University of Puerto Rico
Mayagüez Campus
College of Engineering
Department of Engineering Science and Materials

Course Syllabus

1. General Information:

Alpha-numeric codification: **INGE 3016**
Course Title: **Algorithms and Computer Programming**
Number of credits: **3**
Contact Period: **3 hour lectures per week**

2. Course Description:

English:
Development of algorithms and their implementation in a structured high level language. Programming techniques applied to the solution of engineering and mathematical problems.

Spanish:
Desarrollo de algoritmos y su implantación utilizando un lenguaje estructurado de alto nivel. Técnicas de programación aplicadas a la solución de problemas de ingeniería y de matemáticas.

3. Pre/Co-requisites and other requirements:

MATE 3005 or MATE 3143 or MATE 3172 or MATE 3174

4. Course Objectives:

After successful completion of the course the student would be able to apply acquired computer programming skills to the solution of problems, specially engineering related problems. More specifically, the student would be able to:

- Construct an algorithm for the solution of problems by means of program design tools, e.g., top-down design, flowcharts, pseudocode.
- Analyze and/or debug the programming and logic of a given piece of flowchart, pseudocode or code through desktop checking and debugging tools.
- Develop clear, robust and efficient code using conditional statements.
- Develop clear, robust and efficient code using loop statements.
- Construct codes by means of basic data structures, e.g., codes that involve creation and manipulation of arrays.
- Design a solution to a complex problem through division into simpler problems and implement it using modular design, e.g. library functions, user-defined functions, modules, and/or subroutines.

5. Instructional Strategies:

☒conference ☐discussion ☒computation ☐laboratory

☐seminar with formal presentation ☐seminar without formal presentation ☐workshop

☐art workshop ☐practice ☐trip ☐thesis ☐special problems ☐tutoring

☐research ☐other, please specify:

6. Minimum or Required Resources Available:

N/A

7. Course time frame and thematic outline

Outline	Contact Hours
Introduction to Computer Systems	**5**
a. Basic Components & Definitions	
b. Binary Numeric System	
c. Internal Representation of Information	
Problem Analysis and Design of Algorithms	**7**
a. Problem Analysis and Specification	
b. Algorithms	
1. Flowcharts	
2. Pseudocodes	
c. Structured Algorithms	
1. Sequential Structure	
2. Selection Structure	
3. Repetition Structure	
i. Counter, Accumulator, and Flag Variables	
First Test	**1**
Fundamentals of a High Level Language	**5**
a. General Characteristics	
b. Constants and Variables	
c. Types of Data	
d. Arithmetic Expressions	
e. Logical Expressions	
f. Assignment Statement	
Input/output Alternatives	**5**
a. Interactive programming	
b. Batch processing	
c. Files Processing	
Control Structures	**10**
a. Selection Structures	
Second Test	**1**
b. Repetition Structures and Iteration Techniques	
Modular Programming	**5**
a. Definition and Importance	
b. Subprograms	
Third Test	**1**
Arrays and Records	**5**
a. Declaration	
b. Input/Output	
c. Manipulation	
Total hours: (equivalent to contact period)	**45**

Notes:

The time frame provides the opportunity to incorporate throughout the course elements particular to the programming tool used, which may vary among the course sections offered.

The evaluation strategy is to be determined by the instructor, which might decide on a different number of tests. The content of each test is also subject to the consideration of the instructor.

8. Grading System

☒ Quantifiable (letters) ☐ Not Quantifiable

9. Evaluation Strategies

	Quantity	Percent
☒ **Exams**	**2 to 4**	**60 to 80**
☒ **Final Exam**	**1**	**20 to 30**
☒ **Short Quizzes**	**Variable**	**0 to 10**
☐ **Oral Reports**		
☐ **Monographies**		
☒ **Projects**	**Variable**	**0 to 10**
Other, specify:		
TOTAL:		**100%**

10. Bibliography:

Textbook: (to be identified by the professor at the beginning of the semester)

Chapra, Steven C., "**Introduction to VBA for Excel"**, Second Edition, 2010, Prentice Hall.

or

Chapman, Stephen J., "**Essentials of MATLAB Programming**", 2006, Thomson.

or

Deitel, H.M. & Deitel, P.J., "**C How to Program**", Eighth Edition, 2015, Prentice Hall.

Reference Books: (to be identified by the professor at the beginning of the semester)

Albright, S. Christian, "**VBA for Modelers: Developing Decision Support Systems with Microsoft Office Excel"**, 2012, Thomson Learning.
Reed Jacobson, "**Excel 2002 Visual Basic for Applications Fundamentals"**, 2001, Microsoft Press.

or

Kuncicky, David C. "**MATLAB Programming**.", 2004, Pearson Prentice Hall
Etter, D.M., Kuncicky, D.C., Moore, H. "**Introduction to MATLAB 7**", 2005, Pearson/ Prentice Hall,
Etter, D.M., "**Introduction to MATLAB for Engineering and Scientists"**, 1996
Herniter, Marc E. "**Programming in MATLAB**" , 2001, Brooks/Cole
Biran, A., Breiner, M. "**MATLAB for Engineers**", 1995, Addison-Wesley
Palm, W.J. "**MATLAB for Engineering Applications**", 1999, McGraw-Hill

or

Bronson, G. J. **A First Book of ANSI C**, Fourth Edition, 2006, Course Technology Press.
Bronson, G.J. **Algorithm Development and Program Design Using C**, First Edition, 1996, International Thomson Publishing Company

11. According to Law 51, students will identify themselves with the Institution and the instructor of the course for purposes of accommodations. For more information please call the Student with Disabilities Office, Dean of Students Office, at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

Prepared by:

Luis A. Montejo, PhD
Coordinator
Programming Courses Committee

Approved by:

Aidsa Santiago, PhD
Department Chair

Revised: February 2018