803400815101 Blockchain Technology and Smart Contracts (BTaSC)

Course Syllabus

Assist. Prof. Dr. Murat KARAKUS

2023 - 2024 Spring Semester

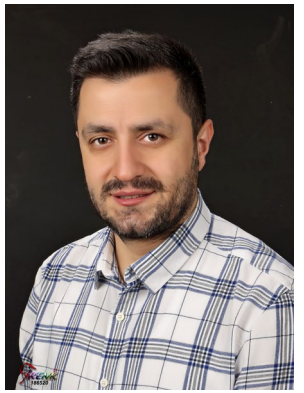
Faculty of Engineering

Ankara University

ANKARA UNIVERSITY

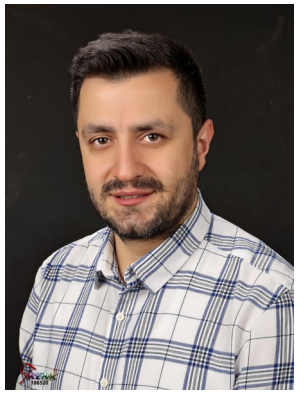
The First University of The Republic of Turkey

About me



- Tokat, Turhal
  - ➢ K-12
- Undergrad
  - ➢ Suleyman Demirel University, Isparta
    - ❖ Faculty of Art and Science, Department of Mathematics (2005 - 2009)
- M.Sc
  - ➢ The University of Michigan – Flint, Flint, MI, ABD
    - ❖ The School of Science, The Department of Information & Computer Science (2011 - 2013)
      - ○ Research Assisstant
- Ph.D
  - ➢ Purdue University, Indianapolis, IN
    - ❖ Purdue School of Science, The Department of Computer Science (2013 - 2018)
      - ○ Research Assisstant
      - ○ Lecturer

About me



- Previous Institutions
  - Bayburt University (Mandatory Service)
    - Technical Sciences Vocational School, Computer Technologies Department (Head of Department), Assist. Prof. (March 2019 – August 2022)
    - Distance Education Research and Development Center – Vice Director
- **Present** - Ankara University (mrtkarakus@ankara.edu.tr)
  - Faculty of Engineering, Department of Software Engineering, Assist. Porf. (2022 Sept – Present)
- Research Areas:
  - Next Generation Communication Networks (E.g., Software Defined Networks)
  - Blockchain
  - Network Security
  - Routing/Forwarding/Quality of Service
  - Machine Learning Methods (E.g., Reinforcement Learning)

Course Information

Code/Name: 803400815101 Blockchain Technology & Smart Contracts

Department: Artificial Intelligence Technologies Program (Ph.D)

Semester: 2024 - Spring

Credits: **T:** 3 **P:** 0 **Total:** 3

Day/Hours: Monday - 19^{00} – 22^{00}

Instructor: Assist. Prof. Dr. Murat KARAKUS

Modality/Classroom: Online/Microsoft Teams

Level/Type/Language: Graduate/Elective/English

~~**Microsoft TEAMS Team/Class Code:**~~

Course Instructor Information

Instructor: Assist. Prof. Dr. Murat KARAKUS

Office: Department of Software Engineering, M Block, Entrance Floor (50th Years Campus)

Office Phone: 0312 600 0100 / 1304 (internal)

E-mail: mrtkarakus@ankara.edu.tr

(Anticipated response time is 24 hours M-F, business days. Usually much faster, including weekends. Please post your general questions on the class discussion board at the e-Kampus portal. I will automatically receive them via email and post my answer so everybody can benefit. If you subscribe to the forum, you will also be notified via email for all the posts.)

Office Days/hours: Everyday 08:00 – 09:00. For other days/hours, you need to make an appointment. **Email is PREFERRED!**

Course Description and Objectives

- This course teaches the **concepts enabling the blockchain** in a concise and comprehensible technical way.
- It aims to address the **four fundamental questions** that arise when being introduced to a new technology:
  1) **What is blockchain?**
  2) **Why do we need blockchain?**
  3) **How does blockchain work?**
  4) **What are the underlying concepts of blockchain?**
- This course explains the **technical concepts of the blockchain** such as **transactions**, **hash values**, **cryptography**, **data structures**, **peer-to-peer and distributed systems**, system integrity, distributed **consensus**, **smart contracts**, **blockchain platforms**, **use cases, application examples**, and so on.

