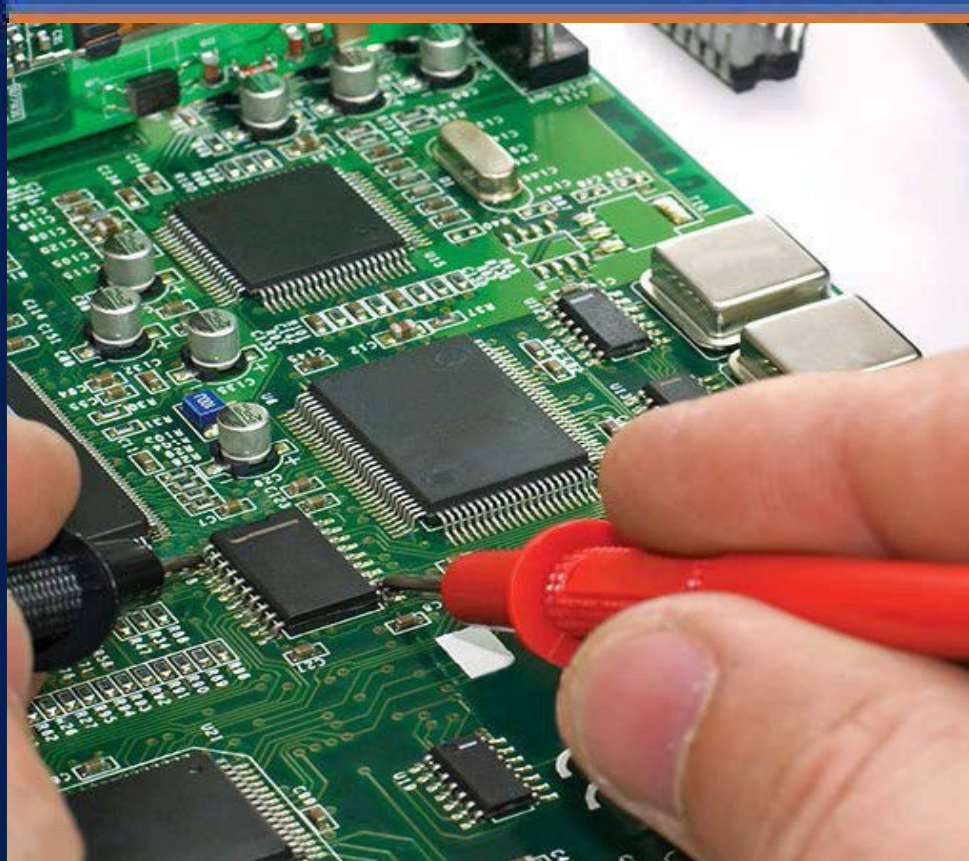




BM ET 1305

Electronics 1



About Us

The College of Biomedical Equipment Technology (CBET) is a majority Veteran owned and operated private college offering Biomedical Equipment Technician (BMET), Healthcare Technology Management (HTM) and Healthcare Information Systems Management training at the certificate and associates degree levels. Our leadership team is comprised of individuals with decades of experience in the healthcare industry and education. Similarly, our instructional staff is comprised of industry experts and award-winning educators dedicated to providing quality education, training, and career services to our students.

Locations

Main Campus

105 Windy Meadows, Suites 201
Schertz, Texas 78154
www.cbet.edu

Mission

“The College of Biomedical Equipment Technology delivers premier education and training in Healthcare Technology Management and Information Technology to equip students to meet the evolving needs of the industries we serve.”

ABOUT THE COURSE

Electronics I is the first of a series of three courses devoted to teaching the basics of electrical theory, functions of electronic circuits, and practical applications for those circuits in the control of medical devices.

COURSE DESCRIPTION

The course is designed to teach students how electricity works, how electrical circuits and components work, as well as how to use basic test equipment to obtain measurements in the circuit. By the end of this course students should have an understanding of basic AC and DC circuits and their measurements and functions. To accomplish this we teach a variety of topics including: Scientific Principles in Relation to Basic Flow of Electricity, Relationship Between Voltage, Current, Resistance and Power in DC and AC, Analyzing and Troubleshooting Series Circuits, Parallel Circuits and Series-Parallel Circuits, Understanding Voltage Divider Networks, the Operation of Various Meters for Electrical Measurements for DC and AC Circuits, Ohm's Law and Kirchhoff's Voltage and Current Laws, Magnets and Magnetic Materials, the Laws of Electromagnetism and Understanding of Transformer Theory.

