

UNDERGRADUATE CURRICULUM CHANGE MEMO

Date: Nov. 4, 2019

From: Luc Longpré, Undergraduate Program Director, Computer Science 

Through: Dr. Ann Gates, Chair, Dept. of Computer Science 

Through: Dr. Louis Everett, Chair, Curriculum Committee, College of Engineering 

Through: Dr. Theresa Maldonado, Dean, College of Engineering 

To: Ms. Carla Ellis, Chair Undergraduate Curriculum Committee 

Proposal Title: Computer Science curriculum changes for the Fall 2020 catalog

The Department of Computer Science proposes the following changes to the Undergraduate Curriculum and to the Bachelor of Science in Computer Science degree plan:

- 1) The department proposes to add new courses: CS 1191 (Special Topics in Computing) and CS 1291 (Special Topics in Computing.)

Rationale. The department already offers CS 1190 and CS 1290, Special Topics in Computing at the freshman level. These courses can count (with restrictions) towards the technical electives in the BS in CS. The department also needs the possibility of teaching Special Topics courses at the lower division level that should not count towards the technical electives, such as pilot courses and/or courses that don't contain a substantial amount of technical material.

- 2) The department proposes to add new courses: CS 1110 (Introduction to Problem Solving,) CS 1120 (Computational Thinking in Problem Solving) and CS 2210 (Algorithmic Thinking in Problem Solving.) and include the three courses as eligible towards their technical electives:

Rationale. The Problem Solving courses were developed to address industry's need for improved problem-solving skills, incorporating consistent, deep collaboration with Google technical staff. The intent is to instill complementary problem solving, computational thinking skills, and logical reasoning needed to succeed in computer science, and make this content available across different student populations at various stages in their academic pathways. Advanced problem solving prepares students for competitive interviews. The courses create opportunities to learn across academic levels, and create new student

communities, mentorship opportunities, and social connections to support retention.

- 3) The department proposes to add new courses: CS 2101 (Discrete Structures I) and CS 2202 (Discrete Structures II.)

Rationale. The two courses have been offered as special topics every semester starting Fall 2018 as an alternate prerequisite for courses requiring MATH 2300 (Discrete Mathematics.) The course outcomes are similar to those of MATH 2300, but the contents targets more directly the interests of Computer Science students. Also, this allows students to get one credit in their first year. The CS department chair has discussed this proposal with the Math department chair who agreed, under the conditions that the course has a different title and is taught by professors with a strong Math background.

- 4) The department proposes to add new course: CS 4175 (Parallel Computing) as a required course for the BSCS degree.

Rationale. The area of Parallel and Distributed Computing has been added as a new competency required for accrediting computing programs by the Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology (ABET). The current BSCS curriculum lacks a course focused on this area, and adding this new course will ensure that the BSCS program meets CAC/ABET accreditation criteria.

- 5) The department proposes to update the list of courses that can count as technical electives in the BS in CS degree plan.

Rationale:

The list needs to be updated with respect to new courses. For ABET accreditation purpose, the degree plan needs 12 credit hours of junior/senior level courses, so we need to limit the freshman/sophomore courses that counts towards technical electives to 3 hours. In addition, the department requires the majority of the technical elective courses taken by the students in the BS in CS to be junior/senior courses with well-defined course outcomes.

Current catalog:

Technical Electives: 15 hours from the following: CS 1190, CS 1290, CS 3000 or 4000 level course. No more than six credit hours of CS xx90, CS 4181, CS 4371, CS 4x73, CS 4392 and/or CS 4393 (in any combination) can count for technical electives.

New catalog:

Technical Electives: 15 hours from the following: CS 1110, CS 1120, CS 2210, CS 1190, CS 1290, CS 3000 or 4000 level course. No more than three credit hours of CS 1xxx and CS 2xxx can count for technical electives. No more than six credit hours of CS 1xxx, CS 2xxx, CS 4390, CS 4181, CS 4371, CS 4x73, CS 4392 and/or CS 4393 (in any combination) can count for technical electives.

- 6) The department proposes to modify some course prerequisites.

Rationale. While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 (or equivalently the new courses CS 2101 and CS 2202) as prerequisite for several courses at the junior/senior level. Also, remove CS 2402 as an alternate prerequisite, as the course has not been taught for over 10 years. The new courses (CS 2101 and CS 2202) should also be added as a MATH 2300 alternate prerequisite.

- 7) The department proposes to modify the CS 1301 course description.

Rationale. The course objectives have not changed, but the new description fixes some typos and is more consistent with other CS course descriptions.

CURRICULUM CHANGE PROPOSAL

APPROVAL PAGE

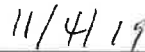
Proposal Title: Computer Science curriculum changes for the Fall 2020 catalog

College: Engineering

Department: Computer Science

DEPARTMENT CHAIR

I have read the enclosed proposal and approve this proposal on behalf of the department.

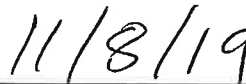


Signature

Date

COLLEGE CURRICULUM COMMITTEE CHAIR

I have read the enclosed documents and approve the proposal on behalf of the college curriculum committee.



Signature

Date

COLLEGE DEAN

I have read the enclosed documents and approve the proposal on behalf of the college. I certify that the necessary funds will be allocated by the college in support of this proposal.



Signature

Date

Graduate Council/Undergraduate Curriculum Committee

Council Action: ☐ Approved ☐ Returned to the College

Date of Action Report: _____

Signature, Chairman

Date

COURSE ADD

All fields below are required

College : Engineering

Department : Computer Science

Rationale for adding the course:

This course has the same purpose as CS 1190, but will not be allowed to count towards technical electives in the Bachelor of Science in Computer Science degree plan.

All fields below are required

Subject Prefix and # CS 1191

Title (29 characters or fewer): Special Topics in Computing

Dept. Administrative Code : 0720

CIP Code 110701

Departmental Approval Required ☒ Yes ☐ No

Course Level ☒ UG ☐ GR ☐ DR ☐ SP

Course will be taught: ☒ Face-to-Face ☒ Online ☒ Hybrid

How many times may the course be taken for credit? (Please indicate 1-9 times): 3

Should the course be exempt from the "Three Repeat Rule?" ☐ Yes ☒ No

Grading Mode: ☒ Standard ☐ Pass/Fail ☐ Audit

Description (600 characters maximum):

Selected topics of current interest in computer science, accessible by any calculus ready student.

Contact Hours (per week): 1 Lecture Hours Lab Hours Other

Types of Instruction (Schedule Type): Select all that apply

- | | |
|---|--|
| ☒ A Lecture | ☐ H Thesis |
| ☐ B Laboratory | ☐ I Dissertation |
| ☐ C Practicum | ☐ K Lecture/Lab Combined |
| ☐ D Seminar | ☐ O Discussion or Review (Study Skills) |
| ☒ E Independent Study | ☐ P Specialized Instruction |
| ☐ F Private Lesson | ☐ Q Student Teaching |

Fields below if applicable

If course is taught during a part of term in addition to a full 16-week term please indicate the length of the course (ex., 8 weeks): Any format

TCCN (Use for lower division courses) :

Prerequisite(s):		
Course Number/ Placement Test	Minimum Grade Required/ Test Scores	Concurrent Enrollment Permitted? (Y/N)
MATH 1508 or equivalent		

Corequisite Course(s):

Equivalent Course(s):

Restrictions:	
Classification	
Major	LDCS or CS

CS 1191 Special Topics in Computing

Course Objectives: Upon successful completion of the course, you will know and be able to use the basic algebra of sets and of logic. You will be able to identify and use common classes of relations. You will know the basic properties of arbitrary functions. You will be familiar with induction and recursion, and their relevance to computer science. You will be introduced to the concept of recurrence relations. You will have a general understanding of why knowing how to solve counting problems involving combinations and permutations is important in computer science. In this class, students will be expected to be active learners, and develop an understanding of the essential connections/relevance of the content of this course with their computer science education. Finally, they will develop team-working skills, critical-thinking skills, and professionalism.

Prerequisite: MATH 1508 with a grade of C or better.

Logistics: Lecture sessions: T 12:00p.m.-1:20p.m. and R 12:00p.m.-12:50 p.m. in CCSB G.0208
Instructor: Dr. Julio Urenda – jcurenda@utep.edu – office room: LIB 504
Office hours: TWR 8:30a.m.-9:00a.m. or by appointment

Textbook: *Discrete Math*, by Zybooks, available. To subscribe to your textbook, please follow the instructions below:

1. **Sign in or create an account at learn.zybooks.com**
2. **Enter zyBook code: UTEPCS1190Spring2019**
3. **Subscribe**

Communication platform: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: <https://piazza.com/utep/spring2019/cs1190/home>

Grading

Grades are communicated to students in a timely manner. It is the students' responsibility to keep track of their grades by compiling the grades they receive. Your semester grade will be based on a combination of homework assignments, weekly quizzes, class participation, 1 mid-term exam, and a final exam.

The approximate percentages are as follows:

- 30% Homework
- 20% Quizzes
- 45% Exams (1 mid-term exam and 1 final exam)

- 5% Class participation (includes on-time lecture attendance, active participation in class, completion of any quizzes for attendance and survey purposes)

The nominal percentage-score-to-letter-grade conversion for CS 1190 is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- Below 60% is an F

Note: Regardless of your standing in the class at that time, you need to earn a 65 or better at the final exam to pass the course.

Expectations

Class Participation: Attendance at and participation in all lecture sessions are critical factors of your success in this course.

Students should be **on time** for all scheduled sessions and **attend the entire session**. Attendance will be taken at every session (at first you will have to sign in but as time goes the instructor will know you and mark you present without your help) and will count towards your class participation grade.

Students should **notify the instructor prior to missing a session** if at all possible, and certainly right after if earlier was not possible. The instructor will allow two unexcused absences per semester before having the option to deduct points from the final grade (5 points per subsequent unexcused absence).