Course Learning Outcomes

Course Learning Outcomes (Based on Bloom's taxonomy of cognitive domain as marked in parenthesis after each learning outcome)	
No	**Description**
1	To know what the distributed system structures are. (knowledge)
2	To know the structure of the blockchain. (knowledge)
3	To understand blockchain applications. (comprehension)
4	To have knowledge about smart contract systems. (knowledge)
5	To know cryptographic mechanisms. (knowledge)
6	To understand and evaluate the concepts of Digital Money and Digital Economy. (synthesis and evaluation)
7	To apply decentralized trust and clearing systems etc. to be able to program. (analysis and application)
P.S: The student learning outcomes above will be achieved by means of reading assignments, lecture slides, lectures, homeworks, exams, and learn-by-doing style activities (when applicable).	

Course Material/Textbook

- **None required**. However, if you need a recommendation for a textbook, you may obtain one of the following textbooks for reference (current or previous edition):

1. Dhillon, V., Metcalf, D., & Hooper, M. (2017). Blockchain enabled applications. ISBN: 978-1484230800, Berkeley, CA: Apress.
2. Kube, N. (2018). Daniel Drescher: Blockchain basics: a non-technical introduction in 25 steps: Apress, ISBN: 978-1484226032, 2017, 255 pp, ISBN: 978-1-4842-2603-2.
3. Raj, P., Saini, K., & Surianarayanan, C. (Eds.). (2020). Blockchain technology and applications. CRC Press, ISBN: 978-0367533403.
4. Bashir, I. (2020). Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more. Packt Publishing Ltd, ISBN: 978-1839213199.
5. Academic papers (surveys/technical articles), white papers, reports, etc. in the literature

Course Policies

1. **DO NOT CONDUCT ANY BEHAVIOUR WHICH DAMAGE THE RESPECT AND RELATIONSHIP AMONG THE TEACHER AND STUDENT IN NO CASE!!!**

2. **DO NOT CONTACT THE INSTRUCTOR TO REQUEST MORE GRADE AT THE END OF SEMESTER. STARTING/CONTINUEING THIS COURSE KNOWING THAT THE ANSWER IS "NO" WILL INCREASE YOUR SUCCESS IN THE COURSE.**

3. ~~**Class Participation:** Active class participation will affect the final grade at a maximum of +10 points.~~

Course Policies (Cont'd)

4. Homeworks:

1. **Preparation-1:** Although you are allowed and even encouraged to discuss the general concepts behind the homeworks with your classmates, you MUST complete them alone; no collaboration is permitted unless explicitly stated. Discussion in any way, inside or outside the classroom, is prohibited. In case of findings related to this, everyone involved in such a situation will receive 0 (zero) points for that assignment, and the respective authorities (head of department, faculty, etc.) will be informed. If a student is involved in such a situation more than once, the course grade for the student will be FF, which will be reported to the university authorities. Assignments should clearly state information taken from other sources. Plagiarism (theft of works) will not be accepted.
2. **Preparation-2:** Instructions about the format and structure of the homework submissions will be provided with the first homework assignment.
3. **Questions about Homeworks:** When there is a situation that is not understood about a question about any homework, you should ask the instructor of the course. The student is responsible for the homework prepared by asking friends or someone from within or outside the university.
4. **Submission:** Only submissions via the e-Kampus platform will be accepted. No late homeworks will be accepted. No email submission of homeworks is accepted.