LEARNING OBJECTIVES

- LO1. Describe the scientific principles that apply to the basic flow of electricity and understand the function of conductors, semiconductors, and insulators in standard and electronic circuits.
- LO2. Understand the relationship between current, voltage, resistance and power in DC and AC Circuits.
- LO3. Analyze and troubleshoot series, parallel and series-parallel circuits.
- LO4. Design a loaded voltage divider.
- LO5. Explain the basic construction and operation of an analog multimeter and the main features of a digital multimeter.
- LO6. Apply Ohm's Law and Kirchhoff's laws to help analyze complex circuits.
- LO7. Describe different types of magnets and classify magnetic materials.
- LO8. Explain the workings of electromagnets
- LO9. Explain the laws of electromagnetism.

TIME-ON-TASK

Time on task is the total learning time spent by a student in this course, including instructional time and time spent studying and completing course assignments and other activities (e.g., reading, research, writing, individual and group projects.) These activities are:

- Attending the weekly webinars
- Reading course presentations/ "lectures"
- Reviewing course notes
- Reading assignment references, books, or other course materials
- Participation in online discussions
- Conducting research
- Writing papers or other assignments
- Completing other assignments (e.g., projects)

The entire course Time-on-Task is 118 hours.

Instructional Team

The Electronics I course is led via webinar and interactive distance learning formats. In addition to the weekly live sessions, the instructor is accessible via the Learning Management System (LMS) daily, and by appointment via Zoom between the hours of Monday through Friday from 0800-1700 (CST).



Mr. Kyle Thomas Callarman was born and raised in Quincy, Illinois. He enlisted in the United States Navy in March 2013, completing basic training at Recruit Training Command in Great Lakes, Illinois, followed by Hospital Corpsman “A” School, where he began his career in Navy Medicine. His first assignment was at Naval Medical Center Portsmouth, Virginia, where he served in the Otorhinolaryngology Clinic and quickly advanced into a leadership role. His early years were marked by a focus on developing strong technical and interpersonal leadership skills, mentoring junior personnel, and supporting clinical readiness within one of the Navy’s largest medical facilities. In 2015, he attended the Navy’s Biomedical Equipment Technician “C” School at the National Medical Education & Training Center, where he earned his certification as a Biomedical Equipment

Technician (BMET). After graduation, he was assigned to the U.S. Naval Hospital in Okinawa, Japan. While stationed overseas, he became certified through Hamilton Medical Systems in G5 Ventilator maintenance and repair, supporting critical patient-care operations across the Pacific region. He also served as Assistant Command Fitness Leader for over 800 sailors, leading the command to a 99% fitness pass rate. Additionally, he coordinated regional decontamination training exercises to enhance CBRN and mass casualty readiness. In 2019, Petty Officer Callarman reported aboard USS San Diego (LPD 22), where he served as the ship’s sole Biomedical Equipment Technician and Medical Training Team Coordinator. His work directly contributed to the ship’s successful inspection and deployment readiness certification. He was also recognized as the 2020 Operational Biomedical Equipment Technician of the Year—the first Petty Officer Second Class (E-5) ever to receive this distinction. During his tenure, he was promoted to Petty Officer First Class (E-6) and led his department to earn multiple Navy awards for medical readiness, retention excellence, and individual professional achievement. In 2022, he completed the Navy Instructor Training Course and joined the staff at Navy Medicine Readiness Training Command, Fort Sam Houston, Texas, as a Biomedical Equipment Instructor. There, he has trained and mentored future BMETs across multiple medical technology disciplines, including Diagnostic Imaging. His excellence as an educator was recognized when he was named the Navy Medicine Forces Development Command Instructor of the Year for Fiscal Year 2023. Today, HM1 Callarman serves as the Enlisted Technical Leader for all Navy Biomedical Equipment Technicians, overseeing professional development and training standards across the Navy BMET community. His career reflects a commitment to technical excellence, mentorship, and innovation in healthcare technology management. Mr. Callarman can be contacted directly through CANVAS messaging or via e-mail at kcallaraman@cbet.edu, during office hours, Monday through Friday, 0800-1700 CST.



Mike Adams brings a wealth of experience and knowledge to the student’s education. His biomedical equipment background began at Philips Medical as a field service engineer for ten years installing, maintaining, and repairing x-ray systems (Cath and Radiology). His career then led to being an in-house service engineer at Lee Health in Fort Myers, FL for two years before promotions during the following 25 years to Lead BMET Imaging Specialist and Supervisor. Mike’s leadership role entailed writing and negotiating equipment contracts, managing service engineers at four hospitals and various outpatient facilities, budgeting, planning capital equipment purchases, and coordinating with the hospital leadership. Mr Adams’ education includes an Associate Degree in Electronics Engineering from ITT Technical Institute, a Bachelor in Science in Business Administration of Technical Studies from Bellevue University, and over forty equipment specific training courses provided by Philips Medical, GE, Siemens, Infimed, and many other manufacturers. He was an invited lecturer at an AAMI convention speaking on the subject of contract negotiation. Mr. Adams can be contacted directly through CANVAS messaging or via e-mail at madams@cbet.edu, during office hours, Monday through Friday, 0800-1700 CST.

