Course Approval Form

For approval of new courses and deletions or modifications to an existing course.

registrar.gmu.edu/facultystaff/curriculum

Action Requested:

- [X] Create new course
- [ ] Inactivate existing course
- [ ] Modify existing course (check all that apply)
  - [ ] Title
  - [ ] Credits
  - [ ] Repeat Status
  - [ ] Grade Type
  - [ ] Prereq/coreq
  - [ ] Schedule Type
  - [ ] Restrictions
  - [ ] Other:

Course Level:

- [X] Undergraduate
- [ ] Graduate

College/School: College of Science
Department:
Submitted by: Nektaria Tryfona
Ext: 4884 **Email:** ntryfona@gmu.edu

Subject Code: COS **Number:** 301
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term:

- [X] Fall
- [ ] Spring
- [ ] Summer

Year 2015

Title:
Current
Banner (30 characters max including spaces): COS Computational Thinking
New: **Computational Thinking and Programming Concepts**

Credits: (check one)

- [x] Fixed: 3 or
- [ ] Variable: to

Repeat Status: (check one)

- [X] Not Repeatable (NR)
- [ ] Repeatable within degree (RD)
- [ ] Repeatable within term (RT)

Maximum credits allowed:

Grade Mode: (check one)

- [X] Regular (A, B, C, etc.)
- [ ] Satisfactory/No Credit
- [ ] Special (A, B C, etc. +IP)

Schedule Type: (check one) LEC can include LAB or RCT

- [X] Lecture (LEC)
- [ ] Lab (LAB)
- [ ] Recitation (RCT)
- [ ] Internship (INT)
- [ ] Independent Study (IND)
- [ ] Seminar (SEM)
- [ ] Studio (STU)

Prerequisite(s):
None

Corequisite(s):

Instructional Mode:

- [X] 100% face-to-face
- [ ] Hybrid: ≤ 50% electronically delivered
- [ ] 100% electronically delivered

Restrictions Enforced by System: Major, College, Degree, Program, etc. Include Code.

Are there equivalent course(s)?

- [ ] Yes
- [X] No

If yes, please list

Catalog Copy for NEW Courses Only (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)
This course introduces students to computational thinking and programming. Discusses and explores algorithmic thinking, abstraction mechanisms, programming concepts and the integration of all these into programs.	

Indicate number of contact hours: Hours of Lecture or Seminar per week: 2 Hours of Lab or Studio:

When Offered: (check all that apply) [X] Fall [ ] Summer [ ] Spring

Approval Signatures

Department Approval Date

College/School Approval Date

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Graduate Courses Only

Graduate Council Member

Provost Office

Graduate Council Approval Date

For Registrar Office's Use Only: Banner_____Catalog_____

revised 11/8/11

Course Proposal Submitted to the Curriculum Committee of the College of Science

1. COURSE NUMBER AND TITLE:

COS 301: Computational Thinking and Programming Concepts

Course Prerequisites:

Catalog Description:

The course familiarizes students with computational thinking concepts and introduces them to programming notions independent of programming language.

2. COURSE JUSTIFICATION:

Course Objectives:

The course focuses on (1) computational concepts, (2) computational practices, and (3) computational perspectives.

In this course students will learn to

- describe the skills involved in computational thinking
- define and use computational and programming concepts
- identify the connection between computational and programming concepts
- model problems and learn practical problem-solving techniques
- identify the use of computational thinking in Science
- analyze effects of computing, connecting computing to economic, social, and cultural contexts and innovations in other fields.

Course Necessity:

Computational thinking and programming skills are an essential part of most scientific disciplines including biology, geography, environments science and math and an important literacy skill of the 21st century in order to become competitive in the STEM workforce. Expanding computing across the higher education curriculum has become a necessity for students.

This course is valuable to all COS students, as it exposes them to practices a scientist should think and teaches them important programming skills.

Course Relationship to Existing Programs:

The course can be an elective in the Computation and Data Science minor.

Course Relationship to Existing Courses:

3. APPROVAL HISTORY:

4. SCHEDULING AND PROPOSED INSTRUCTORS:

Semester of Initial Offering:

Proposed Instructors: Dr. Nektaria Tryfona

5. TENTATIVE SYLLABUS:

(attached)

College of Science

Exploratory Hall
4400 University Drive, MSN 5C3
Email: cos@gmu.edu Web: cos.gmu.edu

COS 301

Computational Thinking and Programming Concepts

1. Introduction

- **Instructor**: Dr. Nektaria Tryfona
- **Course Website:** gmu.blackboard.edu
- **Credits**: 3.0
- **Prerequisites**:
- **Course Forum:** Blackboard. Allow 24hrs for an answer.
- **Office:** Exploratory Hall, 3104
- **Email:** ntryfona@gmu.edu (Please allow up to 24 hours for response M-F)
- **Phone**: 703 993 4884
- **Office Hours/Skype:** Monday 9-10 ET or by appointment
- **Skype Name:** tryfona
- **Preferred Contact method:** email, skype,

2. Course Objectives

The course focuses on (1) computational concepts, (2) computational practices, and (3) computational perspectives.