Course Policies (Cont'd)

5. ~~**Missing Exams:** A valid excuse (doctor's report, etc.) must be presented, and the instructor must be informed. No excuses are accepted in the final exam.~~
6. **Project:** You will need to give **1 project(s)** in **groups of max 3 people**. Check this file for more information. Plagiarism (theft of works) will not be accepted.
7. **Presentation:** You will need to give **a presentation** ~~in groups of 2 people or~~ **individually**. Check this file for more information.
8. **Course Materials:** Course presentations will be shared before the exam. Those who wish can take notes during the lessons. TAKING PICTURES/VIDEOS IS PROHIBITED.
9. **Course Content:** Apart from the lecture presentations, questions may arise in the exams from the information we discuss orally in the lecture. It is recommended that you listen carefully to the lecture.
10. **Lecture Make-ups:** The lectures will continue every week regardless of the majority of the students who come to the lesson except for public holidays and the excuse of the instructor. Reparation will be made in case of an excuse of the instructor.

Course Assessment Criteria

Course Assessment Criteria[a]		
SEMESTER ACTIVITIES	**AMOUNT**	**CONTRIBUTION (%)**
Midterm (30%) (Presentation 50% and Project-based 50%)	1	%30
[b,c]Final Exam (70%) (Presentation 20% and Project-based 80%)	1	%70
SEMESTER TOTAL		**%100**

[a]Modifications can be made to the any fields in the table by the instructor during the semester.

[b]The make-up exam grade replaces only the project grade in the table. The make-up exam will be based on the project. End of the semester total score is calculated accordingly.

[c]A student who scores 49.99 or less out of 100 on the final exam, make-up exam or single course exam is considered unsuccessful and receives an F2 letter grade. (Article 37/2)

Course Assessment Criteria (Sample)

Course Assessment Criteria[a] (Sample)						
SEMESTER ACTIVITIES		**GRADE RECEIVED**		**SUBTOTAL**	**FACTOR**	**SEMESTER END**
Midterm (30%)	Presentation (50%)	90	45	80	0.3	24
	Project (50%)	70	35			
[b,c]Final Exam (70%)	Presentation (20%)	90	18	74	0.7	51.8
	Project (80%)	70	56			
TOTAL						**75.8**

[a]Modifications can be made to the any fields in the table by the instructor during the semester.

[b]The make-up exam grade replaces only the project grade in the table. The make-up exam will be based on the project. End of the semester total score is calculated accordingly.

[c]**A student who scores 49.99 or less out of 100 on the final exam, make-up exam or single course exam is considered unsuccessful and receives an F2 letter grade. (Article 37/2)**

Ankara University Grading Scale (Inclusive)

ANKARA UNIVERSITY GRADING SCALE (INCLUSIVE)			
POINTS	**GRADE**	**POINTS**	**GRADE**
100+	A+ (4.00)	65-69	C2 (2.5)
90-100	A (4.00)	60-64	C3 (2.00)
85-89	B1 (3.50)	50-59	F1 (1.50)
80-84	B2 (3.25)	49 and below	F2 (0.00)
75-79	B3 (3.00)		F3 (0.00)
70-74	C1 (2.75)		F4 (0.00)

- **In the master's programs, grades C1 (2.75) and above are successful, grades C2 (2.5) and below are unsuccessful.**
- **In the doctoral program, grades B3 (3.00) and above are successful, grades C1 (2.75) and below are unsuccessful.**

Course Workload

EXPECTED COURSE WORKLOAD*			
ACTIVITY	AMOUNT	TIME	WORKLOAD (HOUR)
Course Period	14	3	42
Non-Class Working Time (Pre-Study, Reinforcement)	14	2	28
Report (Including Preparation and Presentation Time)	0	0	0
Presentation/Seminar Preparation	1	20	20
Short Exam Preparation	0	0	0
Midterm Exam Preparation	0	0	0
Final Exam Preparation	0	0	0
Midterm Exam	0	0	0
Quiz	0	0	0
Homework	0	0	0
Hands-On	0	0	0
Project	1	100	100
Final Exam	0	0	0
TOTAL			190

*The times determined for the activities in the table reflect the average values. Performances above or below them are entirely up to the student.

