

Advanced Business Analytics (BAN 5753) – Tentative Syllabus for Online (OL) and On Campus (OC or F2F) sections

(All students must check class site regularly for schedule, updated syllabus, etc.)

Professor: Dr. Goutam Chakraborty

Office: 458 Business School, Phone: 405 744 7644, email: Goutam.chakraborty@okstate.edu

Guest Faculty: Guest faculty will be introduced when their sessions start. Some of the guest faculty (Dr. Dmitriy Khots, Mr. Anvesh reddy, Mr. Ramcharan Kakarla) will come and teach specific concepts/modules as those are introduced in the class (these are already on the schedule). Other guest faculty such as Dr. Lolla may join us throughout the entire course as needed.

Class Materials: Most of the class materials will be distributed via the online web site for this class (<https://canvas.okstate.edu/>).

Class Site: (Canvas): <http://canvas.okstate.edu>

Canvas Tutorials for Students: <https://osuonline.okstate.edu/Canvas.vbhtml>

Greenwood Center for Online Excellence Support: spearsonline@okstate.edu

Phone: 405-744-4048

Facebook: Follow Greenwood Center for Online Excellence on Facebook!

<https://www.facebook.com/SpearsOnline/>

Teaching Assistant (TA): Will be announced in the first week of class. Please note that the TA will be your first point of contact for issues related to this class.

E-mail: Please use the class discussion bulletin-board via class site (on canvas) for any general questions, comments, clarifications about any of the class topic (including cases, assignments etc.). Use the e-mail to TA sparingly and only for questions that disclose or ask for personal information (such as grades, scores, etc.) *There is no need to copy faculty with your email to TA – if the TA is unable to answer your question, he/she will discuss with us and get back to you.*

Faculty and TA Responses: The TA will respond to student inquiries *within 24 hours during Monday-Friday business hours*. For inquiries *outside business hours on weekdays or during weekends*, TA will respond within 48 hours. If a response is not received within the expected time as mentioned above, please follow-up with the TA with a CC to faculty.

Students will expect grades for assignments to be posted to the Gradebook in Canvas within one week of turning in the assignment. Please consider these timelines when you are scheduling your course work assignments. While the TA and faculty will do everything we can to respond in a timely manner, waiting to post a question one hour before the assignment is due will not allow for adequate time for a response.

Class Discussion via class site (on Canvas): We will use this site extensively for communication among students as well as between students and the instructor. The discussion will be via a bulletin-board type system with specific folders for different aspects of this course. There may be multiple forums (folders) in this bulletin board. Please check these regularly. Please post your questions only in the **appropriate areas**. Please use appropriate subject line in your posting and use threaded discussion whenever possible.

Required Text:

- None

We will use readings off the web, cases, SAS training materials, chapters from reference books, cases etc. in this class (some of these are shown in the schedule). We have also indicated a number of good books (under reference texts) on this topic that you may find useful.

Reference Texts:

These are great resources. You may find them very useful for writing *papers* and doing *projects* and in appearing for *interviews*. So, I strongly recommend that you read them.

- Predictive Modeling with SAS Enterprise Miner, by Kattamuri Sarma, 3rd Edition, SAS Press Series, 2017.
- SAS for Forecasting Time Series by John Brocklebank, David Dickey and Bong Choi, 3rd Edition, SAS Press Series, 2018.
- Applied Data Mining for Forecasting using SAS by Tim Rey, Arthur Kordon and Chip Wells, 1st Edition, SAS Press Series, 2012.

Office Hours

Tuesday, 9:00-10:30 (via zoom, <https://busokstate.zoom.us/j/2586183301>)

Virtual Office Hours (to get my opinions on any issue related to this class)

Please use the online platform for this purpose. Faculty and TAs will monitor this platform closely and try to answer your questions quickly. All students will also have an option to use call-in via Lab Zoom meeting (see below) to talk to faculty at the beginning of each Monday's lab.

COURSE OBJECTIVES

This course has five major objectives that fit within five of the program learning goals.