In this course students will learn to:

- describe the skills involved in computational thinking
- define and use computational and programming concepts
- identify the connection between computational and programming concepts
- model problems and learn practical problem-solving techniques
- identify the use of computational thinking in Science
- analyze effects of computing, connecting computing to economic, social, and cultural contexts and innovations in other fields.

3. Textbook and References

Required textbook:

Links to be used:

- Python Tutorial http://docs.python.org/tut/tut.html (2.7.6)
- Python Library http://docs.python.org/2/library/index.html (2.7.6)

Additionally, students will be provided additional material in the form of handouts and Web links.

Optional References and Readings:

http://scratched.gse.harvard.edu/ct/defining.html

(more to be added)

4. Course Schedule

The course will be taught as a combination of lectures, topic/problem oriented discussion, and tutorials based on independent reading and class discussion.

The following topics will be covered:

Week of	Lec. #	Topic	Assignment
TBA	1	From physical-world phenomena to virtual worlds	
TBA	2	Data in Science and other fields	
TBA	3	Abstraction Mechanisms	Abstraction in science
TBA	4	Algorithms and abstract data types	
TBA	5	Algorithmic thinking and pseudo coding	Algorithmic thinking in sciences

TBA	6	Programming concepts: Sequence Loops	Experiencing concepts with Python
TBA	7	Programming concepts: Conditions Operations	Experiencing concepts with Python
TBA	8	Programming concepts: Functions	Experiencing concepts with Python
TBA	9	Midterm - Programming practices Experimenting and iterating	
TBA	10	Computing Concepts in scientific projects	
TBA	11	Problem-solving computational techniques	Practice: Case Studies
TBA	12	Computational thinking (in Science and more): the sum of all practices	
TBA	13	Project Presentation	
TBA	14	Project Presentation	

5. Grades

Each assignment and written exam will be given a numerical grade on a 0-100 scale. Some assignments may include bonus tasks. At the end of the term all the marks will be totaled as a weighted average according to the following weights:

Lab assignments	**40%**
Midterm	**25%**
Project	**35%**

Please note that in general all assignments will not have the same weight. The weight of each individual assignment will be indicated on the assignment form. Final grades at the end of the course will be assigned using **a combination of absolute achievements and relative standing in the class forum**.

6. Exams

The course includes a mandatory midterm written exam. The material covered in the exams will be announced in class. A student who cannot write a course examination or complete a course assignment because of an incapacitating illness, severe domestic affliction or other compelling reasons can apply for extension of time to complete an assignment.

7. Assignments

The course will include 4 written assignments on selected topics from the material covered in class and in the assigned reading. Students are expected to bring working cases (to each class, and -when applicable- be prepared to demonstrate their solution. All assignments are mandatory. Typically, one week will be allocated for every assignment.

Assignments should be done **through the Blackboard course website**.

Please note: Assignments should be submitted only through the Assignment submission section of the Blackboard system - DO NOT email assignments directly to the instructor.

Late assignment submission

Assignments submitted **after the due date will not be accepted**. Exceptions to this policy may be made given serious circumstances at the discretion of the Instructor.

Please note: Deferred of term work is a privilege and not a right; there is no guarantee that a deferral will be granted. Please make sure you notify the instructor as soon as you know a deferral is required.

8. Practice

The course will include practice assignments, which will not be delivered or graded, however they are **essential** to the successful delivery of the final project. Material for each practice will be given on time.

9. Project

The course will include one project addressing GIS Computational problem to be addressed with algorithmic thinking in natural language and with Python programming.

The specific format and timing of the project will be discussed in class.

The project will be graded based on the following criteria.

- **Academic merit** of your project
- **Quality of the written report**. The project results need to be communicated in a written report. Please remember that your report is a professional document, and should therefore be formatted and constructed accordingly. A template will be made available. Submission of a hardcopy of the report will be made in class; submission of a softcopy (in PDF) will be made through Blackboard.
- **Quality of the demonstrator** as assessed by the instructor and fellow students during the presentation of the project.
- **Quality of the presentations of the project results** as assessed by the instructor and fellow students**.** Students will be required to present their results in-class. The presentation will include a demonstration of the developed system.