Weekly Course Subjects

WEEKLY COURSE SUBJECTS*			
Week	**Topic**	**Preparation**	**Resources**
1	Introduction to Blockchain and Basics	Lecture Notes	Suggested Resources
2	Cryptography Basics	Lecture Notes	Suggested Resources
3	Financial Technologies and Crypto Economy	Lecture Notes	Suggested Resources
4	Blockchain 1.0 and Blockchain 2.0	Lecture Notes	Suggested Resources
5	Blockchain Use Cases and Applications	Lecture Notes	Suggested Resources
6	Blockchain Platforms	Lecture Notes	Suggested Resources
7	Blockchain Project Examples	Lecture Notes	Suggested Resources
8	**Midterm Exam**	**Lecture Notes**	**Suggested Resources**
9	Blockchain Software Development and Decentralized Autonomous Organizations (DOAs)	Lecture Notes	Suggested Resources
10	Challenges/Risks and Entrepreneurship in Blockchain	Lecture Notes	Suggested Resources
11	Other DLTs	Lecture Notes	Suggested Resources
12	Consensus Protocols	Lecture Notes	Suggested Resources
13	Smart Contracts	Lecture Notes	Suggested Resources
14	FAQs in Blockchain	Lecture Notes	Suggested Resources
15	**Final Exam**	**Lecture Notes**	**Suggested Resources**

*The weekly course topics in the table may vary depending on various factors (official holidays, class performance, etc.).

Important Academic Dates (2023 - 2024 Spring)

2023-2024 YEAR SPRING ACADEMIC CALENDAR	START DATE	END DATE
~~SCIENCE FIRE CEREMONY*~~	~~27 Eylül 2022~~	
~~Orientation Week~~	~~21 Eylül 2022~~	~~23 Eylül 2022~~
Enrollment Renewal	12 February 2024	18 February 2024
Material / Tuition Fee Payment Dates	12 February 2024	18 February 2024
Supervisor Approval	12 February 2024	19 February 2024
Head of Department Approval	20 February 2024	
Student-Supervisor Meetings	21 February 2024	22 February 2024
Course Addition and Drop	26 February 2024	03 March 2024
Supervisor Approval	26 February 2024	04 March 2024
Head of Department Approval	05 March 2024	
CLASSES	**19 February 2024**	**31 May 2024**

*Within the scope of the Orientation Program, the participation of first-year students who have just started our university is compulsory.

Important Academic Dates (2023 - 2024 Spring)

2023-2024 YEAR SPRING ACADEMIC CALENDAR	START DATE	END DATE
Midterm Exam Dates of 5(i) Courses Taught by Distance Education Method	22 April 2024	28 April 2024
FİNAL EXAMS	**01 June 2024**	**14 June 2024**
Final Exams Grade Entry	01 June 2024	21 June 2024
Final Exam Dates of 5(i) Courses Taught by Distance Education Method	03 June 2024	09 June 2024
RESIT EXAMS	**22 June 2024**	**02 July 2024**
Make-Up Exams Grade Entry	22 June 2024	03 July 2024
Make-Up Exam Dates of 5(i) Courses Taught by Distance Education Method	24 June 2024	30 June 2024
~~Three-Course Exam Application Dates~~	~~04 July 2024~~	~~05 July 2024~~
~~Three-Course Exam~~	~~09 July 2024~~	~~14 July 2024~~
~~Three-Course Exams Grade Entry~~	~~09 July 2024~~	~~17 July 2024~~

Academic Calendar

- **ANKARA UNIVERSITY 2023-2024 ACADEMIC YEAR SPRING ASSOCIATE AND UNDERGRADUATE ACADEMIC CALENDAR**

- https://oidb.ankara.edu.tr/wp-content/uploads/sites/91/2023/12/2023-2024_Yili_Akademik_Takvimi-02-Ekim.pdf

Academic Integrity Regulations

- Higher Education Institutions Student Discipline Regulation (Yükseköğretim Kurumları Öğrenci Disiplin Yönetmeliği)

  …….

  ARTICLE 5 – (1) **Actions that require reprimand are as follows**;

  …….

  d) Attempting to cheat in exams.

  ARTICLE 7 – (1) Actions requiring **suspension** from the higher education institutions **for one semester** are as follows;

  …….

  e) Cheating or **help to cheating** in exams

  …….

