Eastern Illinois University
New/Revised Course Proposal Format
(Approved by CAA on 4/3/14 and CGS on 4/15/14, Effective Fall 2014)

Banner/Catalog Information (Coversheet)

1. **_X__New Course or _____Revision of Existing Course**
2. **Course prefix and number:** __TEC 5873_____
3. **Short title:** _ Programming for Data Science_____
4. **Long title:** _ Programming for Data Science in Technology_____
5. **Hours per week:** _2__ Class _2__ Lab _3_ Credit
6. **Terms:** ___ Fall ___ Spring __ Summer _X_ On demand
7. **Initial term**: ___ Fall _X__ Spring ___ Summer Year: _2022___
8. **Catalog course description:** _ This course will focus on the programming environment within the realm of technology, including control statements, functions, various data structures, strings, lambdas, and reading and manipulating files. The course will also address high-end topics such as object-oriented programming, recursion, searching and sorting. Additionally, advanced data science concepts such as natural language processing, data mining, machine learning and cognitive computing in the technology domain will be covered.
9. **Course attributes:**

   General education component: ___ N/A _____

   ___ Cultural diversity ___ Honors ___ Writing centered ___ Writing intensive ___Writing active

10. **Instructional delivery**
    Type of Course:

    ___ Lecture ___ Lab _X_ Lecture/lab combined ___ Independent study/research

    ___ Internship ___ Performance ___ Practicum/clinical ___ Other, specify: _____

    Mode(s) of Delivery:

    _X_ Face to Face _X_ Online Synchronous _X_ Online Asynchronous ___ Study Abroad

    _X_ Hybrid, specify approximate amount of on-line and face-to-face instruction__~ 51% Face-to-face and 49% online _____

11. **Course(s) to be deleted from the catalog once this course is approved:** ___NONE_____
12. **Equivalent course(s):** _____none_____

    a. Are students allowed to take equivalent course(s) for credit? ___ Yes _X__ No

13. **Prerequisite(s): _ NONE _____**

    a. Can prerequisite be taken concurrently? ___ Yes ___ N

b. Minimum grade required for the prerequisite course(s)? _N/A__

c. Use Banner coding to enforce prerequisite course(s)? __ Yes ___ No

d. Who may waive prerequisite(s)?

___ No one ___ Chair ___ Instructor __ Advisor ___ Other (specify)

14. Co-requisite(s): ___NONE_____

15. Enrollment restrictions

a. Degrees, colleges, majors, levels, classes which <u>may</u> take the course: _

Students of major in TEC or permission of instructor

b. Degrees, colleges, majors, levels, classes which may <u>not</u> take the course: __ ALL OTHERS _

16. Repeat status: _X__ May not be repeated ___ May be repeated once with credit

17. Enter the limit, if any, on hours which may be applied to a major or minor: _3__

18. Grading methods: _X__ Standard ___ CR/NC __ Audit ___ ABC/NC

19. Special grading provisions:

___ Grade for course will <u>not</u> count in a student's grade point average.

___ Grade for course will <u>not</u> count in hours toward graduation.

___ Grade for course will be removed from GPA if student already has credit for or is registered in: _____

___ Credit hours for course will be removed from student's hours toward graduation if student already has credit for or is registered in: _____

20. Additional costs to students:
Supplemental Materials or Software_____

Course Fee _X__No ___Yes, Explain if yes_____

21. Community college transfer:

___ A community college course may be judged equivalent.

_X__ A community college may <u>not</u> be judged equivalent.

Note: Upper division credit (3000+) will <u>not</u> be granted for a community college course, even if the content is judged to be equivalent.

Rationale, Justifications, and Assurances (Part I)

1. ___Course is required for the major(s) of _____
   ___Course is required for the minor(s) of _____
   ___Course is required for the certificate program(s) of _____
   _X__ Course is used as an elective

2. **Rationale for proposal**:

   The Computer Technology profession is expected to grow 15 % each year till 2029 according to the Bureau of Labor Statistics. In Illinois alone, this equates to several hundreds of jobs each year. As a result, this course is being developed to satisfy the Industry needs for our students to have knowledge of the latest trends and topics in the Computer Technology domain. The content of this course helps the students attain more "in-demand" skills. Currently, there is no coursework that is flexible for students seeking knowledge in this area online or in a hybrid format.

