CGS Agenda Item: 18-34
Effective Fall 2018

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 5823_____
3. **Short title:** ___ Big Data _____
4. **Long title:** _____ Big Data – Map Reduce _____
5. **Hours per week:** _2__ Class _2_ Lab _3__ Credit
6. **Terms:** ___ Fall ___ Spring ___ Summer _X__ On demand
7. **Initial term**: _X__ Fall ___ Spring ___ Summer Year: _2018_____
8. **Catalog course description:** __(2-2-3) – This course covers Big Data and Data Science and related concepts to Big Data such as Hadoop, Map-Reduce, Combiners, Tool Runners, etc. Implementation of Map-Reduce programs and Hadoop eco system will also be part of this course.
9. **Course attributes: N/A**

   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 ___ 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):** __CIT 4823 Big Data and Cloud Computing _____

    a. Are students allowed to take equivalent course(s) for credit? ___ Yes _X__ No
13. **Prerequisite(s): _** TEC 5373 or equivalent or permission of instructor **__**

    a. Can prerequisite be taken concurrently? ___ Yes _X__ No

    b. Minimum grade required for the prerequisite course(s)? _C__

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

d. Who may waive prerequisite(s)?

___ No one _X__ 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: _ graduate students in TEC or permission of instructor or chair

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: ___

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 in Masters of Technology

2. **Rationale for proposal**:
   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. Concurrently listing the existing CIT 4823 (Big Data – Map Reduce) as TEC 5823 (Big Data – Map Reduce) would allow graduate students to fulfill the required minimum of 19 hours of 5000-level courses.

   Students in TEC 5823 will be held to higher performance standards in all facets of the course. Additional requirements for students in TEC 5823 will include: (1) Homework will contain higher level analytical questions requiring primary literature review. (2) Research Paper will be required of the graduate class, and none is required in the undergrad class (3) Homework will also be held to a higher standard for their research analysis, literature review, writing style and maturity of thought. (4) Students in TEC 5823 will be assigned to lead in-class discussions.

   This course is about one of the latest topics in computer technology field, yielding students with knowledge of Big Data. Forbes predicts demands for Big Data Scientists will soar beyond 28% by 2020. This course will give students a platform to launch their Big Data career. This course has been offered for last 2 years year TEC 5970 as a special topic course with full classes (more than 20 grad students) in each offering.

3. **Justifications for (answer N/A if not applicable)**
   Similarity to other courses: N/A
   Prerequisites*: Material in this course is built on the knowledge of TEC 5373 and uses concepts and knowledge from these courses as a foundation for this new course TEC 5823*
   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 lecture and discussion 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 allows 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 to 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 citation 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 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 5823 – Big Data – Map Reduce

2. Catalog description
This course covers Big Data and Data Science and related concepts to Big Data such as Hadoop, Map-Reduce, Combiners, Tool Runners, etc. Implementation of Map-Reduce programs and Hadoop eco system will also be part of this course.

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

a) Demonstrate the basic concepts of Big Data and Data Scientist. (Grad 3)
b) Evaluate and determine the correct core tools to analyze Big Data problems. (Grad 1, 2, 3)
c) Demonstrate the basic knowledge of Map-Reduce. (Grad 1, 2)
d) Query and explore data, and identify and evaluate the different kinds of analysis that can be applied to big data. (Grad 1, 2, 3)
e) Compare and contrast data network structure, data clusters and graph analytics. (Grad 1, 2)
f) Design, develop, evaluate and demonstrate a project for Big Data ecosystems. (Grad 1 - 4)

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
(a)	X		X	
(b)	X	X	X	
(c)	X	X		
(d)	X	X	X	

(e)	X	X		
(f)	X	X	X	X

4. Course materials.

This will include lecture notes, online resources (such as online tutorials, research papers), etc as well as the following book:

Provost, F., & Fawcett, T. (2013). “Data Science for Business: What you need to know about data mining and data-analytic thinking”. Sebastopol, CA: O'Reilly.

5. Weekly outline of content.

Face-to-Face / Online Modality:

Week	Topics	Activities
1	Introduction of Big Data & Data Scientists	
2	Introduction to Hadoop	• Lab 1
3	Hadoop EcoSystem I	
4	Hadoop EcoSystem II	• Lab 2
5	MapReduce Program in Java I	
6	MapReduce Program in Java II	• Lab 3
7	ToolRunner Class	
8	Combiners	• Lab 4 • Midterm
9	Debug Map Reduce Code	
10	Map-Only MapReduce Jobs	• Lab 5
11	Custom Partitioners	
12	Reducers	• Lab 6
13	Sort and Search large data sets	
14	Term frequency-inverse document frequency	• Lab 7
15	SQOOP	• Lab 8
16	Final Exam	• Final Project • Research Paper

Hybrid Modality:

Week	Topics	Activities
1	Introduction of Big Data & Data Scientists	
2	Introduction to Hadoop	• Lab 1
3	Hadoop EcoSystem I	
4 Face to Face Meetings: 8 am to 5 pm	Question/Answers/Review Sessions of Weeks 1 to 3 Hadoop EcoSystem II	• Lab 2
5	MapReduce Program in Java I	
6	MapReduce Program in Java II	• Lab 3
7	ToolRunner Class	
8 Face to Face Meetings: 8 am to 5 pm	Question/Answers/Review Sessions of Weeks 5 to 7 Combiners Midterm	• Lab 4 • Midterm

9	Debug Map Reduce Code	
10	Map-Only MapReduce Jobs	• Lab 5
11	Custom Partitioners	
12	Reducers	• Lab 6
13	Sort and Search large data sets	
14 Face to Face Meetings: 8 am to 5 pm	Question/Answers/Review Sessions of Weeks 9 to 13 Term frequency-inverse document frequency	• Lab 7
15	SQOOP	• Lab 8
16	Final Exam	• Final Project • Research Paper

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

	Graduate
Lab assignments	35 %
Exams	35 %
Class Projects	20 %
Research Paper / Project	10 %
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	Assignments (35%)	Projects (20%)	Midterm (15%)	Final (20%)	Research Paper/ Project (10%)
a. Demonstrate the basic concepts of Big Data and Data Scientist. (Grad 3)	X		X		X
b. Evaluate and determine the correct core tools to analyze Big Data problems. (Grad 1, 2, 3)	X		X		X
c. Demonstrate the basic knowledge of Map-Reduce. (Grad 1, 2)	X	X	X	X	X
d. Query and explore data, and identify and evaluate the different kinds of analysis that can be applied to big data. (Grad 1, 2, 3)	X	X		X	X
e. Compare and contrast data network structure, data clusters and graph analytics. (Grad 1, 2)	X	X		X	X
f. Design, develop, evaluate and demonstrate a project for Big Data ecosystems.		X			X

(Grad 1 - 4)					

Date approved by the department or school: Feb 1, 2018
Date approved by the college curriculum committee: Feb 20, 2018
Date approved by the Honors Council *(if this is an honors course):*
Date approved by CAA: CGS: