CM-5103

ENTERED 3/20/19 BS

APPROVED GCC 2/28/19 CGSP 3/6/19

UNIVERSITY REGISTRAR
VIRGINIA TECH

Coversheet - Proposal for New and Revised Course

(Use for non-Pathways courses)

For CLE/Pathways course, form can be found here: https://www.pathways.prov.vt.edu/proposal-forms.html

General Information					
Proposal Date:	2/23/2019		*15-Day Review End Date:*		
Department:	Computer Science				
Course Designator and Number:	CS 5594				
Title of Course:	Blockchain Technologies			*Credit Hours:*	3.0
Please refer to Office of University Registrar for guidelines and policy requirements https://www.registrar.vt.edu/faculty/teaching/instructional-minutes.html					
Course Transcript (ADP) Title: (30 Character Maximum)	Blockchain Technologies				
Instructor and/or Departmental Contact:	Lenwood Heath, Clifford A. Shaffer				
Contact Phone:	231-4354	*Contact E-mail:*	heath@vt.edu, shaffer@vt.edu		

Please count this course toward the following Scorecard Metrics areas:

☐ Study Abroad ☐ Service Learning ☐ Experiential ☐ Undergraduate Research

Scorecard Metrics Definitions can be found here: http://www.registrar.vt.edu/faculty/forms/scorecard-metrics.html

Please insert an X if this course should count toward First Year Experience:

☐ First Year Experience (FYE) *For more information see: http://www.fye.vt.edu*

Select ONE of the following boxes		
[X] New Course	☐ *Revised Course	(*Revision > 20%* _____ *Revision < 20%* _____)

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Please include a summary of course revisions to the Justification section of proposal

A:	**Attach statement** from Dean or Departmental Representative as to whether teaching this course will require or generate the need for additional departmental resources.			
B:	**Attach appropriate letters of support** from affected departments and/or colleges.			
C:	*Effective Semester:*	Fall 2019		
D:	*Change in Title From:*			
	To:			
E:	*Change in Transcript Title (ADP) From:*		*To:*	
F:	*Change in Credit Hours From:*		*To:*	
G:	*Change in Lecture and/or Lab Hours From:*		*To:*	
H:	*Course Number(s) and Title(s) to be deleted from the Catalog with APPROVAL:*			

Approval Signatures			
Department Representative		*Date*	1/28/2019
College Curriculum Committee Rep		*Date*	2/25/2019
College Dean		*Date*	2/25/2019

Blockchain Technologies
CS 5594

I – Catalog Description

Principles of an open, distributed ledger. Underlying data structures and algorithms such as cryptographic hashing and Merkle trees, consensus algorithms, and Byzantine agreement. Bitcoin as an exemplar. Proof of work and proof of stake. Applications including cryptocurrencies, financial ledgers, and smart contracts. Pre: Graduate standing in computer science. (3H, 3C).

Course Number: 5594
Transcript (ADP) Title: Blockchain Technologies

II – Learning Objectives

Having successfully completed this course, the student will be able to:

1. Implement a basic blockchain technology for economic applications.
2. Apply relevant data structures and algorithms to a blockchain design.
3. Analyze the efficiency of a published blockchain technology.
4. Assess the merits and weaknesses in a given blockchain technology such as Bitcoin.
5. Compare and contrast different blockchain technologies for suitability to a particular purpose such as cryptocurrency, financial ledger, or smart contract.

III – Justification

The arrival of the cryptocurrency Bitcoin brought with it a wider appreciation of the underlying distributed data structure called blockchain. This data structure is now the subject of numerous technological developments beyond cryptocurrencies, including commercial, medical, and information applications. Blockchain expertise supports related areas including cryptography and computer security. This course fills in a critical need for both theoretical and practical knowledge necessary for the modern information economy.

Course is taught at the 5000-level because Blockchain technologies draw on a rich mix of knowledge areas that are typically required of graduate-level computer science students, including data structures, distributed computing, cryptography, algorithms, and theoretical computer science.

IV – Prerequisites and Corequisites

Pre: Graduate standing in computer science

V – Texts and Special Teaching Aids

Required text:

Narayanan, A., Bonneau, J., Felten, E., Miller, A. & Goldfeder, S. (2016). *Bitcoin and Cryptocurrency Technologies: a Comprehensive Introduction*. Princeton University Press. Pp. xxvii, 304.

VI – Syllabus

Topic	Description/Examples	Percent of Course
Distributed Ledger	An Open, Online Data Structure	10%
Cryptographic Hashing	SHA-256 Algorithm	10%
Merkle Trees	Cryptographically Built Data Structure	10%
Consensus Algorithms	Byzantine Agreement Algorand	10%
Block Structure	Bitcoin Block	10%
Blockchain Structure	Bitcoin Blockchain	10%
Consensus Principles	Proof of Work Proof of Stake	10%
Cryptocurrencies	Bitcoin Zcash Ether	10%
Smart Contracts	Ethereum	10%
Applications of Blockchain technology	Banks Insurance Sharing Economy	10%
Total		100%