It is the student's responsibility to obtain the content covered during missed class(es). Participation points also include completing post-lecture and post-labs online quizzes (when requested) that are administered as surveys to monitor students' overall progress and potential struggles.

Quizzes: The purpose of each **quiz** is to ensure that students are staying current with the weekly reading and homework assignments, and to verify that they have acquired the skills developed in class. **Quizzes will be administered approximately once a week. There will be no make-up on missed quizzes.**

Homework: Reading and homework assignments will be announced in class and/or posted on piazza (under the Homework section of Resources). If you miss a lecture session, it is your responsibility to find out what you missed. You should expect to spend at least two hours per week outside of lecture on reading and homework assignments and reviews. Most of your homework will be work assigned on your online zybook: completing the assigned activities on time will be crucial to your success in the class (since these activities prepare you for classwork) and to getting a good grade (since late completion will be penalized).

Exams: There will be one midterm exam and one final exam. These exams together will weigh 50% of your overall final grade for CS1190. Because the exams contribute so heavily to your total grade, it is vital that you do well on them. If you have test-taking difficulties in general or if you have difficulties with our tests in particular, please come and let me know as soon as possible and/or request appropriate accommodation from UTEP's Center for Accommodation and Students' Services. The purpose of the **midterm exam** is to allow you to demonstrate mastery of course concepts covered thus far during the semester. The mid-term exam will take place during the regular lecture session and is tentatively scheduled around half of the minimester. Make-up exams will be given only in extremely

unusual circumstances. If you must miss an exam, please meet with an instructor, BEFORE the exam. The **final exam** will be comprehensive. You must score 65% or better on the final exam to pass this course. If you have a scheduling conflict (e.g., if you are taking a final at EPCC) or if you are scheduled for three final exams in one day, see your instructor in advance for accommodation, **before the end of the minimester**. The final exam schedule is available online. It is the students' responsibility to keep informed.

Resources

Special Accommodations: If you have a disability and need classroom accommodations, please contact the Center for Accommodations and Support Services (CASS) at 747-5148 or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass. CASS' staff are the only individuals who can validate and if need be, authorize accommodations for students with disabilities.

Scholastic Dishonesty: Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, and submission for credit of any work or materials that are attributable to another person.

Cheating is: Copying from the test paper of another student
Communicating with another student during a test to be taken individually
Giving or seeking aid from another student during a test to be taken individually
Possession and/or use of unauthorized materials during tests (i.e. crib notes, class notes, books, etc.)
Substituting for another person to take a test
Falsifying research data, reports, academic work offered for credit

Plagiarism is: Using someone's work in your assignments without the proper citations
Submitting the same paper or assignment from a different course, without direct permission of instructors
To avoid plagiarism, see: <http://sa.utep.edu/osccr/wp-content/uploads/sites/8/2012/09/Avoiding-Plagiarism.pdf>

Collusion is: Unauthorized collaboration with another person in preparing academic assignments

Important! When in doubt on any of the above, please contact your instructor to check if you are following authorized procedure.

Detailed Learning Outcomes

Level 1: Knowledge and Comprehension. Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. On successful completion of this course, students will be able to describe, at a high level:

1. Counting and its relevance to computer science
2. Recurrence relations

Level 2: Application and Analysis. Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details. Upon successful completion of this course, students will be able:

1. Logical reasoning for propositional logic: truth tables.
2. Predicate logic, including writing predicate logic expressions and basic reasoning: translation and

inference rules.

3. Sets and functions: union, intersection, complement and product; injective, surjective and bijective functions; and combinations and permutations.
4. Induction and recursion: construct recurrence relations and basic proofs by mathematical induction.

Level 3 Outcomes: Synthesis and Evaluation. Level 3 outcomes are those in which the student can apply the material in new situations. This is the highest level of mastery. On successful completion of this course, students will be able to use the syntax and semantics of a higher-level language to express solutions to programming problems, including the pseudocode correct use of:

1. Propositional logic: propositions and operators, evaluation of propositions, conditional statements, and logical equivalence
2. Induction and recursion: identify problems that can be modeled by recurrence relations hypothesize and prove new properties.

Tentative Schedule:

Week	Topic
1	propositional logic and truth tables
1	logical connectives, sets and their operators
2	functions and binary relations
2	equivalence relations and testing
3	Inductively defined sets and functions
3	Inductively defined sets and functions
4	Recurrence relations: sequences (Recursion)
4	Recurrence relations: properties (Recursion)
5	Review
5	Mathematical Induction and first order logic
6	Mathematical Induction and first order logic
6	Counting: the three fundamental principles
7	Counting: combinations and permutations
7	Final Review
8	Final Exam

COURSE ADD

All fields below are required

College : Engineering

Department : Computer Science

Rationale for adding the course:

This course has the same purpose as CS 1290, but will not be allowed to count towards technical electives in the Bachelor of Science in Computer Science degree plan.

All fields below are required

Subject Prefix and # CS 1291

Title (29 characters or fewer): Special Topics in Computing

Dept. Administrative Code : 0720

CIP Code 110701

Departmental Approval Required ☒ Yes ☐ No

Course Level ☒ UG ☐ GR ☐ DR ☐ SP

Course will be taught: ☒ Face-to-Face ☒ Online ☒ Hybrid

How many times may the course be taken for credit? (Please indicate 1-9 times): 2

Should the course be exempt from the "Three Repeat Rule?" ☐ Yes ☒ No

Grading Mode: ☒ Standard ☐ Pass/Fail ☐ Audit

Description (600 characters maximum):

Selected topics of current interest in computer science, accessible by any calculus ready student.

Contact Hours (per week): 2 Lecture Hours Lab Hours Other

Types of Instruction (Schedule Type): Select all that apply

- | | |
|---|--|
| ☒ A Lecture | ☐ H Thesis |
| ☐ B Laboratory | ☐ I Dissertation |
| ☐ C Practicum | ☐ K Lecture/Lab Combined |
| ☐ D Seminar | ☐ O Discussion or Review (Study Skills) |
| ☒ E Independent Study | ☐ P Specialized Instruction |
| ☐ F Private Lesson | ☐ Q Student Teaching |

Fields below if applicable

If course is taught during a part of term in addition to a full 16-week term please indicate the length of the course (ex., 8 weeks): Any format

TCCN (Use for lower division courses) :

Prerequisite(s):		
Course Number/ Placement Test	Minimum Grade Required/ Test Scores	Concurrent Enrollment Permitted? (Y/N)
MATH 1508 or equivalent		

Corequisite Course(s):

Equivalent Course(s):

Restrictions:	
Classification	
Major	LDCS or CS

CS 1291 Special Topics in Computing

Course Objectives: Upon successful completion of the course, you will know and be able to use the fundamental techniques of counting. You will be able to identify and use common classes of graphs and trees. You will reinforce your familiarity with induction and recursion, and their relevance to computer science. You will have a general understanding of why knowing how to model problems using graphs and trees is crucial in many computer science areas. In this class, students will be expected to be active learners, and develop an understanding of the essential connections/relevance of the content of this course with their computer science education. Finally, they will develop team-working skills, critical-thinking skills, and professionalism.

Prerequisite: CS 1190 and MATH 1411 with a grade of C or better. This is only a mathematical maturity requirement.

Logistics:

Lecture sessions: M-R 4:20p.m.- 6:15 p.m. in CCSB 1.0702

Instructor: Dr. Julio Urenda – jcurenda@utep.edu – office room: LIB 504

Office hours: TWR 12:00p.m.-1:00p.m. or by appointment

Textbook: *Discrete Math*, by Zybooks, available. To subscribe to your textbook, please follow the instructions below:

UTEP-CS1290-Summer2019

Communication platform: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: <https://piazza.com/utep/spring2019/cs1290/home>

Grading

Grades are communicated to students in a timely manner. It is the students' responsibility to keep track of their grades by compiling the grades they receive. Your semester grade will be based on a combination of homework assignments, weekly quizzes, class participation, 1 mid-term exam, and a final exam.

The approximate percentages are as follows:

- 40% Homework
- 15% Quizzes

- 40% Exams (1 mid-term exam and 1 final exam)
- 5% Attendance and active participation

The nominal percentage-score-to-letter-grade conversion for CS 1290 is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- Below 60% is an F

Note: Regardless of your standing in the class at that time, you need to earn a 65 or better at the final exam to pass the course.

Expectations

Class Participation: Attendance at and participation in all lecture sessions are critical factors of your success in this course.

Students should be **on time** for all scheduled sessions and **attend the entire session**. Attendance will be taken at every session (at first you will have to sign in but as time goes the instructor will know you and mark you present without your help) and will count towards your class participation grade.

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Homework: Reading and homework assignments will be announced in class and/or posted on piazza (under the Homework section of Resources). If you miss a lecture session, it is your responsibility to find out what you missed. You should expect to spend at least two hours per week outside of lecture on reading and homework assignments and reviews. Most of your homework will be work assigned on your online zybook: completing the assigned activities on

time will be crucial to your success in the class (since these activities prepare you for classwork) and to getting a good grade (since late completion will be penalized). Your homework grade will be a combination of the zybook homework and additional assigned work from class.

Exams: There will be one midterm exam and one final exam. These exams together will weigh 50% of your overall final grade for CS1190. Because the exams contribute so heavily to your total grade, it is vital that you do well on them. If you have test-taking difficulties in general or if you have difficulties with our tests in particular, please come and let me know as soon as possible and/or request appropriate accommodation from UTEP's Center for Accommodation and Students' Services.

The purpose of the midterm exam is to allow you to demonstrate mastery of course concepts covered thus far during the semester. The mid-term exam will take place during the regular lecture session and is tentatively scheduled around half of the minimester. Make-up exams will be given only in extremely unusual circumstances. If you must miss an exam, please meet with an instructor, BEFORE the exam.

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Scholastic Dishonesty: Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, and submission for credit of any work or materials that are attributable to another person.

