

UNDERGRADUATE COUNCIL

Request for New Course

Originating unit requesting course: Computer Science

New course title: Object-Oriented Programming and Design Patterns

New course number: COSC 40453

Appropriate computer abbreviation if title is more than 30 spaces: OOP and Design Patterns

Prerequisites for new course:

COSC 30403

Effective date for course (semester and year): Fall 2022

Instructional methodology (Click in box to the left of the name to select a course type.)
(See departmental chairperson or deans for definition of type.):

- | | | | |
|--------------------------------------|---|---|---------------------------------------|
| <input type="checkbox"/> activity | <input type="checkbox"/> clinical | <input type="checkbox"/> directed study | <input type="checkbox"/> internship |
| <input type="checkbox"/> laboratory | <input checked="" type="checkbox"/> lecture | <input type="checkbox"/> lecture w/integrated lab | |
| <input type="checkbox"/> performance | <input type="checkbox"/> research | <input type="checkbox"/> seminar | <input type="checkbox"/> study abroad |

Description of new course (as it will appear in catalog copy):

COSC 40453 - Object-Oriented Programming and Design Patterns (3)
Prerequisites: COSC 30403

This course teaches how to write code of high quality by providing an in-depth coverage of object-oriented programming principles and techniques. Topics include but not limited to fundamental object-oriented programming concepts, software design principles (SOLID), Gang of Four (GoF) design patterns, coding standards, refactoring. Each topic will be explained by using diagrammatic notations Unified Modeling Language (UML) and numerous real-world code demos.

1. Submit a representative course syllabus that includes the following:

- a. A concise course description including the course purpose (e.g. fulfill part of university, college, or department mission, discipline requirement, program enrichment, etc.) and course instructional methodology (e.g. lecture, laboratory, lecture and laboratory, clinical, internship, etc.)
- b. the goals of the course;
- c. a clear statement of course expectations - essentially, what students shall be expected to do in order to satisfactorily complete the course at different performance levels (generally speaking, what does it take to get an A, B, C, etc.);
- d. a statement of the faculty member's policies on attendance, make-up work, missed exams, etc;
- e. information concerning major projects or papers and when these assignments must be completed by the students;
- f. information about the number and dates of the exams;
- g. statements reflecting TCU policy regarding accommodations under Americans with Disabilities Act (ADA) ([this disabilities statement](#) MUST be included *verbatim*) and university policy regarding academic misconduct ([this statement](#), while not required, may be used); and
- h. a statement indicating how the instructor can be reached and how office hour requirements will be met.

A [syllabus template](#), which includes these required elements and others, is available from the Koehler Center.

2. Faculty Resources: How will the unit provide faculty support for this course?

Describe how this course will impact other current departmental listings.

The department plans to offer this new course every year. One Computer Science professor with experience in this domain has taught this OOP course as an elective during Fall 2020. The feedback from students is very positive and many students strongly suggest the department offering this course regularly. This course can be used as an elective course for both COSC and CITE majors provided they have the prerequisites. The addition of this new course will better prepare our students in other computer science courses and future career.

3. Educational Resources: Will this course require additional resources not currently available (e.g., space, equipment, library)?

Yes

No

4. **If this course affects other units of the University, include a statement signed by chairperson of the affected unit(s).**
5. **If cross-listed, provide evidence of approval of all curriculum committees appropriate to both the originating and cross-listed units.**
6. **If this course is to be delivered online, include a letter from the Koehler Center stating that program administrators and identified faculty are working with the Koehler Center to fulfill TCU Distance Learning requirement.**



 Approval signature of chairperson of originating unit

Course Syllabus

COSC 40453 – Object-Oriented Programming and Design Patterns

Computer Science Department

Last update: October 19, 2021

Instructor Information

Instructor: Bingyang Wei
Office Location: Tucker Technology Center (TUC) 341D
E-mail: b.wei@tcu.edu
Office Phone: 817-257-4876
Office Hours: MW: 2pm – 3pm
 TuThur: 2pm-5:30pm
Response Time: Emails/Slack messages will be responded within 12 hours

