-while loops.</li> <li>· Using loops for iteration and repetitive tasks.</li> <li>· Tutorial on loop control statements: break and continue.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                 | Lecture notes, textbooks |
| 11 | <b>Functions</b> <ul style="list-style-type: none"> <li>· Understanding function definition and invocation.</li> <li>· Parameters and return values in functions.</li> <li>· Tutorial on writing and using functions effectively.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                           | Lecture notes, textbooks |
| 12 | <b>Recursion</b> <ul style="list-style-type: none"> <li>· Basic concepts of recursion.</li> <li>· Writing and understanding recursive functions.</li> <li>· Examples and applications of recursion.</li> <li>· Tutorial on debugging recursive functions.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                   | Lecture notes, textbooks |
| 13 | <b>Object-Oriented Programming – Fundamentals – 1</b><br><b>Class Fundamentals</b> <ul style="list-style-type: none"> <li>• Introduction to classes and objects.</li> <li>• Understanding the concept of instances.</li> <li>• Creating and using classes in a chosen programming language.</li> <li>• Practical examples of class implementation.</li> </ul> <b>Inheritance</b> <ul style="list-style-type: none"> <li>• Understanding inheritance and its importance.</li> <li>• Implementing inheritance in practice.</li> <li>• Examples of single and multiple inheritance.</li> <li>• Tutorial on creating and using derived classes.</li> </ul> | Lecture notes, textbooks |
| 14 | <b>Object-Oriented Programming – Fundamentals – 2</b><br><b>Polymorphism</b> <ul style="list-style-type: none"> <li>• Introduction to polymorphism and its benefits.</li> <li>• Implementing polymorphism with method overriding.</li> <li>• Examples of polymorphism in a chosen programming language.</li> <li>• Practical applications of polymorphism.</li> </ul> <b>Practical Implementation</b>                                                                                                                                                                                                                                                  | Lecture notes, textbooks |

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|    | <ul style="list-style-type: none"> <li>Combining classes, inheritance, and polymorphism in a project.</li> <li>Step-by-step guide to designing a simple OOP-based project.</li> <li>Hands-on practice with real-world scenarios.</li> <li>Debugging and testing OOP code.</li> </ul> |                          |
| 15 | <b>Finals</b> <ul style="list-style-type: none"> <li>Comprehensive review of all course materials.</li> <li>Addressing student questions and clarifying concepts.</li> <li>Preparation for the final exam.</li> </ul>                                                                | Lecture notes, textbooks |
| 16 | <b>Final Exam</b>                                                                                                                                                                                                                                                                    |                          |

| Assessment Methods and Criteria                                 |          |             |
|-----------------------------------------------------------------|----------|-------------|
| In-term studies                                                 | Quantity | Percentage  |
| Attendance                                                      |          |             |
| Lab                                                             |          |             |
| Practice                                                        |          |             |
| Fieldwork                                                       |          |             |
| Course-specific internship                                      |          |             |
| Quiz/Studio/Criticize                                           | 1        | 10          |
| Homework                                                        | 4        | 20          |
| Presentation / Seminar                                          |          |             |
| Project                                                         |          |             |
| Report                                                          |          |             |
| Seminar                                                         |          |             |
| Midterm Exam                                                    | 1        | 20          |
| Final Exam                                                      | 1        | 50          |
| <b>Total</b>                                                    |          | <b>100%</b> |
| <b>Contribution of Midterm Studies to Success Grade</b>         |          |             |
| <b>Contribution of End of Semester Studies to Success Grade</b> |          |             |
| <b>Total</b>                                                    |          | <b>100%</b> |

| ECTS Allocated Based on Student Workload |          |                |                |
|------------------------------------------|----------|----------------|----------------|
| Activities                               | Quantity | Duration (Hrs) | Total Workload |
| Course Hours                             | 14       | 3              | 42             |
| Lab                                      |          |                |                |
| Practice                                 |          |                |                |
| Fieldwork                                |          |                |                |
| Course-specific Work Placement           |          |                |                |
| Out-of-class study time                  | 14       | 3              | 42             |
| Quiz/Studio/Criticize                    |          |                |                |
| Homework                                 | 4        | 3              | 12             |