Course Objectives	Program Learning Goal
Students will be able to engage in analytical reasoning to break problems into their component parts; identify important patterns by analyzing data; and test for assumptions behind models.	• Critical Thinking
Student can apply science and business principles to analyze and interpret data, using analytic and computer-based techniques.	• Critical and Creative Thinking
Students will be able to present written results from their analyses by relating those back to the business issues that demonstrate a mastery of language and mechanics.	• Written Communication
Students will be able to present their results orally using a message that is well organized, concise and quickly understandable by business professionals.	• Oral Communication
Students will be able to use appropriate tools and technologies for data visualization and statistical model building	• Technology Skills

Course Prerequisites

My assumption is before coming into this advanced class, you have already acquired knowledge of all topics covered in prerequisite courses: descriptive analytics (BAN5733) and predictive analytics (BAN5743). It is also assumed that you have understanding of concepts of database management systems and SQL. A fair amount of SAS and some amount of R and Python programming experience is strongly recommended before taking this course. If you do not have these programming skills, consider acquiring them via OSU and/or online courses before taking this class.

Course Description

In this course will focus on learning how to use **advanced business analytics tools and techniques** in the context of common applications in business. Content in this course will include various modeling techniques as well as data engineering and data science topics. We will likely use various programming/analytics tools such as SAS Viya, SAS EM, base SAS, R and Python. In addition, we will use open source platforms such as GCP and Spark. While many of the topics in this course will be new, we will take a deep dive into mechanics of certain techniques that you have been exposed before (such as Multiple Regression or, MR).

My philosophy in teaching the course is “*you learn by doing*,” that is, you should be mentally prepared to work extensively with software in analyzing data sets using various techniques. The course will use lectures, data analysis using state-of-the-art analytics software, readings, discussions and exercises/assignments and projects.

Course Format

Lectures: The link for each video lecture will be posted on class site. It is your responsibility to watch the lecture video and do appropriate readings/exercises **for each week**.

Labs for Online learning students: It is not required for online students to attend labs physically or, synchronously. But I **strongly recommend that you try to attend the lab synchronously**, if possible. If not, then at least watch the lab recordings as soon as possible.

Computer and Software Requirements:

- A broadband internet connection
- Windows 10 or Mac OS Mavericks or newer operating system are preferred
- Google Chrome or Mozilla Firefox web browser
- Note: lecture videos may not compatible with Internet Explorer or Edge
- [VLC Viewer](#) video player (click on link to download)
- Other software such as SAS, R, Python, etc. as needed

Attendance in Lab

- *Mandatory attendance* required for all on campus students (whether on campus or, online) for Monday evening labs.
 - *However, if you feel sick, please do not come to class and go to UHS and notify me*
- *Online students are not required to attend lab via zoom* But I **strongly recommend that you try to attend the lab synchronously via zoom**, if at all possible. If not, then at least watch the lab recordings as soon as possible.
- However, all class requirements must be turned in by the time those are due.

Lab Zoom link for Online Students:

The link below will be used every Monday throughout the semester, except University Holidays. This information will also be found on the online platform calendar for your convenience. I **strongly encourage** you to use this option to clarify any topics related to this class.

[Join Zoom Meeting](#)

One tap mobile: US: [+17193594580](tel:+17193594580) or [+12532158782](tel:+12532158782)

Meeting URL: <https://busokstate.zoom.us/j/97315694221>

Meeting ID: 973 1569 4221

Join by Telephone

For higher quality, dial a number based on your current location.

Dial:

US: +1 719 359 4580 or +1 253 215 8782 or +1 346 248 7799 or +1 669 444 9171
or +1 669 900 6833 or +1 386 347 5053 or +1 564 217 2000 or +1 646 931 3860
or +1 929 205 6099 or +1 301 715 8592 or +1 309 205 3325 or +1 312 626 6799

Meeting ID: 973 1569 4221

Finally, as faculty I retain the right to modify this tentative syllabus based on how the class progresses. If I make changes, I will let you know via class site and/or email.

Class Requirements for Online Learning (OL) and On Campus (OC) Students

Exams (Individual): One comprehensive final exam (**35% of course grade**) as shown in the schedule. Exam will be handled using approved proctored methods (as noted below). There is a possibility of doing an external group project (such as Humana-Mays health analytics competition) as an alternative to the final exam. More details will be provided in class.

On Campus Section Students: In person during finals week (most likely on Monday of the finals week – TBA)

Online Section Students: Please contact Greenwood Center for Online Excellence Support: spearsonline@okstate.edu (**no later than September 1**). and set up your proctored exam to be completed by Monday of the finals week as soon as possible. More details TBA.

Exercises and Summary of Papers (Individual): Because of the emphasis on “hands-on learning” in this course, throughout the semester you will be working on many exercises (using appropriate software) on your own time. From time-to-time, you will be assigned papers to read and you will be asked to turn-in summaries of those papers. These exercises will primarily reinforce the concepts covered in the lectures. These exercises and summaries of paper must be done individually. Together these will be worth **25% of the course grade**. These will be due by *midnight on Sunday* of each week.