- Higher Education Institutions Law (Yükseköğretim Kurumları Kanunu)
- Ankara University Regulations (Ankara Üniversitesi Yönetmelikler)
- Ankara University Guidelines (Ankara Üniversitesi Yönergeler)
- Ankara University Principles/Principles of Practice (Ankara Üniversitesi İlkeler/Uygulama Esasları)

Academic Integrity

- Intellectual integrity is the most fundamental value of an academic community. **Students and faculty are expected to uphold the highest standards of honesty and integrity** in their scholarship. **No departure from the highest standards of intellectual integrity, whether by cheating, plagiarism, fabrication, falsification or aiding and abetting dishonesty by another person,** can be tolerated in a community of scholars. Such transgressions may result in action ranging from reduced grade or failure of a course to expulsion from the university or revocation of degree.
- It is the **responsibility of all students and faculty to know the policies on academic integrity** in the instructional units at Ankara University. Information about these policies and the appeals process is available from the appropriate administrative offices of the instructional units and the university web pages.

Procedural Rights of The Accused Student

- A student who is charged with academic dishonesty by an instructor, administrator, or another student may be assured that he/she has the right to a fair hearing of the charges and the evidence, the right to question witnesses, to invite witnesses on his/her behalf, and to introduce whatever other evidence may be relevant to the charge.

Code of Academic Conduct

- The University, like all communities, functions best when its members treat one another with honesty, fairness, respect, and trust. Therefore, an individual should realize that deception for the purpose of individual gain is an offense against the members of the community. Such dishonesty includes:
  - **Plagiarism:** taking credit for someone else's work or ideas, submitting a piece of work (for example, an essay, research paper, assignment, laboratory report) which in part or in whole is not entirely the student's own work without fully and accurately attributing those same portions to their correct source.
  - **Cheating:** using unauthorized notes, or study aids, or information from another student or student's paper on an examination; altering a graded work after it has been returned, then submitting the work for regrading; allowing another person to do one's work, then submitting the work under one's own name.

Code of Academic Conduct (cont'd)

- **Fabrication:** fabricating data; selectively reporting or omitting conflicting data for deceptive purposes; presenting data in a piece of work when the data were not gathered in accordance with guidelines defining the appropriate methods of collecting or generating data; failing to include a substantially accurate account of the method by which the data were gathered or collected.
- **Aiding and Abetting Dishonesty:** providing material or information to another person when it should reasonably be expected that such action could result in these materials or information being used in a manner that would violate this code of academic integrity.
- **Falsification of Records and Official Documents:** altering documents affecting academic records; forging a signature of authorization or falsifying or omitting necessary information on an official academic document, election form, grade report, letter of permission, petition, or any document designed to meet or exempt a student from an established College or University academic regulation; falsification or unauthorized altering of information in any official academic computer file.

Code of Academic Conduct (cont'd)

- **Identity Theft:** Assuming another person's identity or role through deception or without proper authorization. Communicating or acting under the guise, name, identification, email address, signature, or indicia of another person without proper authorization, or communicating under the rubric of an organization, entity, or unit that you do not have the authority to represent.
- **Misrepresentation and Other Acts of Academic Dishonesty:** Fraudulently obtaining and/or using academic materials that would give oneself an unfair advantage over other students or would deceive the person evaluating one's academic performance.
- **Attempts:** An attempt to commit an act prohibited by this code may be punished to the same extent as a completed violation.

Accessibility Issues

(http://engelsiz.ankara.edu.tr/)

It is my intention to support the full participation of all students in the learning process of this class. Students with disabilities that may restrict their full participation in course activities are encouraged to contact the Disability Support Office (DSO).