Cheating is: Copying from the test paper of another student
Communicating with another student during a test to be taken individually
Giving or seeking aid from another student during a test to be taken individually
Possession and/or use of unauthorized materials during tests (i.e. crib notes, class notes, books, etc.)
Substituting for another person to take a test
Falsifying research data, reports, academic work offered for credit

Plagiarism is: Using someone's work in your assignments without the proper citations
Submitting the same paper or assignment from a different course, without direct permission of instructors

To avoid plagiarism, see: <http://sa.utep.edu/osccr/wp-content/uploads/sites/8/2012/09/Avoiding-Plagiarism.pdf>

Collusion is: Unauthorized collaboration with another person in preparing academic assignments

Important! When in doubt on any of the above, please contact your instructor to check if you are following authorized procedure.

Detailed Learning Outcomes

Level 1: Knowledge and Comprehension. Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. On successful completion of this course, students will be able to describe, at a high level:

1. Multiple types of graphs and trees, and how they each are relevant to computer science

Level 2: Application and Analysis. Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details. Upon successful completion of this course, students will be able:

1. Articulate what counting is and how relevant it is to computer science
2. Apply the basic principles of counting.
3. Model combinatorial problems using graphs and trees.
4. Describe various types of graphs and their common properties.
5. Identify trees as a fundamental structure in modeling computer science problems.

Level 3 Outcomes: Synthesis and Evaluation. Level 3 outcomes are those in which the student can apply the material in new situations. This is the highest level of mastery. On successful completion of this course, students will be able to:

1. Reason about the complexity of algorithms using counting techniques and properties of graphs
2. Model computer science problems using graphs and trees
3. Lay out a proof plan for existential and universal proofs, be able to identify shortcomings of some types of proving strategies
4. Identify an inductive structure of a set: use it to conduct an inductive proof and to set a recurrence relation.

COURSE ADD

All fields below are required

College : Engineering

Department : Computer Science

Rationale for adding the course:

This course has been taught many times as a special topics course and the department intends to continue teaching it.

All fields below are required

Subject Prefix and # CS 1110

Title (29 characters or fewer): Intro to Problem Solving

Dept. Administrative Code : 0720

CIP Code 110701

Departmental Approval Required ☒ Yes ☐ No

Course Level ☒ UG ☐ GR ☐ DR ☐ SP

Course will be taught: ☒ Face-to-Face ☒ Online ☒ Hybrid

How many times may the course be taken for credit? (Please indicate 1-9 times): 1

Should the course be exempt from the "Three Repeat Rule?" ☐ Yes ☒ No

Grading Mode: ☒ Standard ☐ Pass/Fail ☐ Audit

Description (600 characters maximum):

The student will learn a systematic approach to problem solving, including questioning, reflecting, consideration of different perspectives and defending the selected solution.

Contact Hours (per week): 1 Lecture Hours Lab Hours Other

Types of Instruction (Schedule Type): Select all that apply

- | | |
|---|--|
| ☒ A Lecture | ☐ H Thesis |
| ☐ B Laboratory | ☐ I Dissertation |
| ☐ C Practicum | ☐ K Lecture/Lab Combined |
| ☐ D Seminar | ☐ O Discussion or Review (Study Skills) |
| ☒ E Independent Study | ☐ P Specialized Instruction |
| ☐ F Private Lesson | ☐ Q Student Teaching |

Fields below if applicable

If course is taught during a part of term in addition to a full 16-week term please indicate the length of the course (ex., 8 weeks): Any format

TCCN (Use for lower division courses) :

Prerequisite(s):		
Course Number/ Placement Test	Minimum Grade Required/ Test Scores	Concurrent Enrollment Permitted? (Y/N)

Corequisite Course(s):

Equivalent Course(s):

Restrictions:	
Classification	
Major	LDCS or CS

CS 1110 Introduction to Problem Solving

Spring 2019

1. General Information

Instructor:

Diego Aguirre

Email: daguirre6@utep.edu

Web: www.aguirrediego.com

Office hours: TR 3:00p.m. – 4:00p.m. or by appointment.

Office location: CCSB 3.1022

Gmail: diego4.aguirre@gmail.com

Meeting Times

TR 4:30p.m. – 5:20p.m. in CCSB 1.0702

Class Website

Blackboard

2. Learning Objectives

COMPETENCY
Level 1: Knowledge and Comprehension
1.1 Describe the IDEAL problem-solving approach.
1.2 Describe the difference between clarifying and probing questions.
Level 2: Application and Analysis
2.1 Apply the IDEAL problem-solving approach to a set of similar problems. - Identify the steps that have been employed - Articulate assumptions/presumptions about the problem

2.2 Break down a problem into its key components (set boundaries within a problem statement)
2.3 Assess the benefits and risks of given solutions.
2.4 Apply techniques to identify resources needed to solve a given problem.
2.5 Formulate clarifying or probing questions. • Able to identify what you know / don't know / need to know
2.6 Explore possible courses of action to solve the problem based on new/improved problem statement. • Brainstorm • Analyze options • Identify resources (e.g., data and expertise) that are necessary to attack the problem.
2.7 Analyze and prioritize options.
Level 3: Synthesis and Evaluation
3.1 Negotiate a new problem statement based on information obtained by questioning. • Rephrase a problem description to demonstrate understanding. • Compare and contrast your own personal problem statement from the original statement.
3.2 Reflect on one's own progress as a problem solver
3.3 Articulate different perspectives to solving a problem.
3.4a Articulate and defend the solution to a problem over other options [Product]. 3.4b Defend decisions (prioritizing, improved problem solving) [Process].

3. Policies and Other Information

Prerequisites: No official pre-requisites

Grading: Final grades will be based on a combination of homework assignments, in-class attendance and performance, homework assignments, presentations, one midterm project, and a final project. The approximate weights are as follows:

- 10% - In-class attendance and performance
- 35% - Homework assignments
- 20% - Presentations
- 15% - Midterm Project/Presentation
- 20% - Final Project/Presentation

The nominal percentage-score-to-letter-grade conversion is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- below 60% is an F

There will be a 15% penalty for every day that an assignment is late.

Collaboration: Collaboration among students is strongly encouraged.

It is OK to:

- Talk with other students about approaches and ideas.
- Get ideas and extra information from the internet, books, etc.

However, it is not OK to:

- Share homework answers.
- Look at other people's reports
- Look for problems' solutions online

Cellular telephones are prohibited during lecture and lab sessions.

Laptops and tablets are usually not allowed during lectures. If you wish to use yours to take notes (which is discouraged) you must obtain permission from the instructor.

Attendance policy: Students are expected to attend all lectures.

Disabilities: If you feel that you may have a disability that requires accommodation, contact the Center for Accommodations and Support Services (CASS) at 747-5148, go to Room 106E Union, or email cass@utep.edu

4. Standards of Conduct and Academic Dishonesty

You are expected to conduct yourself in a professional and courteous manner, as prescribed by the UTEP Standards of Conduct:

http://admin.utep.edu/portals/68/Standards_of_Conduct_2013-2014.pdf

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, submission for credit of any work or materials that are attributable to another person.

Cheating is:

- Copying from the test paper of another student
- Communicating with another student during a test to be taken individually
- Giving or seeking aid from another student during a test to be taken individually
- Possession and/or use of unauthorized materials during tests (i.e. crib notes, class notes, books, etc.)
- Substituting for another person to take a test
- Falsifying research data, reports, academic work offered for credit

Plagiarism is:

- Using someone's work in your assignments without the proper citations
- Submitting the same paper or assignment from a different course, without direct permission of instructors

Avoiding plagiarism: <https://www.utep.edu/student-affairs/osccr/Files/docs/Avoiding-Plagiarism.pdf>

Collusion is:

- Unauthorized collaboration with another person in preparing academic assignments

COURSE ADD

All fields below are required

College : Engineering

Department : Computer Science

Rationale for adding the course:

This course has been taught many times as a special topics course and the department intends to continue teaching it.

All fields below are required

Subject Prefix and # CS 1120

Title (29 characters or fewer): Computational Thinking

Dept. Administrative Code : 0720

CIP Code 110701

Departmental Approval Required ☒ Yes ☐ No

Course Level ☒ UG ☐ GR ☐ DR ☐ SP

Course will be taught: ☒ Face-to-Face ☒ Online ☒ Hybrid

How many times may the course be taken for credit? (Please indicate 1-9 times): 1

Should the course be exempt from the "Three Repeat Rule?" ☐ Yes ☒ No

Grading Mode: ☒ Standard ☐ Pass/Fail ☐ Audit

Description (600 characters maximum):

Problem solving using computational thinking involves formulating problems in a manner that enables the use of computers and related tools to find the solution. The activities will focus on developing abilities to identify specific modules in a difficult problem, and build solutions using a bottom-up method.

Contact Hours (per week): 1 Lecture Hours Lab Hours Other

Types of Instruction (Schedule Type): Select all that apply

- | | |
|---|--|
| ☒ A Lecture | ☐ H Thesis |
| ☐ B Laboratory | ☐ I Dissertation |
| ☐ C Practicum | ☐ K Lecture/Lab Combined |
| ☐ D Seminar | ☐ O Discussion or Review (Study Skills) |
| ☒ E Independent Study | ☐ P Specialized Instruction |
| ☐ F Private Lesson | ☐ Q Student Teaching |

Fields below if applicable

If course is taught during a part of term in addition to a full 16-week term please indicate the length of the course (ex., 8 weeks): Any format

TCCN (Use for lower division courses) :

Prerequisite(s):		
Course Number/ Placement Test	Minimum Grade Required/ Test Scores	Concurrent Enrollment Permitted? (Y/N)
(CS 1301 AND CS 1101) OR CS 1401	C	N

Corequisite Course(s):

Equivalent Course(s):

Restrictions:	
Classification	
Major	

CS 1120 - Computational Thinking in Problem Solving

Spring 2019

1. General Information

Instructor:

Diego Aguirre

Email: daguirre6@utep.edu

Web: www.aguirrediego.com

Office hours: TR 3:00p.m. – 4:00p.m.

