A. COURSE INFORMATION

Course number/section: MATH 5390.001
Class meeting time: MTWR 12:00-01:53 PM
Class location: CS-108
Course Website: https://bb9.tamucc.edu/webapps/login/

B. INSTRUCTOR INFORMATION

Instructor: Dr. Sunil Mathur
Office location: CI 356
Office hours: MW 2-3 PM, or by appointment
E-mail: sunil.mathur@tamucc.edu
Appointments: Via email

C. COURSE DESCRIPTION

This course integrates skill set spanning mathematics, statistics, machine learning, databases and computer science along with a good understanding of the craft of problem formulations in STEM fields to find effective solutions. This course will introduce basic principles and tools in data science and will expose students to concepts and techniques to deal with various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, and evaluation. R and other statistical software will be used to make the learning contextual.

D. PREREQUISITES AND COREQUISITES

Prerequisites: Prerequisites: Math 5342, Math 5344, Math 6315, Math 6317, Math 6318. Fall, Spring
Corequisites: None

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Supplies
You need to download free R code from internet

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

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1. Students will be able to use data collection and integration to understand key features of data.
2. Students will be able to perform exploratory data analysis,
3. Students will be able to perform predictive modeling, descriptive modeling, data product creation, and evaluation.
4. Students will be able to determine an appropriate statistical analysis, given data and a research question.
5. Students will be able to interpret the results of all calculations and statistical tests in the context of the processes that generate that data, and will be able to express these interpretations clearly in writing.
6. Students will be able to use appropriate technology tools to perform needed calculations and tests.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

Methods for instruction include the following:
• Lecture.
• Demonstrations.
• Use of computer resources, including statistical software, spreadsheets, and the Internet for data location, data organization, and data analysis.

H. MAJOR COURSE REQUIREMENTS AND GRADING

Final course standing will be based upon homework, project, and final exam each weighted as follows
Grades will be assigned according to the following scale.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Range</th>
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<tbody>
<tr>
<td>A</td>
<td>90% - 100%</td>
</tr>
<tr>
<td>B</td>
<td>80% - 89.99%</td>
</tr>
<tr>
<td>C</td>
<td>70% - 79.99%</td>
</tr>
<tr>
<td>D</td>
<td>60% - 69.99%</td>
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<tr>
<td>F</td>
<td>below 60%</td>
</tr>
</tbody>
</table>

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>DATE (BY WEEK)</th>
<th>TOPIC</th>
<th>CHAPTER(S)</th>
<th>Hws</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Syllabus discussion and introduction</td>
<td>Chapter 1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Basic concepts and graphing, foundations of R</td>
<td>Chapters 1 and 2</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>Managing Data in R</td>
<td>Chapter 3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Linear Algebra and Matrix computing</td>
<td>Chapters 4 and 5</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Dimension reduction</td>
<td>Chapter 6</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Probabilistic learning: Classification</td>
<td>Chapter 8</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Forecasting numerical data</td>
<td>Chapter 10</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Black-Box</td>
<td>Chapter 11</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Black Box</td>
<td>Chapter 11</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>k-Mean Clustering</td>
<td>Chapter 13</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>k-mean clustering</td>
<td>Chapter 13</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Model performance assessment</td>
<td>Chapter 14</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Thanksgiving Holidays</td>
<td>Chapter 14</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Improving model performance</td>
<td>Chapter 15</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Project presentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Final Exam*</td>
<td></td>
<td></td>
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</tbody>
</table>
*Exact date and time will be announced based on lab availability and university calendar.

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

Late Work and Make-up Exams
Homework will have a 10% penalty after the due date. There will be no makeup for a missed exam. Please see section below regarding the exams policy.

Final Exam Policy
You are allowed to bring in TWO pages of notes for the final exam, written or typed on both sides on a sheet not larger than 8.5”x11”. Your name should be written at the top of the page in large and clear letters. You are allowed to use TI-83 plus or TI 84 calculator but no TI inspire or other calculator with internet connectivity capabilities. Pages of notes and/or calculators cannot be shared. Cell phones cannot be used as calculators. No music devices are allowed during the examinations. Scratch paper and distribution tables sheets will be provided during the examination and should be returned to the instructor. No other webpages should be opened during a computer administered exam. If extra points are given, the total score should not exceed 100%. No points will be “saved” toward the next examination.

K. COLLEGE AND UNIVERSITY POLICIES

- Academic Integrity (University)
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- Classroom/Professional Behavior
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to
disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. **Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course.** Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.
• Disability Services
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

http://disabilityservices.tamucc.edu/

• Statement of Academic Continuity
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. OTHER INFORMATION

• Academic Advising
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

GENERAL DISCLAIMER
  I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.