Weekly quizzes (Individual): There will be weekly quizzes to test your understanding of each week’s assigned lecture topics. These will be multiple-choice type questions based on content covered in each week. These will be worth **10% of course grade**. These will be due by *midnight on Sunday* of each week.

Group Project (Group of both OL and OC students): All students will be working on *two mini group projects* to compete in one of the national competitions as announced in class. A group for any project should consist of about **4 students** with **at least one student each** from **OL and OC** group. This group project will count for **30% of the course grade**. Peer evaluation forms will be used to ensure everyone participates in the group work. Students’ scores on group projects may be adjusted appropriately based on the data from the peer evaluations forms. More details about group projects/exercises will be announced in Lab or via class site/email.

Semester Grades: The final grade will be based on a class total of 100% as per details below.

Items	Description	Type	Course Grade Percentage
1	Final Exam	Individual	35%
2	Exercises	Individual	20%
3	Weekly Quizzes	Individual	10%
4	Mini Projects	Group	30%
5	Summary of papers	Individual	5%
	Total		100%

Those scoring 90% or above will result in A, 80% or more will result in B, 70% or above will result in C, 60% or above will result in D. Those getting less than 60% will get an F. I will look at the distribution of the total scores within each section and use any appropriate normalization as needed.

Late Assignments and University Policies: These are common for OL and OC students and is mentioned at the end of the schedule.

Tentative Schedule (All changes to this schedule will be announced via class site or email. Note there may be more deliverables with respect group work such as group mini projects– those will be announced via class site/email):

Week	Video Lecture Availability	Video Lecture Content	Lab Content and Activities (video of lab will be available as soon as possible)	Deliverables and Due Dates
1	21-Aug	Course introduction and course expectations. Basics of matrix algebra including matrix addition, subtraction, inversion and singularity, length and angle of vectors. Eigen values and Eigen Vectors, Diagonalization of SSCP matrix.	Group formation for mini projects. Discussion of class logistics	<ul style="list-style-type: none"> • Student self-introduction by Aug. 28 • Paper summary by Aug. 28 • Quiz by Aug. 28 • Exercise by Aug. 31
2	28-Aug	Derivation of MR equation using matrix algebra. Lecture on MR assumptions and Deep dive into MR diagnostics	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects.	<ul style="list-style-type: none"> • Group members' names by Sep 4 • Paper summary by Sep. 4 • Quiz by Sep. 4 • Exercise by Sep. 7
3	4-Sep	Public data cloud overview including basics of IaaS, PaaS and SaaS, Data tech stack on Azure, GCP, AWS and other cloud neutral options (Guest faculty: Dr. Khots)	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary by Sep. 11 • Quiz by Sep.11 • Exercise by Sep. 14
4	11-Sep	GCP Infrastructure and Data Ingestion/Storage , ingest Crypto API historical data into GCS and BigQuery (Guest faculty: Dr. Khots)	No lab due to Labor Day holiday	<ul style="list-style-type: none"> • Paper summary by Sep. 18 • Quiz by Sep.18 • Exercise by Sep.21
5	18-Sep	Google Data Studio :build dashboard using Google's internal BI tool Data Studio using freshly loaded data (Guest faculty: Dr. Khots))	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary 5 by Sep. 25 • Quiz by Sep.25 • Exercise by Sep. 28
6	25-Sep	BigQueryML and Vertex AI (use Google's public datasets to build a predictive model: https://cloud.google.com/bigquery/public-data using BQML and deploy model using AI Platform/Vertex AI) Guest faculty: Dr. Khots	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary 6 by Oct. 2 • Quiz by Oct. 2 • Exercise by Oct. 5
7	2-Oct	Group mini-project 1 (combination of learnings from <i>previous 4 GCP modules</i>) Guest faculty: Dr. Khots	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • No quiz or, paper • Mini-project due by Oct.12
8	9-Oct	Spark Introduction: Introduction to Big- Data, distributed system, distributed consensus, HDFS, execution engines, running spark on yarn, spark architecture, spark sessions and	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary by Oct. 16 • Quiz by Oct. 16 • Exercise by Oct. 19