Course Identification

Course Number: COSC 40453
Course Name: Object-Oriented Programming and Design Patterns
Class Times: MW 3:30pm - 4:50pm
Class Location:

Course Description/Overview

This course teaches students to write code of high quality by providing an in-depth coverage of object-oriented programming principles and techniques. Topics include (1) fundamental object-oriented programming concepts (Objects and Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Interfaces, Abstract Classes and Generics), (2) software design principles (Single Responsibility Principle, Open/Closed Principle, Liskov Substitution Principle, Interface Segregation Principle, Dependency Inversion Principle, Law of Demeter, Composition/Aggregate Reuse Principle), (3) design patterns (aka Gang of Four (GoF) patterns), (4) coding standards, (5) refactoring, (6) core features since Java 8. Each topic will be explained by using diagrammatic notations called Unified Modeling Language (UML) and numerous code demos.

Goals of the Course

Students completing this course are expected to be able to:

- 1) Demonstrate adeptness of object-oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance
- 2) Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching
- 3) Explain different OOP concepts, principles, design patterns and methods

- 4) Evaluate quality of programs written by others
- 5) Analyze and draw UML diagrams given a piece of open-source code written by others
- 6) Learn and apply new Java 8 features in programs, including lambda expression, stream APIs

Course Resources

Technologies

- TCU Online < <https://tcuonline.tcu.edu/> >
 - I will use TCU Online to distribute class materials electronically, please log into TCU Online system frequently to receive the updates.
- Email
 - The official TCU student email address will be used for all course notification. It is your responsibility to check your TCU email on a regular basis
- Slack App
 - I will also use Slack app to make class announcements, e.g. due day change, class cancellation, assignment clarification
 - Slack is also a good place for Q&A
 - PLEASE download the Slack app on both your phone and computer, and TURN ON its notification so you won't miss my announcement
 - It is your responsibility to check your Slack on a regular basis

Course Materials

TCU students are prohibited from sharing any portion of course materials (including videos, PowerPoint slides, assignments, or notes) with others, including on social media, without written permission by the course instructor. Accessing, copying, transporting (to another person or location), modifying, or destroying programs, records, or data belonging to TCU or another user without authorization, whether such data is in transit or storage, is prohibited. The full policy can be found at: <https://security.tcu.edu/polproc/usage-policy/>.

Violating this policy is considered a violation of Section 3.2.15 of the Student Code of Conduct (this policy may be found in the Student Handbook at <https://tcu.codes/code/index/>), and may also constitute Academic Misconduct or Disruptive Classroom Behavior (these policies may be found in the undergraduate catalog at <https://tcu.smartcatalogiq.com/current/Undergraduate-Catalog/Student-Policies/Academic-Conduct-Policy-Details>). TCU encourages student debate and discourse; accordingly, TCU generally interprets and applies its policies, including the policies referenced above, consistent with the values of free expression and First Amendment principles.

Required Course Textbook

- Thinking in Java 4th Edition by Bruce Eckel

Other Useful Resources

- Effective Java 3rd Edition by Joshua Bloch
- Intro to Java Programming, Comprehensive Version 10th Edition by Y. Daniel Liang

- Head First Design Patterns: A Brain-Friendly Guide 1st Edition by Eric Freeman, Bert Bates, Kathy Sierra, Elisabeth Robson

Your own notes

- Students learn best when they take notes

Grading Scheme

Grading Policy

Grades will be based on the following:

- Midterm: 20%
- Final: 20%
- Homework (5): 30%
- Quizzes (5): 10%
- Presentation (1): 10%
- Discussion Post (5): 10%

Late Assignments

Every assignment must be uploaded to TCU Online no later than the beginning of class on the due day.

Late assignment incurs a 15% penalty for each late day, including weekend and holidays. Assignments that are late more than TWO days will **NOT** be accepted (except for Official University Absences or medical reasons).