Office location: CCSB 3.1022

Gmail: diego4.aguirre@gmail.com

Meeting Times

F 10:00a.m. – 11:50a.m. in CCSB 1.0704

2. Objectives and Outcomes

Problem solving using computational thinking involves formulating problems in a manner that enables the use of computers and related tools to find the solution. When employing computational thinking techniques, being aware of the specific characteristics of constructs and features and choosing the appropriate tool to solve the problem is essential. In this course, students would build-on their problem-solving skills to address complex real-world problems. The activities will focus on developing abilities to identify specific modules in a difficult problem, and build solutions using a bottom-up method.

Learning Objectives

COMPETENCY
Level 1: Knowledge and Comprehension
1.1 Define what it means to use computational thinking to solve a problem.
1.2 Describe problem-solving strategies/approaches. • IDEAL • Duke's 7 steps.
Level 2: Application and Analysis

2.1 Design algorithms to solve a set of familiar problems. - Identify computational constructs
2.2 Identify the separate components of a complex problem (problem decomposition).
2.3 Identify, organize, and analyze data related to the problem domain.
2.4 Convert a real-world problem to its computational equivalent problem.
2.5 Apply appropriate strategies to solve a problem.
Level 3: Synthesis and Evaluation
3.1 Convert a new problem to its computational equivalent problem.
3.2 Identify and evaluate different approaches to create a solution.
3.3 Reuse components of one solution as part of another solution to a different problem.
3.4a Articulate and defend the solution to a problem over other options [Product]. 3.4b Defend decisions (prioritizing, improved problem solving) [Process].
3.5 Reflect on one's own progress as a computational thinker in solving problems.

3. Policies and Other Information

Prerequisites: No official pre requisites

Grading: Final grades will be based on a combination of homework assignments, in-class attendance and performance, two exams/projects, and a final project/presentation. The approximate weights are as follows:

- 25% - In-class attendance and performance
- 25% - Homework assignments, in-class exercises, and quizzes
- 25% - Partial Exams/Projects (12.5% each)
- 25% - Final Project/Presentation

The nominal percentage-score-to-letter-grade conversion is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- below 60% is an F

Collaboration: Collaboration among students is strongly encouraged.

It is OK to:

- Talk with other students about approaches and ideas.
- Get ideas and extra information from the internet, books, etc.

However, it is not OK to:

- Share code with another student (if a piece of code is submitted by two or more students, both students are guilty of cheating, regardless of who wrote the original code).
- Use code acquired from an outside source (the internet, a friend, etc.)
- Look at another student's code
- Debug another student's code

Cellular telephones are prohibited during lecture and lab sessions.

Laptops and tablets are usually not allowed during lectures. If you wish to use yours to take notes (which is discouraged) you must obtain permission from the instructor.

Attendance policy: Students are expected to attend all lectures.

Disabilities: If you feel that you may have a disability that requires accommodation, contact the The Center for Accommodations and Support Services (CASS) at 747-5148, go to Room 106E Union, or email cass@utep.edu

5. Standards of Conduct and Academic Dishonesty

You are expected to conduct yourself in a professional and courteous manner, as prescribed by the UTEP Standards of Conduct:

http://admin.utep.edu/portals/68/Standards_of_Conduct_2013-2014.pdf

Academic dishonesty includes but is not limited to cheating, plagiarism and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying data (for example program outputs) in laboratory reports. Plagiarism occurs when someone represents the work or ideas of another person as his/her own. Collusion involves collaborating with another person to commit an academically dishonest act.

Professors are required to - and will - report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students.

COURSE ADD

All fields below are required

College : Engineering

Department : Computer Science

Rationale for adding the course:

This course has been taught many times as a special topics course and the department intends to continue teaching it.

All fields below are required

Subject Prefix and # CS 2210

Title (29 characters or fewer): Algo. Thinking in Prob. Solv.

Dept. Administrative Code : 0720

CIP Code 110701

Departmental Approval Required ☒ Yes ☐ No

Course Level ☒ UG ☐ GR ☐ DR ☐ SP

Course will be taught: ☒ Face-to-Face ☒ Online ☒ Hybrid

How many times may the course be taken for credit? (Please indicate 1-9 times): 1

Should the course be exempt from the "Three Repeat Rule?" ☐ Yes ☒ No

Grading Mode: ☒ Standard ☐ Pass/Fail ☐ Audit

Description (600 characters maximum):

Provide practice on solving problems employers use during interviews through development of analytical, coding and communication skills.

Contact Hours (per week): 2 Lecture Hours Lab Hours Other

Types of Instruction (Schedule Type): Select all that apply

- | | |
|---|--|
| ☒ A Lecture | ☐ H Thesis |
| ☐ B Laboratory | ☐ I Dissertation |
| ☐ C Practicum | ☐ K Lecture/Lab Combined |
| ☐ D Seminar | ☐ O Discussion or Review (Study Skills) |
| ☒ E Independent Study | ☐ P Specialized Instruction |
| ☐ F Private Lesson | ☐ Q Student Teaching |

Fields below if applicable

If course is taught during a part of term in addition to a full 16-week term please indicate the length of the course (ex., 8 weeks): Any format

TCCN (Use for lower division courses) :

Prerequisite(s):		
Course Number/ Placement Test	Minimum Grade Required/ Test Scores	Concurrent Enrollment Permitted? (Y/N)
CS 2302 AND (MATH 2300 OR CS 2202)	C	N

Corequisite Course(s):

Equivalent Course(s):

Restrictions:	
Classification	
Major	

CS 2210 – Algorithmic Thinking in Problem Solving

Spring 2019

1. General Information

Instructor:

Diego Aguirre

Email: daguirre6@utep.edu

Web: www.aguirrediego.com

Office hours: TR 3:00pm – 4:00pm (or by appointment)

Office location: CCSB 3.1022

Gmail: diego4.aguirre@gmail.com

Meeting Times

TR 4:30p.m. – 5:50p.m. in CCSB 1.0702

Textbook

Cracking the Coding Interview: 189 Programming Questions and Solutions, by Gayle Laakmann McDowell. Sixth Edition, 2015.

2. Objectives and Outcomes

The goal of the course is to achieve the following objectives:

- Provide practice on solving problems employers use during *real* interviews. *Cracking the Coding Interview* by Gayle Laakmann McDowell will be the primary source of reference problems.
- Assist students in the development of analytical, coding, and communication skills.
- Help students build strong computer science and problem solving fundamentals that can be applied to *real* interview and industry problems.

Learning Objectives

COMPETENCY
Level 1: Knowledge and Comprehension
1.1 Describe problem-solving strategies/approaches. · IDEAL · Duke's 7 steps.
1.2 Describe the role of abstraction in analyzing a problem description.
1.3 Describe the difference between clarifying and probing questions.
1.4 Understand the importance of basic data structure and algorithm knowledge.
Level 2: Application and Analysis
2.1 Apply problem-solving strategies to coding interview problems, including abstraction, question generation (clarifying and probing), data collection and analysis, problem decomposition, and pattern generalization.
2.2 Communicate (oral and written) solutions to technical/coding problems.
Level 3: Synthesis and Evaluation
3.1 Solve technical/coding problems with redundant, incomplete, and inconsistent specifications.
3.2 Evaluate correctness and quality of different solutions to technical/coding problems using metrics such as efficiency, correctness, and coverage.
3.3 Provide constructive critique of solutions presented by other groups. - Identify strengths and weaknesses of solutions.
3.4 Resolve critique of your group's solution to improve your solution.
3.5a Articulate and defend the solution to a problem over other options [Product]. 3.5b Defend decisions (prioritizing, improved problem solving) [Process].
3.6 Reflect on problem solving process to improve and contribute to one's tool box for solving problems.

3. Policies and Other Information

Prerequisites: No official pre-requisites, but having taken CS2302 – Data Structures is highly recommended

Textbook: Reading and assignments will be drawn from Cracking the Coding Interview: 189 Programming Questions and Solutions, by Gayle Laakmann McDowell. You are required to obtain this book for use in this course.

Grading: Final grades will be based on a combination of homework assignments, in-class attendance and performance, two exams/projects, and a final project/presentation. The approximate weights are as follows:

- 25% - In-class attendance and performance
- 25% - Homework assignments, in-class exercises, and quizzes
- 25% - Two Partial Exams (12.5% each)
- 25% - Final Exam

The nominal percentage-score-to-letter-grade conversion is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- below 60% is an F

Collaboration: Collaboration among students is strongly encouraged.

It is OK to:

- Talk with other students about approaches and ideas.
- Get ideas and extra information from the internet, books, etc.

However, it is not OK to:

- Share code with another student (if a piece of code is submitted by two or more students, both students are guilty of cheating, regardless of who wrote the original code).
- Use code acquired from an outside source (the internet, a friend, etc.)
- Look at another student's code
- Debug another student's code

Cellular telephones are prohibited during lecture and lab sessions.

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Attendance policy: Students are expected to attend all lectures.

Disabilities: If you feel that you may have a disability that requires accommodation, contact the The Center for Accommodations and Support Services (CASS) at 747-5148, go to Room 106E Union, or email cass@utep.edu

5. Standards of Conduct and Academic Dishonesty

You are expected to conduct yourself in a professional and courteous manner, as prescribed by the UTEP Standards of Conduct:

http://admin.utep.edu/portals/68/Standards_of_Conduct_2013-2014.pdf

Academic dishonesty includes but is not limited to cheating, plagiarism and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying data (for example program outputs) in laboratory reports. Plagiarism occurs when someone represents the work or ideas of another person as his/her own. Collusion involves collaborating with another person to commit an academically dishonest act.

Professors are required to - and will - report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students.

COURSE ADD

All fields below are required

College : Engineering

Department : Computer Science

Rationale for adding the course:

This course (with sequel CS 2202) is an alternate prerequisite of MATH 2300 Discrete Mathematics for CS upper level courses. The material aligns with MATH 2300, but is more focused to the Computer Science students' interests.