		memory settings. Guest faculty: Anvesh Reddy and Ramcharan Kakarla		
9	16-Oct	Spark Scala RDD and Operations: RDD creation, RDD transformation, Scala transformation, Lazy evaluation and textual operations. Guest faculty: Anvesh Reddy and Ramcharan Kakarla	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary by Oct. 23 • Quiz by Oct. 23 • Exercise by Oct. 26
10	23-Oct	Spark structured data processing and data sources: data frames such as Json, parquet and others, compressions, broadcast, serialization, partition and join, spark submit for batch processing. Guest faculty: Anvesh Reddy and Ramcharan Kakarla	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary by Nov 2 • Quiz by Oct. 30 • Exercise by Nov. 2
11	30-Oct	Spark applications GraphDB & MLib, Performance Tuning: mlib, ML pipeline, spark graphdb, industry best practices, performance tuning. Guest faculty: Anvesh Reddy and Ramcharan Kakarla	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary by Nov 9 • Quiz by Nov 6 • Exercise by Nov 9
12	6-Nov	Group mini-project 2 (combination of learnings from <i>previous 4 Spark modules</i>). Guest faculty: Anvesh Reddy and Ramcharan Kakarla	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • No quiz or, paper • Mini-project due by Nov.16
13	13-Nov	Variable reduction and variable selection, PCA, Variable Clustering	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary by Nov 20 • Quiz by Nov 20 • Exercise by Nov 20
14	20-Nov	Thanksgiving Break	Thanksgiving Break	• Nothing due – Yippee!
15	27-Nov	SVM, Gradient Boosting and Random Forest Models.	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary by Dec 4 • Quiz by Dec 4 • Exercise by Dec 7
16	4-Dec	Advanced Time Series Models Part 1 and Part 2, Class summary, review of final exam	Discussion of prior week's topics, discussion of any papers assigned in last week, clarification about exercise/mini projects	<ul style="list-style-type: none"> • Paper summary by Dec 11 • Quiz by Dec 11 • Exercise by Dec 11
17	11-Dec	Final exam week (details to be announced) to be held on campus on Monday night from 8PM to 950PM for OC section and via online for OL section		Final Exam

Late Assignment and University Policies (Common for OL and OC students)

Late Assignments: Any assignment must be turned in by the class time on the due date/time via Canvas assignment (not emails). All late assignments (*even 1-minute late*) will be *penalized* as follows:

- One late assignment (individual not group) allowed (within 24 hours of due date and time) – *no excuse needed and no penalty*
- All other late assignments (individual or group) will carry following penalty structure:
 - Within 1 hour of due date and time – 15% penalty
 - More than 1 hour but less than 24 hours of due date and time – 30% penalty
 - More than 24 hours but less than 48 hours of due date and time – 50% penalty
 - More than 48 of due date and time – will not be graded (no credit)

We enforce this rule because we believe that part of effective functioning in business is the ability to complete projects on time. **Please do not email/call/contact us or our TA with excuses (however valid they may be) about making exceptions to our late submission policy.**

More details on the assignments/cases/readings/projects will be posted on the class site.

University Policies

For all other issues such as add/drop policy, academic integrity etc., we will follow OSU guidelines as posted in the site below – look at the bottom of the following page for syllabus attachment <https://academicaffairs.okstate.edu/content/resources-faculty-staff>

Drop Policy: Information about university drop policy and dates is at this website:

<http://registrar.okstate.edu/>. To drop this course, contact the Registrar's office, (405) 744-6876, or drop through Banner Self Service, <http://my.okstate.edu>

Academic Integrity: Oklahoma State University is committed to the maintenance of the highest standards of integrity and ethical conduct of its members. This level of ethical behavior and integrity will be maintained in this course. Participating in a behavior that violates academic integrity (e.g., unauthorized collaboration, plagiarism, multiple submissions, cheating on examinations, fabricating information, helping another person cheat, unauthorized advance access to examinations, altering or destroying the work of others, and fraudulently altering academic records) will result in your being sanctioned. Violations may subject you to disciplinary action including the following: receiving a failing grade on an assignment, examination or course, receiving a notation of a violation of academic integrity on your transcript (F!), and being suspended from the University. You have the right to appeal the charge. Contact the Office of Academic Affairs, 101 Whitehurst, 405-744-5627, <http://academicintegrity.okstate.edu/>.

Student Disability Service Issues: If any member of the class believes that s/he has a physical, emotional, or psychological disability and needs accommodations of any nature, the instructor will work with you and the university Office of Student Disability Services (SU 315, 744-7116 v/t) to provide reasonable accommodations to ensure that you have a fair opportunity to perform in this class. Please advise the instructor of such disability and the accommodations as soon as possible. You will need to also contact the Student Disability Services office to receive accommodations. No accommodations will be made without prior notification.