Students are responsible for making sure the assignment is uploaded properly. Failing to do so results in a ZERO for that assignment.

Missed Quizzes

If you miss a quiz, you CANNOT make it up (except for Official University Absences or medical reasons).

Missed Exams

Make up exams will be given only for Official University Absences or absences approved in advance by the instructor. Such absences include documented medical illnesses or family emergencies.

Attendance:

Students are expected to attend all lectures.

Questions on Grading

Requests for re-evaluation of points on exams, assignments, and projects must be made to the instructor within one week of receiving your grade and accompanied by a brief written description of the grading error you believe was made. After this time, grades are final. Resubmission for re-evaluation subjects the entire assignment for review. This means that if an error was made in your favor, you may lose points when re-submitting.

Grading Scale

The following grading scale will be used in this course (overall score will be rounded to the nearest whole number that is greater than the score)

Grade	Score
A	90–100
B	80–89
C	70–79
D	60–69
F	0–59

Policies

Academic Dishonesty:

You are encouraged to discuss assignments in general terms with your classmates or the instructor. However, you are not permitted to receive solutions from others or to read or copy part or all of others' solution to a problem. All work turned in must be your own. Any proven allegation of academic dishonesty will result in the offending student receiving a grade of zero for the assignment and reporting to the Dean's office. Two occurrences of cheating will result in the instructor recommending a course grade of F to the (Associate) Dean.

Student Access and Accommodation:

Texas Christian University affords students with disabilities reasonable accommodations in accordance with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. To be eligible for disability-related academic accommodations, students are required to register with the TCU Office of Student Access and Accommodation and have their requested accommodations evaluated. If approved for accommodations, students are required to discuss their official TCU Notification of Accommodation with their instructors. Accommodations are not retroactive and require advance notice to implement. The Office of Student Access and Accommodation is located in The Harrison, Suite 1200. More information on how to apply for accommodations can be found at <https://www.tcu.edu/access-accommodation/> or by calling Student Access and Accommodation at (817) 257-6567.

Anti-Discrimination and Title IX Information:

Statement on TCU's Discrimination Policy

TCU prohibits discrimination and harassment based on age, race, color, religion, sex, sexual orientation, gender, gender identity, gender expression, national origin, ethnic origin, disability, predisposing genetic information, covered veteran status, and any other basis protected by law, except as permitted by law. TCU also prohibits unlawful sexual and gender-based harassment and violence, sexual assault, incest, statutory rape, sexual exploitation, intimate partner violence,

bullying, stalking, and retaliation. We understand that discrimination, harassment, and sexual violence can undermine students' academic success and we encourage students who have experienced any of these issues to talk to someone about their experience, so they can get the support they need.

- Review TCU's Policy on Prohibited Discrimination, Harassment and Related Conduct or to file a complaint: <https://titleix.tcu.edu/title-ix/>.
- Learn about the Campus Community Response Team and Report a Bias Incident: <https://titleix.tcu.edu/campus-community-response-team/>

Statement on Title IX at TCU

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. It is my goal that you feel able to share information related to your life experiences in classroom discussions, in your written work, and in our one-on-one meetings. I will seek to keep any information you share private to the greatest extent possible. However, I have a mandatory reporting responsibility under TCU policy and federal law and I am required to share any information I receive regarding sexual harassment, discrimination, and related conduct with TCU's Title IX Coordinator. Students can receive confidential support and academic advocacy by contacting TCU's Confidential Advocate in the Campus Advocacy, Resources & Education office at <https://care.tcu.edu/> or by calling (817) 257-5225 or the Counseling & Mental Health Center at <https://counseling.tcu.edu/> or by calling (817) 257-7863. Alleged violations can be reported to the Title IX Office at <https://titleix.tcu.edu/student-toolkit/> or by calling (817) 257-8228. Should you wish to make a confidential report, the Title IX Office will seek to maintain your privacy to the greatest extent possible, but cannot guarantee confidentiality. Reports to law enforcement can be made to the Fort Worth Police Department at 911 for an emergency and (817) 335-4222 for non-emergency or TCU Police at (817) 257-7777.