All fields below are required

Subject Prefix and # CS 2101

Title (29 characters or fewer): Discrete Structures I

Dept. Administrative Code : 0720

CIP Code 110701

Departmental Approval Required ☒ Yes ☐ No

Course Level ☒ UG ☐ GR ☐ DR ☐ SP

Course will be taught: ☒ Face-to-Face ☒ Online ☒ Hybrid

How many times may the course be taken for credit? (Please indicate 1-9 times): 1

Should the course be exempt from the "Three Repeat Rule?" ☐ Yes ☒ No

Grading Mode: ☒ Standard ☐ Pass/Fail ☐ Audit

Description (600 characters maximum):

Topics include propositional logic, proofs, sets, functions, and relations, counting, induction and recursion. This course emphasizes the connections of its content with Computer Science.

Contact Hours (per week): 1 Lecture Hours Lab Hours Other

Types of Instruction (Schedule Type): Select all that apply

- | | |
|---|--|
| ☒ A Lecture | ☐ H Thesis |
| ☐ B Laboratory | ☐ I Dissertation |
| ☐ C Practicum | ☐ K Lecture/Lab Combined |
| ☐ D Seminar | ☐ O Discussion or Review (Study Skills) |
| ☐ E Independent Study | ☐ P Specialized Instruction |
| ☐ F Private Lesson | ☐ Q Student Teaching |

Fields below if applicable

If course is taught during a part of term in addition to a full 16-week term please indicate the length of the course (ex., 8 weeks): Any format

TCCN (Use for lower division courses) :

Prerequisite(s):		
Course Number/ Placement Test	Minimum Grade Required/ Test Scores	Concurrent Enrollment Permitted? (Y/N)
MATH 1508 or equivalent	C	N

Corequisite Course(s):

Equivalent Course(s):

Restrictions:	
Classification	
Major	LDCS or CS

CS 2101 Discrete Structures I

Course Objectives: Upon successful completion of the course, the student will know and be able to use the basic algebra of sets and of logic; be able to identify and use common classes of relations; know the basic properties of arbitrary functions; be familiar with induction and recursion and their relevance to computer science; be introduced to the concept of recurrence relations; and have a general understanding of why knowing how to solve counting problems involving combinations and permutations is important in computer science.

In this class, students will be expected to be active learners and develop an understanding of the essential connections/relevance of the content of this course with their computer science education.

Finally, they will develop team-working skills, critical-thinking skills, and professionalism.

Prerequisite: MATH 1508 with a grade of C or better.

Logistics: Lecture sessions: T 12:00p.m.-1:20p.m. and R 12:00p.m.-12:50 p.m. in CCSB G.0208
Instructor: Dr. Julio Urenda – jcurenda@utep.edu – office room: LIB 504
Office hours: TWR 8:30a.m.-9:00a.m. or by appointment

Textbook: *Discrete Math*, by Zybooks, available. To subscribe to your textbook, please follow the instructions below:

1. Sign in or create an account at learn.zybooks.com
2. Enter zyBook code: UTEPCS1190Spring2019
3. Subscribe

Communication platform: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: <https://piazza.com/utep/spring2019/cs1190/home>

Grading

Grades are communicated to students in a timely manner. It is the students' responsibility to keep track of their grades by compiling the grades they receive. Your semester grade will be based on a combination of homework assignments, weekly quizzes, class participation, 1 mid-term exam, and a final exam.

The approximate percentages are as follows:

- 30% Homework
- 20% Quizzes

- 45% Exams (1 mid-term exam and 1 final exam)
- 5% Class participation (includes on-time lecture attendance, active participation in class, completion of any quizzes for attendance and survey purposes)

The nominal percentage-score-to-letter-grade conversion for CS 1190 is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- Below 60% is an F

Note: Regardless of your standing in the class at that time, you need to earn a 65 or better at the final exam to pass the course.

Expectations

Class Participation: Attendance at and participation in all lecture sessions are critical factors of your success in this course.

Students should be **on time** for all scheduled sessions and **attend the entire session**. Attendance will be taken at every session (at first you will have to sign in but as time goes the instructor will know you and mark you present without your help) and will count towards your class participation grade.

Students should **notify the instructor prior to missing a session** if at all possible, and certainly right after if earlier was not possible. The instructor will allow two unexcused absences per semester before having the option to deduct points from the final grade (5 points per subsequent unexcused absence).

It is the student's responsibility to obtain the content covered during missed class(es). Participation points also include completing post-lecture and post-labs online quizzes (when requested) that are administered as surveys to monitor students' overall progress and potential struggles.

Quizzes: The purpose of each **quiz** is to ensure that students are staying current with the weekly reading and homework assignments, and to verify that they have acquired the skills developed in class. **Quizzes will be administered approximately once a week. There will be no make-up on missed quizzes.**

Homework: Reading and homework assignments will be announced in class and/or posted on piazza (under the Homework section of Resources). If you miss a lecture session, it is your responsibility to find out what you missed. You should expect to spend at least two hours per week outside of lecture on reading and homework assignments and reviews. Most of your homework will be work assigned on your online zybook: completing the assigned activities on time will be crucial to your success in the class (since these activities prepare you for classwork) and to getting a good grade (since late completion will be penalized).

Exams: There will be one midterm exam and one final exam. These exams together will weigh 50% of your overall final grade for CS1190. Because the exams contribute so heavily to your total grade, it is vital that you do well on them. If you have test-taking difficulties in general or if you have difficulties with our tests in particular, please come and let me know as soon as possible and/or request appropriate accommodation from UTEP's Center for Accommodation and Students' Services.

The purpose of the **midterm exam** is to allow you to demonstrate mastery of course concepts covered thus far during the semester. The mid-term exam will take place during the regular lecture session and is

tentatively scheduled around half of the minimester. Make-up exams will be given only in extremely unusual circumstances. If you must miss an exam, please meet with an instructor, BEFORE the exam. The **final exam** will be comprehensive. You must score 65% or better on the final exam to pass this course. If you have a scheduling conflict (e.g., if you are taking a final at EPCC) or if you are scheduled for three final exams in one day, see your instructor in advance for accommodation, **before the end of the minimester**. The final exam schedule is available online. It is the students' responsibility to keep informed.

Resources

Special Accommodations: If you have a disability and need classroom accommodations, please contact the Center for Accommodations and Support Services (CASS) at 747-5148 or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass. CASS' staff are the only individuals who can validate and if need be, authorize accommodations for students with disabilities.

Scholastic Dishonesty: Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, and submission for credit of any work or materials that are attributable to another person.

Cheating is:

- Copying from the test paper of another student
- Communicating with another student during a test to be taken individually
- Giving or seeking aid from another student during a test to be taken individually
- Possession and/or use of unauthorized materials during tests (i.e. crib notes, class notes, books, etc.)
- Substituting for another person to take a test
- Falsifying research data, reports, academic work offered for credit

Plagiarism is:

- Using someone's work in your assignments without the proper citations
- Submitting the same paper or assignment from a different course, without direct permission of instructors

To avoid plagiarism, see: <http://sa.utep.edu/osccr/wp-content/uploads/sites/8/2012/09/Avoiding-Plagiarism.pdf>

Collusion is: Unauthorized collaboration with another person in preparing academic assignments

Important! When in doubt on any of the above, please contact your instructor to check if you are following authorized procedure.

Detailed Learning Outcomes

Level 1: Knowledge and Comprehension. Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. On successful completion of this course, students will be able to describe, at a high level:

1. Counting and its relevance to computer science
2. Recurrence relations

Level 2: Application and Analysis. Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details. Upon successful completion of this course, students will be able:

1. Logical reasoning for propositional logic: truth tables.

2. Predicate logic, including writing predicate logic expressions and basic reasoning: translation and inference rules.
3. Sets and functions: union, intersection, complement and product; injective, surjective and bijective functions; and combinations and permutations.
4. Induction and recursion: construct recurrence relations and basic proofs by mathematical induction.

Level 3 Outcomes: Synthesis and Evaluation. Level 3 outcomes are those in which the student can apply the material in new situations. This is the highest level of mastery. On successful completion of this course, students will be able to use the syntax and semantics of a higher-level language to express solutions to programming problems, including the pseudocode correct use of:

1. Propositional logic: propositions and operators, evaluation of propositions, conditional statements, and logical equivalence
2. Induction and recursion: identify problems that can be modeled by recurrence relations hypothesize and prove new properties.

Tentative Schedule:

Week	Topic
1	propositional logic and truth tables
1	logical connectives, sets and their operators
2	functions and binary relations
2	equivalence relations and testing
3	Inductively defined sets and functions
3	Inductively defined sets and functions
4	Recurrence relations: sequences (Recursion)
4	Recurrence relations: properties (Recursion)
5	Review
5	Mathematical Induction and first order logic
6	Mathematical Induction and first order logic
6	Counting: the three fundamental principles
7	Counting: combinations and permutations
7	Final Review
8	Final Exam

COURSE ADD

All fields below are required

College : Engineering

Department : Computer Science

Rationale for adding the course:

This course (with prerequisite CS 2101) is an alternate prerequisite of MATH 2300 Discrete Mathematics for CS upper level courses. The material aligns with MATH 2300, but is more focused to the Computer Science student's interests.

All fields below are required

Subject Prefix and # CS 2202

Title (29 characters or fewer): Discrete Structures II

Dept. Administrative Code : 0720

CIP Code 110701

Departmental Approval Required ☒ Yes ☐ No

Course Level ☒ UG ☐ GR ☐ DR ☐ SP

Course will be taught: ☒ Face-to-Face ☒ Online ☒ Hybrid

How many times may the course be taken for credit? (Please indicate 1-9 times): 1

Should the course be exempt from the "Three Repeat Rule?" ☐ Yes ☒ No

Grading Mode: ☒ Standard ☐ Pass/Fail ☐ Audit

Description (600 characters maximum):

Topics include induction and recursion, fundamental techniques of counting, common classes of graphs and trees, and models that use graphs and trees. This course emphasizes the connections of its content with Computer Science.