10. Course's website

This course has a Blackboard website. Each course's website will provide you a single portal through which you may obtain lecture notes, retrieve assignment data and, review links to additional materials, and receive special announcements.

Please be aware that innocent remarks can be easily misconstrued. Sarcasm and humor can be easily taken out of context. When communicating, please be positive and diplomatic. I encourage you to learn more about Netiquette.

11. Technology Requirements

Hardware

You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and to a fast, reliable broadband Internet connection (e.g., cable, DSL). For optimum visibility of course material, the recommended computer monitor and

laptop screen size is 13-inches or larger. You will need computer speakers or headphones to listen to recorded content. A headset microphone is recommended for live audio sessions using course tools like Blackboard Collaborate. For the amount of computer hard disk space required to take an online course, consider and allow for the space needed to: 1) install, if you prefer to, the required and recommended software and, 2) save your course assignments.

For hardware and software purchases, visit Patriot Computers.

Software

You will need:

- A supported web browser (See Blackboard Support for supported web browsers)
- Blackboard Courses (Log into http://mymason.gmu.edu, select the Courses Tab)
- Blackboard Collaborate (Select Tools from the Blackboard Course Menu, then select "Blackboard Collaborate")
- Adobe Acrobat Reader (free download)
- PDF Creator - An open source PDF printer (free download)
- Flash Player (free download)
- Windows Media Player (free download)
- Microsoft Office (purchase, also available in the GGS computer labs in Exploratory hall and in the general computing labs on campus

All software and libraries (Python) needed for this course are located in the Virtual Computer Lab (VCL) for students, faculty, and staff. The VCL is a technological way of remotely delivering software to users, through the Internet, regardless of their physical location or the time of day. Please visit VCL's web page to find out the installed software and how to make use of it.

In addition, you will also need access to a word processor and a PDF document generator (more information will be provided in class). Instructors will let you know in advance the specific software to be used in each course.

Note: If you are using an employer-provided computer or corporate office for class attendance, please verify with your systems administrators that you will be able to install the necessary applications and that system or corporate firewalls do not block access to any sites or media types.

12. Important Dates

Please refer to the GMU Semester Calendar for information on important dates.

13. Student Expectations

Academic Integrity

Students must be responsible for their own work, and students and faculty must take on the responsibility of dealing explicitly with violations. The tenet must be a foundation of our university culture. [See http://oai.gmu.edu].

Honor Code

Students must adhere to the guidelines of the George Mason University Honor Code [See http://academicintegrity.gmu.edu/honorcode].

MasonLive/Email (GMU Email)

Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account. [See https://thanatos.gmu.edu/masonlive/login].

Patriot Pass

Once you sign up for your Patriot Pass, your passwords will be synchronized, and you will use your Patriot Pass username and password to log in to the following systems: Blackboard, University Libraries, MasonLive, myMason, Patriot Web, Virtual Computing Lab, and WEMS. [See https://thanatos.gmu.edu/passwordchange/index.jsp].

Responsible Use of Computing

Students must follow the university policy for Responsible Use of Computing. [See http://universitypolicy.gmu.edu/1301gen.html].

Students with Disabilities

Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu].

Students are expected to follow courteous Internet etiquette.

14. Student Services

Student Resources

For technical questions regarding Blackboard, see Courses Support and Blackboard Tutorials. If you still have questions, email courses@gmu.edu for assistance with Blackboard.

For technical questions regarding computer networking, see IT Services for Students. If you still have questions, email support@gmu.edu or call (703) 993-8870.

University Libraries

University Libraries provides resources for distance students. [See http://library.gmu.edu/distance].

Writing Center

The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing. [See http://writingcenter.gmu.edu]. You can now sign up for an Online Writing Lab (OWL) session just like you sign up for a face-to-face session in the Writing Center, which means YOU set the date and time of the appointment! Learn more about the Online Writing Lab (OWL) (found under Online Tutoring).

Counseling and Psychological Services

The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu].

Family Educational Rights and Privacy Act (FERPA)

The Family Educational Rights and Privacy Act of 1974 (FERPA), also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights. [See http://registrar.gmu.edu/privacy].

15. Disclaimer and Copyright Notice

Disclaimer: Any typographical errors in this Course Outline are subject to

change and will be announced in class.

Notice: Recording of any kind (e.g., audio, video), reuse or remix of course materials, and further dissemination of the course content is not permitted unless prior written consent of the professor and George Mason University has been given or if recording is part of an approved accommodation plan.