   Graduate students in Technology are required to take a minimum of 19 hours of elective courses numbered 5000 and above. Currently, we offer fewer courses at 5000 and above in Computer domain in the graduate program of Technology.

3. **Justifications for (answer N/A if not applicable)**

   Similarity to other courses: N/A

   Prerequisites: N/A

   Co-requisites: N/A

   Enrollment restrictions: Graduate students in TEC or permission of instructor or chair

   Writing active, intensive, centered: N/A

4. **General education assurances (answer N/A if not applicable)**

   General education component: N/A

   Curriculum: N/A

   Instruction: N/A

   Assessment: N/A

5. **Online/Hybrid delivery justification & assurances (answer N/A if not applicable)**

   Online or hybrid delivery justification:

   The content and structure for this course relies upon independent research, in-depth group discussion, and video-based lecture. As compared to many lab courses already offered in technology area, this course requires online delivery of lectures and discussions and face-to-face lab activities for applied projects. For content delivered online, the course employs online video presentations, structured web discussions focused on reading assignments, and linked to articles submitted to the instructor. Students are required to draw on research and review of articles to discuss and develop fundamental procedural knowledge of application. Discussions invite students to explore in more detail the

required knowledge and procedures to analyze and design systems. Discussions and examinations will be administered and submitted via the online course management tool. With the current technology, many software design companies have made their software tools more readily accessible for students. The Internet connection speed for many users has increased thereby allowing for higher quality rich media instruction to be delivered. Finally, the course management tools that the university now uses allow there to be a richer interaction between students and faculty. To accommodate this situation, many of the given activities may be completed in a hybrid format.

Instruction:

This course employs instructor-led online presentations, student reading assignments, student applied design assignments, peer critique and troubleshooting, student presentations, and examinations. After reviewing the instructor-led presentations and completing the student reading assignments, students will be required to draw on what they have read and then apply it to a context of analyzing and designing software systems. While working on these projects, students may engage in the activity of troubleshooting or critique while posting their work in an online discussion board for both classmates and the instructor to provide feedback and guidance. Presentations will provide learners a forum to share the results of their work and receive further feedback. Reading assignments, applied projects, and examinations will be administered, collected, and/or submitted via the online course management tool. Presentations may also be delivered in the course tool or face-to-face. All faculty who will deliver this course online are/will be OCDi (or appropriate equivalent) trained.

Integrity:

Work submitted online, such as discussions and examinations, will be substantiated via learners providing citations in APA format and submitting related articles to quantify work. Further, the length, frequency, quality, and integrity of discussion posts can be monitored via the online course management tool. Examinations will require the same of learners and additionally will use software tools, such as “TURNITIN”, to check work for the integrity and authenticity of submitted assignments. The examinations will be time-restricted and of sufficient length to prohibit consultation of unauthorized sources. Work submitted face-to-face in applied lab projects will be checked for authenticity via the individualized nature of project completion. Requirements for projects will require learners to engage in activities that require the creation of original content for either themselves or local entity.

Interaction:

For online content, the course employs email, web-based discussions, exploration of off-site Internet resources, web-based presentations, web chat rooms and lab based applied project work. The instructor will communicate with students through the online discussion board and web-based discussions. Email may also be a tool used for the instructor to communicate with an individual student or to post course announcements. The learners for this course may also communicate with one another for these tools. During digital office hours, the instructor will remain available for discussion

during certain times and communicate using a chat room tool in the learning management system. For face-to-face interaction, the instructor may communicate synchronously with the learners during open lab activities and during office hours. The learners are also free to communicate with other learners during lab activities.

Model Syllabus (Part II)

Please include the following information:

1. Course number and title
   TEC 5873 – Programming for Data Science in Technology

2. Catalog description
   This course will focus on the programming environment within the realm of technology, including control statements, functions, various data structures, strings, lambdas, and reading and manipulating files. The course will also address high-end topics such as object-oriented programming, recursion, searching and sorting. Additionally, advanced data science concepts such as natural language processing, data mining, machine learning and cognitive computing in the technology domain will be covered.