Contact Hours (per week): 2 Lecture Hours Lab Hours Other

Types of Instruction (Schedule Type): Select all that apply

- | | |
|---|--|
| ☒ A Lecture | ☐ H Thesis |
| ☐ B Laboratory | ☐ I Dissertation |
| ☐ C Practicum | ☐ K Lecture/Lab Combined |
| ☐ D Seminar | ☐ O Discussion or Review (Study Skills) |
| ☐ E Independent Study | ☐ P Specialized Instruction |
| ☐ F Private Lesson | ☐ Q Student Teaching |

Fields below if applicable

If course is taught during a part of term in addition to a full 16-week term please indicate the length of the course (ex., 8 weeks): Any format

TCCN (Use for lower division courses) :

Prerequisite(s):		
Course Number/ Placement Test	Minimum Grade Required/ Test Scores	Concurrent Enrollment Permitted? (Y/N)
MATH 1411 AND CS 2101	C	N

Corequisite Course(s):

Equivalent Course(s):

Restrictions:	
Classification	
Major	

CS 2202 Discrete Structures II

Course Objectives: Upon successful completion of the course, the student will know and be able to use the fundamental techniques of counting; be able to identify and use common classes of graphs and trees; reinforce your familiarity with induction and recursion and their relevance to computer science; and have a general understanding of why knowing how to model problems using graphs and trees is crucial in many computer science areas. In this class, students will be expected to be active learners, and develop an understanding of the essential connections/relevance of the content of this course with their computer science education. Finally, students will develop team-working skills, critical-thinking skills, and professionalism.

Prerequisite: CS 2101 and MATH 1411 with a grade of C or better. This is only a mathematical maturity requirement.

Logistics:

Lecture sessions: M-R 4:20p.m.- 6:15 p.m. in CCSB 1.0702

Instructor: Dr. Julio Urenda – jcurenda@utep.edu – office room: LIB 504

Office hours: TWR 12:00p.m.-1:00p.m. or by appointment

Textbook: *Discrete Math*, by Zybooks, available. To subscribe to your textbook, please follow the instructions below:

UTEP CS 1290 Summer 2019

Communication platform: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: <https://piazza.com/utep/spring2019/cs1290/home>

Grading

Grades are communicated to students in a timely manner. It is the students' responsibility to keep track of their grades by compiling the grades they receive. Your semester grade will be based on a combination of homework assignments, weekly quizzes, class participation, 1 mid-term exam, and a final exam.

The approximate percentages are as follows:

- 40% Homework
- 15% Quizzes

- 40% Exams (1 mid-term exam and 1 final exam)
- 5% Attendance and active participation

The nominal percentage-score-to-letter-grade conversion for CS 1290 is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- Below 60% is an F

Note: Regardless of your standing in the class at that time, you need to earn a 65 or better at the final exam to pass the course.

Expectations

Class Participation: Attendance at and participation in all lecture sessions are critical factors of your success in this course.

Students should be **on time** for all scheduled sessions and **attend the entire session**. Attendance will be taken at every session (at first you will have to sign in but as time goes the instructor will know you and mark you present without your help) and will count towards your class participation grade.

Students should **notify the instructor prior to missing a session** if at all possible, and certainly right after if earlier was not possible. The instructor will allow two unexcused absences per semester before having the option to deduct points from the final grade (5 points per subsequent unexcused absence).

It is the student's responsibility to obtain the content covered during missed class(es). Participation points also include completing post-lecture and post-labs online quizzes (when requested) that are administered as surveys to monitor students' overall progress and potential struggles.

Quizzes: The purpose of each **quiz** is to ensure that students are staying current with the weekly reading and homework assignments, and to verify that they have acquired the skills developed in class. Quizzes will be administered approximately once a week. There will be **no make-up** on missed quizzes.

Homework: Reading and homework assignments will be announced in class and/or posted on piazza (under the Homework section of Resources). If you miss a lecture session, it is your responsibility to find out what you missed. You should expect to spend at least two hours per week outside of lecture on reading and homework assignments and reviews. Most of your homework will be work assigned on your online zybook: completing the assigned activities on

time will be crucial to your success in the class (since these activities prepare you for classwork) and to getting a good grade (since late completion will be penalized). Your homework grade will be a combination of the zybook homework and additional assigned work from class.

Exams: There will be one midterm exam and one final exam. These exams together will weigh 50% of your overall final grade for CS1190. Because the exams contribute so heavily to your total grade, it is vital that you do well on them. If you have test-taking difficulties in general or if you have difficulties with our tests in particular, please come and let me know as soon as possible and/or request appropriate accommodation from UTEP's Center for Accommodation and Students' Services.

The purpose of the **midterm exam** is to allow you to demonstrate mastery of course concepts covered thus far during the semester. The mid-term exam will take place during the regular lecture session and is tentatively scheduled around half of the minimester. Make-up exams will be given only in extremely unusual circumstances. If you must miss an exam, please meet with an instructor, BEFORE the exam.

The **final exam** will be comprehensive. You must score 65% or better on the final exam to pass this course. If you have a scheduling conflict (e.g., if you are taking a final at EPCC) or if you are scheduled for three final exams in one day, see your instructor in advance for accommodation, **before the end of the minimester**. The final exam schedule is available online. It is the students' responsibility to keep informed.

Resources

Special Accommodations: If you have a disability and need classroom accommodations, please contact the Center for Accommodations and Support Services (CASS) at 747-5148 or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass. CASS' staff are the only individuals who can validate and if need be, authorize accommodations for students with disabilities.

Scholastic Dishonesty: Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, and submission for credit of any work or materials that are attributable to another person.

Cheating is: Copying from the test paper of another student
Communicating with another student during a test to be taken individually
Giving or seeking aid from another student during a test to be taken individually
Possession and/or use of unauthorized materials during tests (i.e. crib notes, class notes, books, etc.)
Substituting for another person to take a test
Falsifying research data, reports, academic work offered for credit

Plagiarism is: Using someone's work in your assignments without the proper citations
Submitting the same paper or assignment from a different course, without direct permission of instructors

To avoid plagiarism, see: <http://sa.utep.edu/osccr/wp-content/uploads/sites/8/2012/09/Avoiding-Plagiarism.pdf>

Collusion is: Unauthorized collaboration with another person in preparing academic assignments

Important! When in doubt on any of the above, please contact your instructor to check if you are following authorized procedure.

Detailed Learning Outcomes

Level 1: Knowledge and Comprehension. Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. On successful completion of this course, students will be able to describe, at a high level:

1. Multiple types of graphs and trees, and how they each are relevant to computer science

Level 2: Application and Analysis. Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details. Upon successful completion of this course, students will be able:

1. Articulate what counting is and how relevant it is to computer science
2. Apply the basic principles of counting.
3. Model combinatorial problems using graphs and trees.
4. Describe various types of graphs and their common properties.
5. Identify trees as a fundamental structure in modeling computer science problems.

Level 3 Outcomes: Synthesis and Evaluation. Level 3 outcomes are those in which the student can apply the material in new situations. This is the highest level of mastery. On successful completion of this course, students will be able to:

1. Reason about the complexity of algorithms using counting techniques and properties of graphs
2. Model computer science problems using graphs and trees
3. Lay out a proof plan for existential and universal proofs, be able to identify shortcomings of some types of proving strategies
4. Identify an inductive structure of a set: use it to conduct an inductive proof and to set a recurrence relation.

COURSE ADD

All fields below are required

College : Engineering

Department : Computer Science

Rationale for adding the course:

The new course will address a lack of focused coverage of Parallel computing within the BSCS curriculum

All fields below are required

Subject Prefix and # CS 4175

Title (29 characters or fewer): Parallel Computing

Dept. Administrative Code : 0720

CIP Code 110701

Departmental Approval Required ☒ Yes ☐ No

Course Level ☒ UG ☐ GR ☐ DR ☐ SP

Course will be taught: ☒ Face-to-Face ☐ Online ☐ Hybrid

How many times may the course be taken for credit? (Please indicate 1-9 times): 1

Should the course be exempt from the "Three Repeat Rule?" ☐ Yes ☒ No

Grading Mode: ☒ Standard ☐ Pass/Fail ☐ Audit

Description (600 characters maximum):

The course covers fundamentals of parallel computing, including principles of parallel decomposition, processes communication and coordination, architecture, parallel algorithms, analysis, and programming.

Contact Hours (per week): 1 Lecture Hours Lab Hours Other

Types of Instruction (Schedule Type): Select all that apply

- | | |
|---|--|
| ☒ A Lecture | ☐ H Thesis |
| ☐ B Laboratory | ☐ I Dissertation |
| ☐ C Practicum | ☐ K Lecture/Lab Combined |
| ☐ D Seminar | ☐ O Discussion or Review (Study Skills) |
| ☒ E Independent Study | ☐ P Specialized Instruction |
| ☐ F Private Lesson | ☐ Q Student Teaching |

Fields below if applicable

If course is taught during a part of term in addition to a full 16-week term please indicate the length of the course (ex., 8 weeks): Any format

TCCN (Use for lower division courses) :

Prerequisite(s):		
Course Number/ Placement Test	Minimum Grade Required/ Test Scores	Concurrent Enrollment Permitted? (Y/N)
CS 3331	C	N
CS 3432	C	N

Corequisite Course(s):

Equivalent Course(s):

Restrictions:	
Classification	
Major	

University of Texas at El Paso
Course Syllabus

COURSE DESCRIPTION

Dept., Number	CS 4175	Course Title	Parallel Computing
Approval Date	XXX	Course Coordinator	

CATALOG DESCRIPTION

The course covers fundamentals of parallel computing, including principles of parallel decomposition, processes communication and coordination, architecture, parallel algorithms, analysis, and programming.