Obligations to Report Conduct Raising Title IX or VAWA Issues

Mandatory Reporters: All TCU employees, except Confidential Resources, are considered Mandatory Reporters for purposes of their obligations to report, to the Coordinator, conduct that raises Title IX and/or VAWA (Violence Against Women Act) issues.

Mandatory Reporters are required to immediately report to the Coordinator information about conduct that raises Title IX and/or VAWA issues, including any reports, complaints or allegations of sexual harassment, discrimination and those forms of prohibited conduct that relate to nonconsensual sexual intercourse or contact, sexual exploitation, intimate partner violence, stalking and retaliation involving any member of the TCU community, except as otherwise provided within the Policy on Prohibited Discrimination, Harassment and Related Conduct.

Mandatory Reporters may receive this information in a number of ways. For example, a complainant may report the information directly to a Mandatory Reporter, a witness or third-party may provide information to a Mandatory Reporter, or a Mandatory Reporter may personally witness such conduct. A Mandatory Reporter's obligation to report such information to the Coordinator does not depend on how he/she received the information. Mandatory

Reporters must provide all known information about conduct that raises Title IX or VAWA issues to the Coordinator, including the identities of the parties, the date, time and location, and any other details. Failure of a Mandatory Reporters to provide such information to the Coordinator in a timely manner may subject the employee to appropriate discipline, including removal from a position or termination of employment.

Mandatory Reporters cannot promise to refrain from forwarding the information to the Coordinator if it raises Title IX or VAWA issues or withhold information about such conduct from the Coordinator. Mandatory Reporters may provide support and assistance to a complainant, witness, or respondent, but they should not conduct any investigation or notify the respondent unless requested to do so by the Coordinator.

Mandatory Reporters are not required to report information disclosed (1) at public awareness events (e.g., "Take Back the Night," candlelight vigils, protests, "survivor speak-outs," or other public forums in which students may disclose such information (collectively, public awareness events); or (2) during an individual's participation as a subject in an Institutional Review Board approved human subjects research protocol (IRB Research). TCU may provide information about Title IX rights and available resources and support at public awareness events, however, and Institutional Review Boards may, in appropriate cases, require researchers to provide such information to all subjects of IRB Research.

Relevant reporting phone numbers are: 911 for an emergency and (817) 335-4222 for non-emergency or TCU Police at (817) 257-7777.

Class Norms and Netiquette:

All members of the class are expected to follow rules of common courtesy in all email messages, discussions, and chats. If I deem any of them to be inappropriate or offensive, I will forward the message to the Chair of the department and appropriate action will be taken, not excluding expulsion from the course. The same rules apply online as they do in person. Be respectful of other students. Foul discourse will not be tolerated. Please take a moment and read the basic information about netiquette (<http://www.albion.com/netiquette/>).

Participating in the virtual realm, including social media sites and shared-access sites sometimes used for educational collaborations, should be done with honor and integrity. Please review TCU's guidelines on electronic communications (email, text messages, social networks, etc.) from the Student Handbook (<https://tcu.codes/policies/network-and-computing-policy/email-electronic-communications-social-networks/>).

Emergency Response Information:

Please review TCU's L.E.S.S. is More public safety video to learn about Lockdown, Evacuate, and Seek Shelter procedures. (<https://publicsafety.tcu.edu/less-is-more/>)

TCU's Public Safety website provides maps that show our building's rally point for evacuation and the seek shelter location. (<https://publicsafety.tcu.edu/>)

In the event of an emergency, call the TCU Police Department at 817-257-7777.

Download the Frogshield Campus Safety App on your phone.

(<https://police.tcu.edu/frogshield/>).