- **Contact:**

  Prof. Dr. Cevriye Ergul

  Coordinator of Ankara University Disability Support Office

  Ankara University

  Faculty of Educational Sciences

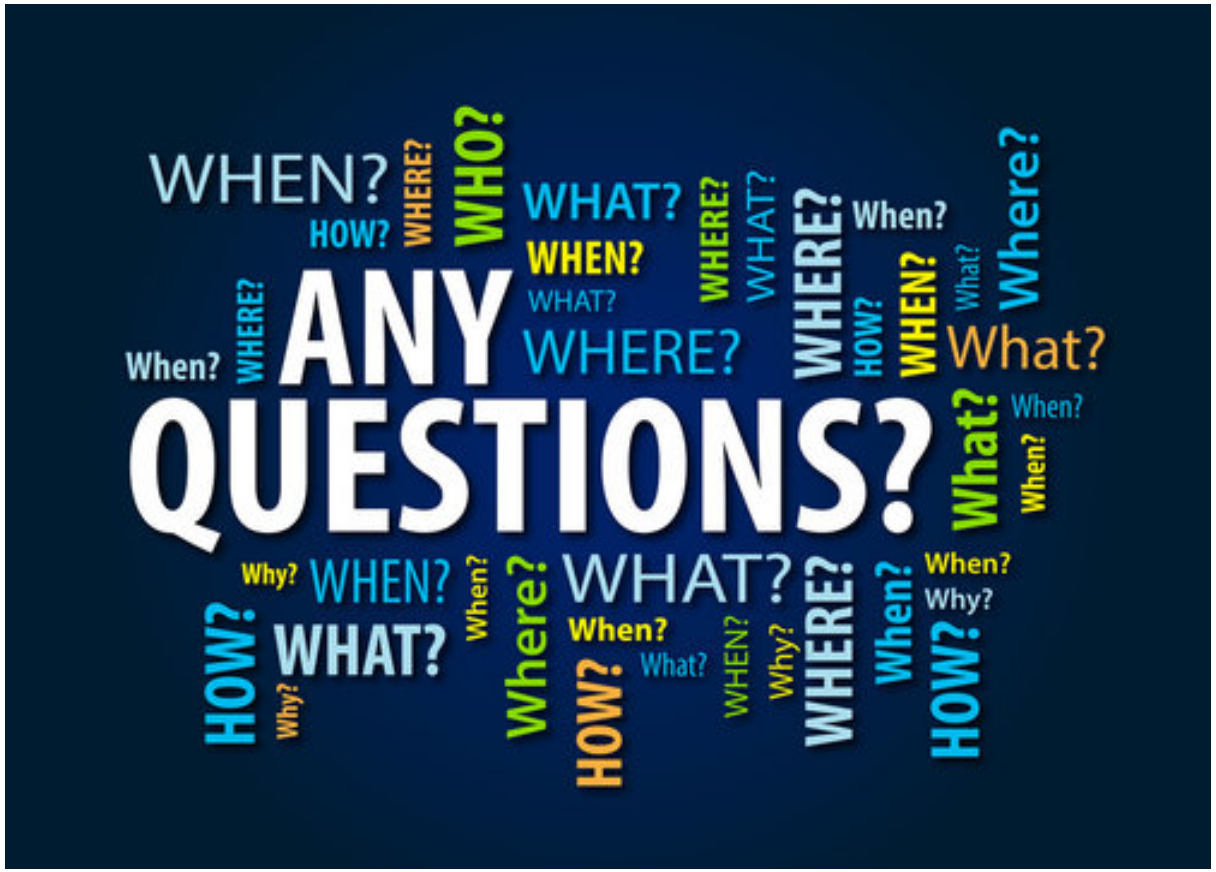
  Special Education Department

  06590 Cebeci / Ankara / Turkey

Notes

- I reserve the **right to modify** course policies, the course calendar, assignment point values, and due dates with the main goal of makings things easier for the students. I have to note that I rarely make changes. Any **extenuating circumstances** that **hinder your participation in the course** should be **discussed with me** as soon as those circumstances are known.
- Make-ups for graded activities may be arranged if an absence is caused by documented illness or personal emergency. A written explanation, including supporting documentation, must be submitted to me for exams (if available) except midterm and final; if the explanation is acceptable, then an alternative to the graded activity will be arranged.
- **Make-ups for midterm and final exams are at the discretion of the the Graduate School of Natural and Applied Sciences**. Whenever possible, make-up arrangements must be completed before the scheduled activity.
- **In all other cases not specified in this syllabus, you are deemed to have accepted that the instructor of the course has the right to make all decisions** unless a formal petition is submitted to the department chair within 2 days of the official start date of the course specified in the academic calendar.

Q/A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