TEXT BOOK

TBD

COURSE OUTCOMES

Level 1: Knowledge and Comprehension:

Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. Upon successful completion of this course, students will be able to:

- a. State the goals of parallelism.
- b. Distinguish between parallelism and concurrency.
- c. Distinguish data races from higher level races.
- d. Explain when and why multicast or event-based messaging can be preferable to alternatives.
- e. Describe at least one design technique for avoiding liveness failures in programs using multiple locks or semaphores.
- f. Describe the relative merits of optimistic versus conservative concurrency control under different rates of contention among updates.
- g. Give an example of a scenario in which an attempted optimistic update may never complete.
- h. Define “critical path”, “work”, and “span”.
- i. Define “speed-up” and explain the notion of an algorithm’s scalability in this regard.
- j. Characterize features of a workload that allow or prevent it from being naturally parallelized.
- k. Provide an example of a problem that fits the producer-consumer paradigm.
- l. Explain the differences between shared and distributed memory.
- m. Describe the SMP architecture and note its key features.
- n. Characterize the kinds of tasks that are a natural match for SIMD machines.
- o. Describe the advantages and limitations of GPUs vs. CPUs.

Level 2: Application and Analysis:

Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details.

Upon successful completion of this course, students will be able to:

- a. Identify opportunities to partition a serial program into independent parallel modules.
- b. Parallelize an algorithm by applying task-based decomposition.
- c. Parallelize an algorithm by applying data-parallel decomposition.
- d. Write a program using actors and/or reactive processes.
- e. Use mutual exclusion to avoid a given race condition.
- f. Use semaphores or condition variables to block threads until a necessary precondition holds.
- g. Give an example of a scenario in which blocking message sends can deadlock
- h. Write a program that correctly terminates when all of a set of concurrent tasks have completed.
- i. Use a properly synchronized queue to buffer data passed among activities.
- j. Write a test program that can reveal a concurrent programming error; for example, missing an update when two activities both try to increment a variable.
- k. Compute the work and span, and determine the critical path with respect to a parallel execution diagram.
- l. Identify independent tasks in a program that may be parallelized.
- m. Implement a parallel divide-and-conquer (and/or graph algorithm) and empirically measure its performance relative to its sequential analog.
- n. Decompose a problem (e.g., counting the number of occurrences of some word in a document) via map and reduce operations.

Comp Sci Designated Core

All courses listed below are required for CS majors and satisfy the following components of the University Core Curriculum.

[\(show less\)](#)

Math

(Complete MATH 1411)

Please Choose a Course Below:

[MATH 1411](#) |

Natural Sciences

Select one lecture/lab combinations from the following:

- BIOL 1305 & 1107
- BIOL 1306 & 1108
- ASTR 1307 & 1107
- CHEM 1305 & 1105
- CHEM 1306 & 1106
- GEOL 1313 & 1103
- GEOL 1314 & 1104
- PHYS 2420

Two lectures and a lab associated with one of the lectures will fulfill the core curriculum, hence require a C or better grade.

Please Choose a Course Below:

[ASTR 1107](#) | [ASTR 1307](#) | [BIOL 1107](#) | [BIOL 1108](#) | [BIOL 1305](#) | [BIOL 1306](#) | [CHEM 1105](#) | [CHEM 1106](#) | [CHEM 1305](#) | [CHEM 1306](#) | [GEOL 1103](#) | [GEOL 1104](#) | [GEOL 1313](#) | [GEOL 1314](#) | [PHYS 2420](#) |

PHYS 2320/2120

(Complete PHYS 2320/2120)

Please Choose a Course Below:

[PHYS 2120](#) | [PHYS 2320](#) | [PHYS 2420](#) |

Computer Science Core

All courses listed below are required:

[CS 1101](#) | [CS 1301](#) | [CS 2302](#) | [CS 2401](#) | [EE 2169](#) | [EE 2369](#) | [MATH 1312](#) |

MATH 2300

(Complete MATH 2300)

Please Choose a Course Below:

[MATH 2300](#) |

Computer Science Major

All courses listed below are required:

[CS 3195](#) | [CS 3331](#) | [CS 3350](#) | [CS 3360](#) | [CS 3432](#) | [CS 4310](#) | [CS 4311](#) | [CS 4342](#) | [CS 4375](#) | [MATH 3323](#) [\(remove C requirement\)](#) |

Statistics

(Select a course from EE 3384; STAT 3320, 3330)

Please Choose a Course Below:

[EE 3384](#) | [STAT 3320](#) | [STAT 3330](#) |

Additional Math or Science Opt

(Option A: Mathematics)

Select one from the following: MATH 2312, 2325, 2326, 3320, 3325, 4329; STAT 3381, 4380, 4385

Option B: Science

Take an additional three credit lecture course from the list of science courses)

Please Choose a Course Below:

[ASTR 1307](#) | [BIOL 1305](#) | [BIOL 1306](#) | [CHEM 1305](#) | [CHEM 1306](#) | [GEOL 1313](#) | [GEOL 1314](#) | [MATH 2313](#) | [MATH 2325](#) | [MATH 2326](#) | [MATH 3320](#) | [MATH 3325](#) | [MATH 4329](#) | [PHYS 2320](#) | [STAT 3381](#) | [STAT 4380](#) | [STAT 4385](#) |

Technical Electives

(Select fifteen hours from the following: CS 1190, 1290, 3000 or 4000 level course)

Please Choose a Course Below:

CS 1190	CS 1290	CS 3320	CS 3370	CS 4173	CS 4177	CS 4181	CS 4273	CS 4316	CS 4317	CS 4318	CS 4320	CS 4330	CS 4339
CS 4351	CS 4352	CS 4361	CS 4362	CS 4363	CS 4364	CS 4365	CS 4371	CS 4373	CS 4374	CS 4376	CS 4377	CS 4379	CS 4381
CS 4387	CS 4390	CS 4392	CS 4393										

Free Electives

(Complete four additional hours of free electives. Courses that may be counted towards the free elective requirements are college-level courses offered by the college of Liberal Arts, Business, Science, or Engineering. Remedial courses cannot be counted as a free elective.)

BS in Computer Science

The B.S. in Computer Science provides a strong base in programming and problem-solving skills, a theoretical understanding of computer science, and practical experience in applying the computer to the solution of problems. Specialization is provided through numerous upper-division electives. The program offers concentrations in Secure Cyber Systems, Software Engineering, and Data Analytics.

Educational Objectives

The B.S. in Computer Science program's educational objectives address the department's mission to serve the region, nation, and the world by graduating highly competitive students with the potential to become leaders in their profession.

- Our graduates will be innovative and productive problem solvers in industry, academia, and government who have the ability to apply theoretical and technical computer science knowledge to provide solutions to real-world problems of varying complexity (*Quality of our Graduates*).
- Our graduates will contribute to the economic health of the nation, in particular the Paso del Norte region, through technical expertise and complementary skills such as ability to work in interdisciplinary teams, lead, innovate, and apply entrepreneurial thinking with a global perspective (*Local and Global Impact*).
- Our graduates will remain at the forefront of computing through research, advanced studies, certification, entrepreneurship, or other means of self-advancement (*Continuous Learning*).

Sample Degree Plan

Freshman Year, 1st semester

Code	Title	Hours
CS 1301	Intro to Computer Science	3
CS 1101	Intro to Computer Science Lab	1
RWS 1301	Rhetoric & Composition I (*)	3
MATH 1411	Calculus I (*)	4
CS 1310	Intro-Computational Thinking (*)	3

Course List

Freshman Year, 2nd semester

Code	Title	Hours
CS 2401	Elem. Data Struct./Algorithms	4
RWS 1302	Rhetoric & Composition 2 (*)	3
MATH 2300	Discrete Mathematics	3
HIST 1301	History of U.S. to 1865 (*)	3
UNIV 1301	Seminar/Critical Inquiry (*)	3

Course List

Sophomore Year, 1st semester

Code	Title	Hours
CS 2302	Data Structures	3
EE 2369	Digital Systems Design I	3
EE 2169	Laboratory for EE 2369	1
HIST 1302	History of U.S. Since 1865 (*)	3
MATH 1312	Calculus II	3
*Social and Behavioral Sciences (choose from core curriculum list)		3

Course List

Sophomore Year, 2nd semester

Code	Title	Hours
CS 3331	Adv. Object-Oriented Programng	3

Code	Title	Hours
POLS 2310	Introduction to Politics (*)	3
PHYS 2420	Introductory Mechanics	4
PHIL 2306	Ethics (*)	3
*Creative Arts (choose from core curriculum list)		3

Course List

Junior Year, 1st semester

Code	Title	Hours
CS 3432	Comp Arch I: Comp Org/Design	4
CS 3350	Automata/Computabi/Formal Lang	3
MATH 3323	Matrix Algebra	3
POLS 2311	American Gover & Politics (*)	3

Life and Physical Science II

Course List

Junior Year, 2nd semester

Code	Title	Hours
CS 3195	Junior Professionl Orientation	1
MATH 4329	Numerical Analysis	3
CS 4342	Data Base Management	3

Code	Title	Hours
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Life and Physical Science III		4
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Technical Elective		3
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Course List

Senior Year, 1st semester

Code	Title	Hours
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CS 4310	Software Eng: Requirements Eng	3
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CS 3360	Design/Implementation Prog Lan	3
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STAT 3320	Probability and Statistics	3
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CS 4375	Theory of Operating Systems	3
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Technical Elective		3
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Course List

Senior Year, 2nd semester

Code	Title	Hours
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CS 4311	Software Eng: Design & Implmnt	3
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Technical Elective

Technical Elective

Free Elective		3
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CS 4175	Parallel Computing	1
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Code	Title	Hours
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Course List

- * Courses that are part of the University Core Curriculum.
- **Life and Physical Sciences.** In addition to PHYS 2420, students must complete two semesters of lecture and associated labs. Acceptable courses are: ASTR 1307 & 1107, PHYS 2421, BIOL 1305 & 1107, CHEM 1305 & 1105, GEOL 1313 & 1103. Courses that count towards the core curriculum (2 lectures and a lab associated with one of the 2 lectures) require grade C or better.
- **Technical Electives:** 15 hours from the following: CS 1110, CS 1120, CS 2210, CS 1190, CS 1290, CS 3000 or 4000 level course. No more than three credit hours of CS 1xxx and CS 2xxx can count for technical electives. No more than six credit hours of CS 1xxx, CS 2xxx, CS 4390, CS 4181, CS 4371, CS 4x73, CS 4392 and/or CS 4393 (in any combination) can count for technical electives. **Free Elective.** Courses that may be counted towards the free elective requirement are college-level courses (not remedial) offered by the college of Liberal Arts, Business, Science, or Engineering.