Academic Misconduct:

Academic Misconduct (Sec. 3.4 from the TCU Code of Student Conduct): Any act that violates the academic integrity of the institution is considered academic misconduct. The procedures used to resolve suspected acts of academic misconduct are available in the offices of Academic Deans and the Office of Campus Life and are also listed in detail in the Undergraduate Catalog and the Graduate Catalog. Specific examples include, but are not limited to:

- Cheating: Copying from another student's test paper, laboratory report, other report, or computer files and listings; using, during any academic exercise, material and/or devices not authorized by the person in charge of the test; collaborating with or seeking aid from another student during a test or laboratory without permission; knowingly using, buying, selling, stealing, transporting, or soliciting in its entirety or in part, the contents of a test or other assignment unauthorized for release; substituting for another student or permitting another student to substitute for oneself.
- Plagiarism: The appropriation, theft, purchase or obtaining by any means another's work, and the unacknowledged submission or incorporation of that work as one's own offered for credit. Appropriation includes the quoting or paraphrasing of another's work without giving credit therefore. [If you are using Turnitin, place information about your course ID/password or state that items will be checked as part of the TCU Online assignment submission process. If you want to use Turnitin as a spot check, indicate that you may use Turnitin for plagiarism detection.]
- Collusion: The unauthorized collaboration with another in preparing work offered for credit.
- Abuse of resource materials: Mutilating, destroying, concealing, or stealing such material.
- Computer misuse: Unauthorized or illegal use of computer software or hardware through the TCU Computer Center or through any programs, terminals, or freestanding computers owned, leased or operated by TCU or any of its academic units for the purpose of affecting the academic standing of a student.
- Fabrication and falsification: Unauthorized alteration or invention of any information or citation in an academic exercise. Falsification involves altering information for use in any academic exercise. Fabrication involves inventing or counterfeiting information for use in any academic exercise.
- Multiple submission: The submission by the same individual of substantial portions of the same academic work (including oral reports) for credit more than once in the same or another class without authorization.
- Complicity in academic misconduct: Helping another to commit an act of academic misconduct.
- Bearing false witness: Knowingly and falsely accusing another student of academic misconduct.

Course Schedule

This calendar represents my current plans and objectives. As we go through the semester, those plans **may need to change** to enhance the class learning opportunities. Such changes will be clearly communicated.

Week	Date	Topics
1	08/17	OOP Fundamentals – Objects and Classes, Memory Layout
	08/19	OOP Fundamentals – Information Hiding
2	08/24	OOP Fundamentals – Inheritance and Polymorphism
	08/26	OOP Fundamentals – Object Instantiation Process
3	08/31	OOP Fundamentals – Abstract Classes and Interfaces, Programming to Interface
	09/02	OOP Fundamentals – Generics
4	09/07	Java Reflection API
	09/09	UML and Software Design Principles (SOLID)
5	09/14	Software Design Principles (SOLID)
	09/16	Refactoring
6	09/21	Refactoring (cont.)
	09/23	Midterm
7	09/28	Design Patterns – Singleton
	09/30	Design Patterns – Factory Design Patterns – Builder
8	10/05	Design Patterns – Decorator, Bridge, Façade
	10/07	Design Patterns – Adapter
9	10/12	Design Patterns – Composite, Flyweight
	10/14	Design Patterns – Proxy
10	10/19	Design Patterns – Observer
	10/21	Design Patterns – Chain of Responsibility Last day to drop (October 22) P/NC date (October 23)
11	10/26	Design Patterns – Strategy
	10/28	Design Patterns – Iterator, Template
12	11/02	Design Patterns – State
	11/04	Design Patterns – Memento
13	11/09	Tomcat Source Code
	11/11	Tomcat Source Code (cont.)
14	11/16	Spring IoC Source Code
	11/18	Spring IoC Source Code (cont.)
15	11/23	Thanksgiving holiday
	11/25	
16	11/30	Spring AOP Source Code

Week	Date	Topics
	12/2	Spring AOP Source Code (cont.)
17	12/7	Last Lecture
	12/9	Final exam: 2:00pm-4:30pm