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|                                           |   |    |             |
|-------------------------------------------|---|----|-------------|
| Presentation / Seminar                    |   |    |             |
| Project                                   |   |    |             |
| Report                                    |   |    |             |
| Midterm Exam and Preparation for Midterm  | 1 | 25 | 25          |
| Final Exam and Preparation for Final Exam | 1 | 30 | 30          |
| <b>Total Workload</b>                     |   |    | <b>151</b>  |
| <b>Total Workload / 25</b>                |   |    | <b>6.04</b> |
| <b>ECTS Credit</b>                        |   |    | <b>6</b>    |

| <b>Course Learning Outcomes</b> |                                                                                                                                        |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>No</b>                       | <b>Outcome</b>                                                                                                                         |
| <b>L1</b>                       | An ability to apply knowledge of science, mathematics, and engineering.                                                                |
| <b>L2</b>                       | An ability to design programs and algorithms                                                                                           |
| <b>L3</b>                       | An ability to work with multi-disciplinary teams.                                                                                      |
| <b>L4</b>                       | An ability to identify, formulate, and solve engineering problems.                                                                     |
| <b>L5</b>                       | Take responsibility to solve unpredictable and complex problems encountered in applications as an individual and as a member of a team |
| <b>L6</b>                       | Plan and manage activities in teamwork                                                                                                 |
| <b>L7</b>                       | An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.                             |
| <b>L8</b>                       | Can do research on interdisciplinary fields.                                                                                           |

| <b>Contribution of Course Learning Outcomes to Program Competencies/Outcomes</b>                       |           |           |           |           |           |           |           |           |           |            |            |  |  |  |              |
|--------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|--|--|--|--------------|
| <i>Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant</i> |           |           |           |           |           |           |           |           |           |            |            |  |  |  |              |
|                                                                                                        | <b>P1</b> | <b>P2</b> | <b>P3</b> | <b>P4</b> | <b>P5</b> | <b>P6</b> | <b>P7</b> | <b>P8</b> | <b>P9</b> | <b>P10</b> | <b>P11</b> |  |  |  | <b>Total</b> |
| <b>L1</b>                                                                                              | 5         | 4         | 3         | 4         | 3         | 2         | 1         | 4         | 2         | 2          | 2          |  |  |  | 32           |
| <b>L2</b>                                                                                              | 4         | 5         | 5         | 4         | 3         | 2         | 1         | 3         | 2         | 2          | 2          |  |  |  | 33           |
| <b>L3</b>                                                                                              | 2         | 3         | 3         | 3         | 2         | 5         | 3         | 3         | 3         | 3          | 2          |  |  |  | 32           |
| <b>L4</b>                                                                                              | 4         | 5         | 4         | 4         | 3         | 3         | 2         | 4         | 3         | 3          | 3          |  |  |  | 38           |
| <b>L5</b>                                                                                              | 3         | 4         | 3         | 3         | 3         | 5         | 3         | 4         | 4         | 4          | 3          |  |  |  | 39           |
| <b>L6</b>                                                                                              | 2         | 3         | 3         | 3         | 2         | 5         | 3         | 4         | 3         | 3          | 3          |  |  |  | 34           |
| <b>L7</b>                                                                                              | 4         | 4         | 4         | 5         | 4         | 3         | 3         | 4         | 3         | 4          | 3          |  |  |  | 41           |
| <b>L8</b>                                                                                              | 4         | 4         | 3         | 4         | 5         | 3         | 2         | 5         | 4         | 3          | 4          |  |  |  | 41           |
| <b>Total</b>                                                                                           |           |           |           |           |           |           |           |           |           |            |            |  |  |  | <b>290</b>   |

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- i. Adequate knowledge in mathematics, science, and subjects specific to Computer Engineering; ability to use theoretical and applied knowledge in these areas to solve complex engineering problems.
- ii. Ability to identify, formulate, and solve complex engineering problems; ability to select and apply appropriate analysis and modeling methods for this purpose.
- iii. Ability to design a complex system, process, device, or product under realistic constraints and conditions to meet specific requirements; ability to apply modern design methods for this purpose.
- iv. Ability to develop, select, and use modern techniques and tools required for the analysis and solution of complex problems encountered in engineering practice; ability to use information technologies effectively.
- v. Ability to design and conduct experiments, collect data, analyze and interpret results in order to investigate complex engineering problems or research topics specific to the discipline of Computer Engineering.
- vi. Ability to work effectively in disciplinary and multidisciplinary teams; ability to work individually.
- vii. Ability to communicate effectively in oral and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give and receive clear and understandable instructions.
- viii. Awareness of the necessity of lifelong learning; the ability to access information, to follow developments in science and technology and to continuously renew oneself.
- ix. Acting in accordance with ethical principles, professional and ethical responsibility awareness; knowledge of standards used in engineering applications.
- x. Knowledge about business life practices such as project management, risk management, and change management; awareness of entrepreneurship, innovation; knowledge about sustainable development.
- xi. Knowledge about the effects of engineering applications on health, environment, and safety in universal and social aspects and the problems of the age reflected in the field of engineering; awareness of the legal implications of engineering solutions.