Deleted: CS 3320, CS 3370, or any CS 4000 level course. No more than six credit hours of CS 4390, CS 4371, CS 4373, and/or CS 4392 (in any combination) can count for technical electives.†

Concentration in Secure Cyber Systems

Students earning a B.S. in Computer Science can select a concentration in Secure Cyber-Systems by taking a set of courses with significant computer security content. Students must take the following five courses.

- [CS 4316](#) Computer Networks
- [CS 4318](#) Wireless Networks
- [CS 4351](#) Computer Security
- [CS 4379](#) Software Reverse Engineering
- [CS 4177](#) Software Vulnerabilities

Concentration in Software Engineering

Students earning a B.S. in Computer Science can select a concentration in Software Engineering by taking the following set of courses.

Students must take the following two courses:

- [CS 4374](#) Software Construction
- [CS 4387](#) Software Integration and V&V

Students must take one course from the following list:

- [CS 4330](#) Mobile Application Development
- [CS 4339](#) Secure Web-Based Systems
- [CS 4371](#) Computer Science Problems
- [CS 4373](#) Computer Science Internship
- [CS 4381](#) Topics Software Engineering

Concentration in Data Analytics

Students earning a B.S. in Computer Science can select a concentration in Data Analytics by taking the following set of courses.

Student must take the following two courses:

- [CS 4361](#) Machine Learning
- [CS 4362](#) Data Mining

Students must take one course from the following list:

- [CS 4363](#) Computer Vision
- [CS 4364](#) Topics in Data Science

Joint Degree BS-MBA programs

Students with at least 90 hours accumulated toward their degree, a cumulative GPA of at least 3.30, and admission to the full-time MBA program can pursue a joint-degree BS-MBA program. Students admitted to this program (a) will apply credit for [ECON 5360](#) Global Econ Environment-Mgrs, [BLAW 5306](#) Business Law and Ethics, and [ACCT 5301](#) Financial Accounting toward the requirements of one free elective and two technical electives in Computer Science and (b) will apply credit for three graduate courses (approved for Fast-Track) in Computer Science toward the elective requirement of the MBA program.

BS in Computer Science

Degree Plan

Required Credits: 120

Code	Title	Hours
University Core Curriculum		
Complete the University Core Curriculum requirements.		42
Computer Science Designated Core (All courses require a grade of C or better.)		
Required Courses:		
PHYS 2420	Introductory Mechanics	4
MATH 1411	Calculus I	4

Code	Title	Hours
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Select one of the following lecture/lab combinations:

4

BIOL 1305 & BIOL 1107	General Biology and Topics in Study of Life I
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BIOL 1306 & BIOL 1108	Organismal Biology and Organismal Biology Laboratory
--	--

ASTR 1307 & ASTR 1107	Elem Astronomy-Solar System and Astronomy Lab I
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CHEM 1305 & CHEM 1105	General Chemistry and Laboratory for CHEM 1305
--	--

CHEM 1306 & CHEM 1106	General Chemistry and Laboratory for CHEM 1306
--	--

GEOL 1313 & GEOL 1103	Intro to Physical Geology and Lab for GEOL 1313
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GEOL 1314 & GEOL 1104	Intro to Historical Geol and Lab for GEOL 1314
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PHYS 2421	Introductory Electromagnetism
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Computer Science Core (All courses require a grade of C or better.)

Required Courses:

Code	Title	Hours
CS 1301 & CS 1101	Intro to Computer Science and Intro to Computer Science Lab	4
CS 2302	Data Structures	3
CS 2401	Elem. Data Struct./Algorithms	4
EE 2169	Laboratory for EE 2369	1
EE 2369	Digital Systems Design I	3
MATH 1312	Calculus II	3
MATH 2300	Discrete Mathematics	3

Computer Science Major

Required Courses:

CS 3195	Junior Professional Orientation	1
CS 3331	Adv. Object-Oriented Programing ^c	3
CS 3350	Automata/Computabi/Formal Lang	3
CS 3360	Design/Implementation Prog Lan	3
CS 3432	Comp Arch I: Comp Org/Design ^c	4

Code	Title	Hours
CS 4310	Software Eng: Requirements Eng ^c	3
CS 4311	Software Eng: Design & Implmnt	3
CS 4342	Data Base Management	3
CS 4375	Theory of Operating Systems	3
MATH 3323	Matrix Algebra	3

Statistics:

Select one of the following.

EE 3384	Probabilistic Methods-Engr/Sci	3
STAT 3320	Probability and Statistics	
STAT 3330	Probability	

Additional Mathematics or Science Option:

Option A: Mathematics

MATH 2313	Calculus III	
MATH 2325	Intro. to Higher Mathematics	
MATH 2326	Differential Equations	
MATH 3320	Actuarial Mathematics	

Code	Title	Hours
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MATH 3325	Principles of Mathematics	
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MATH 4329	Numerical Analysis	
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STAT 3381	Nonparametric Statistics	
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STAT 4380	Statistics I	
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STAT 4385	Applied Regression Analysis	
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CS 4175	Parallel Computing	
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Option B: An additional 3 credit lecture course from the list of science courses above

Technical Electives:

Select 15 hours from the following: 15

Free Electives:

CS 1190	Special Topics in Computing	1
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CS 1290	Special Topics in Computing	2
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CS 3000 or 4000 level course

Complete four additional hours of free electives ²	4
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Total Hours	120
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Course List

C Courses require a grade of C or better.

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Commented [RJA3]: No courses to select from

Code	Title	Hours
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1 No more than six credit hours of CS xx90, [CS 4181](#) Undergraduate Seminar, [CS 4371](#) Computer Science Problems, CS 4X73, [CS 4392](#) Rsrch Methods/Computer Science and/or [CS 4393](#) Senior Project (in any combination) can count for technical electives.

2 Courses that may be counted towards the free elective requirements are college-level courses offered by the college of Liberal Arts, Business, Science, or Engineering. Remedial courses cannot be counted as a free elective.

University Core Curriculum

NOTE: The department may make specific suggestions for courses which are most applicable towards your major.

Psychology and Criminal Justice majors and minors are required to take [MATH 1320](#) Math for Social Sciences I or a higher level Calculus course.

Business majors are required to take [MATH 1320](#) Math for Social Sciences I or a higher level Calculus course.

NOTE: All courses require a C or better

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 4362

Course Title Data Mining

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300. The course CS 2402 has not been taught for over 10 years.

All fields below are required

Subject Prefix and number CS 3195

Course Title Junior Professional Orientation

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better) OR (CS 2402 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300. The course CS 2402 has not been taught for over 10 years.

All fields below are required

Subject Prefix and number CS 3331

Course Title Adv. Object-Oriented Programng

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better) OR (CS 2402 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering Department : Computer Science

Rationale for changing the course:
While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 3360

Course Title Design/Implementation Prog Lan

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering Department : Computer Science

Rationale for changing the course:
While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300. The course CS 2402 has not been taught for over 10 years.

All fields below are required

Subject Prefix and number CS 3370

Course Title Computer Graphics

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better) OR (CS 2402 w/C or better) AND (MATH 3323 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better) AND (MATH 3323 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300. The course CS 2402 has not been taught for over 10 years.

All fields below are required

Subject Prefix and number CS 4317

Course Title Human-Computer Interaction

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2402 w/C or better) OR (CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering Department : Computer Science

Rationale for changing the course:
While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 4318

Course Title Wireless Networks

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering Department : Computer Science

Rationale for changing the course:
While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300. The course CS 2402 has not been taught for over 10 years.

All fields below are required

Subject Prefix and number CS 4320

Course Title Artificial Intelligence.

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2402 w/C or better) OR (CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering Department : Computer Science

Rationale for changing the course:
While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 4339

Course Title Secure Web-Based Systems

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering Department : Computer Science

Rationale for changing the course:
While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300. The course CS 2402 has not been taught for over 10 years.

All fields below are required

Subject Prefix and number CS 4342

Course Title Data Base Management

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better) OR (CS 2402 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering Department : Computer Science

Rationale for changing the course:
While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 4361

Course Title Machine Learning

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 4363

Course Title Computer Vision

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 4364

Course Title Topics in Data Science

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300. The course CS 2402 has not been taught for over 10 years.

All fields below are required

Subject Prefix and number CS 4365

Course Title Topics in Soft Computing

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better) OR (CS 2402 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering Department : Computer Science

Rationale for changing the course:
While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 4374

Course Title Software Construction

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

While MATH 2300 (Discrete Math) is a prerequisite for CS 2302 at UTEP, it is not at other community colleges or universities, so we need to explicitly require MATH 2300 as prerequisite. In addition, students have an additional option which we consider equivalent to MATH 2300.

All fields below are required

Subject Prefix and number CS 4376

Course Title Comp Dcsn-Mkng & Risk Analysis

Change	From	To
Ex. Prerequisite	Ex. POLS 2310	Ex. POLS 2312
Prerequisite	(CS 2302 w/C or better)	(MATH 2300 w/C or better OR CS 2202 w/C or better) AND (CS 2302 w/C or better)

These changes will be reflected in Banner, Goldmine, and the catalog

COURSE CHANGE FORM

All fields below are required

College : Engineering

Department : Computer Science

Rationale for changing the course:

The course objectives have not changed, but the new description fixes some typos and is more consistent with other CS course descriptions.

All fields below are required

Subject Prefix and number CS 1301

Course Title Intro to Computer Science.

[illegible]

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These changes will be reflected in Banner, Goldmine, and the catalog