3. Learning objectives.
   Upon completion of this course, students will be able to:

   a. Explain what data science is, the various activities of a data scientist's job, and methodology to think and work like a data scientist – (Grad 1, 3, 4)
   b. Develop hands-on skills using the tools, languages, and libraries used by professional data scientists – Grad (1 – 4)
   c. Import and clean data sets, analyze and visualize data, and build and evaluate machine learning models and pipelines using a programming language (such as Python) – Grad (1 – 4)
   d. Apply various data science skills, techniques, and tools to complete a project and publish a report. – Grad (1 – 5)

Graduate Learning Goals

Objective	Depth of Content knowledge	Critical thinking and problem solving	Oral and/or written communication	Advance scholarship through research and creative activity	Ethical and Professional Responsibility
(a)	X		X	X	
(b)	X	X	X	X	
(c)	X	X	X	X	
(d)	X	X	X	X	X

4. Course materials.
   This will include lecture notes, online resources (such as online tutorials, research papers), etc. The following textbook is an example of the textbook that will be used in class:

Deitel, P. J., & Dietel, H. (2020). Intro to Python for computer science and data science: learning to program with Ai, big data and the cloud. Pearson Education, Inc.

5. Weekly outline of content.

Face-to-Face / Online Modality:

Week	Topics	Activities
Week 1	History and Introduction of Data Science in Technology	Fundamentals Lab
Week 2	Intro to Programming	Basic Programming Lab
Week 3	Control Statements and Program Development	Control Lab
Week 4	Functions	Functions Lab
Week 5	Lists and Tuples	Data Struct Lab I
Week 6	Dictionaries and Sets	Data Struct Lab II
Week 7	Array Oriented Programming	Array Lab
Week 8	MIDTERM	Presentations
Week 9	Strings	Strings Lab
Week 10	Files and Exceptions	Files and Exceptions Lab
Week 11	OOP	OOP Lab
Week 12	Recursion and Sorting	Recursion and Sorting Lab
Week 13	Natural Language Processing	NLP Lab
Week 14	Data Mining in Technology Domain	Data Mining Lab
Week 15	Machine Learning in Technology Domain	Machine Learning Lab
Week 16	Final Exam	Presentation

Hybrid Modality:

Week	Topics	Activities
Week 1	History and Introduction of Data Science in Technology	Fundamentals Lab
Week 2	Intro to Programming	Basic Programming Lab
Week 3	Control Statements and Program Development	Control Lab
Week 4	Question/Answers/Review Sessions of Weeks 1 to 3 Functions	Functions Lab
Week 5	Lists and Tuples	Data Struct Lab I
Week 6	Dictionaries and Sets	Data Struct Lab II
Week 7	Array Oriented Programming	Array Lab
Week 8	Question/Answers/Review Sessions of Weeks 5 to 7 MIDTERM	Presentations
Week 9	Strings	Strings Lab
Week 10	Files and Exceptions	Files and Exceptions Lab
Week 11	OOP	OOP Lab
Week 12	Recursion and Sorting	Recursion and Sorting Lab
Week 13	Question/Answers/Review Sessions of Weeks 9 to 12 Natural Language Processing	NLP Lab
Week 14	Data Mining in Technology Domain	Data Mining Lab
Week 15	Machine Learning in Technology Domain	Machine Learning Lab
Week 16	Final Exam	Presentation

6. Assignments and evaluation, including weights for final course grade.

	Graduate (G)
Labs	45 %
Class Participation	5 %
Exams	35 %
Projects	15 %
Total	100 %

7. Grading scale.
A = 90% or above, B = 80 – 89%, C = 70 – 79%, D = 60 – 69%, F = Below 60%

8. Correlation of learning objectives to assignments and evaluation.

Objective	**Labs** 45%	**Class Participation** 5%	**Projects** 15%	**Exams** 35%
a. Explain what data science is, the various activities of a data scientist's job, and methodology to think and work like a data scientist – (Grad 1, 3, 4)	X	X		X
b. Develop hands-on skills using the tools, languages, and libraries used by professional data scientists – Grad (1 – 4)	X	X		X
c. Import and clean data sets, analyze and visualize data, and build and evaluate machine learning models and pipelines using a programming language (such as Python) – Grad (1 – 4)	X	X		X
d. Apply various data science skills, techniques, and tools to complete a project and publish a report. – Grad (1 – 5)	X	X	X	X

Date approved by the department or school: 11/29/2021
Date approved by the college curriculum committee: 12/16/2021
Date approved by the Honors Council ***(if this is an honors course):***
Date approved by CAA: **CGS:**