Instructional Methods and Activities

The student online learning environment is structured to mirror the course syllabus and includes all the information students require to successfully navigate the course. The online learning environment referred to as CANVAS, provides a means for students to engage, communicate, and learn. CBET instructors will actively engage students in CANVAS via discussion board forums and other activities designed to cultivate student engagement and participation.

Online Classes (Daily): Students are expected to engage in CANVAS. Courses includes weekly assignments, quizzes, tests, and other requirements prescribed by the instructor. Students are responsible for completing weekly assignments in a timely manner as prescribed by the instructor(s). It is important to remember that in addition to the resulting grades, completion of weekly assignments is also used to measure student engagement, attendance, and participation.

Weekly Live Webinars Mandatory: Mandatory instructor led webinars will be conducted at least once per week (60 Minutes). Additionally, students may request one-on-one counseling or tutoring sessions based on the instructor's availability. Webinars are not optional; however, we understand that from time-to-time students may not be able to attend in person. If you cannot attend a live session, the webinars will be posted in CANVAS for review.

Online Discussion Forum (Daily/Weekly): CANVAS includes a discussion board with weekly prompts and instructions for completing daily/weekly assignments. Students are required to respond to all weekly discussion board topics and instructor-directed prompts. Responses must be substantive and meet the minimum word count requirement. Additionally, students are required to engage with peers by responding to no fewer than two student responses per week. Student participation and attendance in CANVAS is reported to the Director of Education on a weekly basis and the information is used, in part, to measure attendance and participation in the course.

Late/Make-up work: All assignments must be completed on time and as instructed to receive full credit. Make-up work shall:

1. Be supervised by an instructor approved for the subject being made up.
2. Require the student to demonstrate the same knowledge or competence expected of a student who attended the scheduled class session.
3. No more than 5% of the missed work can be made up. All work must be completed and submitted within seven (7) calendar days of its original due date. All coursework must be submitted no later than six (6) calendar days after the course ends.

WEEK 1/MODULE 1 (Module 1 Fundamentals of Electricity)

Learning Objective 1: Fundamentals of DC Circuits.	
TLO 1	Scientific Principles in Relation to Basic Flow of Electricity.
TLO 2	Relationship between Current and Voltage.

Module 1 Overview:

The first course module requires students to learn the basic concepts of electricity, have an in depth look at current and voltage, learn about scientific notation and how to convert between prefixes in powers of ten.

Week 1 Discussion Questions

Discussion Question (DQ) 1: Please take some time to introduce yourself and give a brief description of your electronics background (if applicable). If not just tell us a little about yourself and what you hope to gain from this course.

Discussion Question (DQ) 2: What is Ohm's Law, and why is voltage so important. [Minimum 200-word response for full credit]

Discussion Question (DQ) 3: Write about two applications for a series circuit, (Think about the different electronics at home or at work), and some of the advantages and disadvantages? [Minimum 200 word response for full credit of 10 bonus points]

Webinar Session (60 Minutes): The Module 1 webinar will include a course overview and instructions to improve the student's ability to access materials and resources. Additionally, the Webinar's topics and discussions will be directed toward the weeks learning objectives.

Week 1 Assignments

Assignment 1: The weekly assignment will 30 multiple choice, fill in the blank and true/false questions, based on the weeks reading and lecture topics.

Assignment 2: Complete a weekly 100-point quiz based on the learning objectives of the week.

Assignment 3: The lab will require research and creation of a basic electrical circuit which will enhance the understanding of one or more of the week's topics. In addition, Students will be required to submit both photographic and written portions to show their work.

Time-on-Task

The Time-on-Task for this module is 21 hours.

WEEK 2/MODULE 2 (Resistance and Laws of Electricity)

Learning Objective 2: Identify the Laws of Electricity and identify the role of resistance and resistors in a circuit.	
TLO 1	Understand Resistors and Their relationship Between Current and Voltage.
TLO 2	Apply Ohm's Law and Kirchoff's Laws to help analyze complex circuits.
TLO 3	Operation of Various Meters for Electrical Measurements in DC Circuits.

Module 2 Overview:

During week 2 students will take an in-depth look at resistors and how they are connected in series and parallel circuits, explore the basics of Ohms and Kirchoff's Laws and how to take electrical measurements to include current. Voltage and resistance using various meters.

Week 2 Discussion Questions

Discussion Question (DQ) 1: What are some applications for a series-parallel circuit? [Minimum 200-word response for full credit]

Discussion Question (DQ) 2: Choose one of the applications and tell everyone why a series-parallel circuit is used for the application instead of just a series or parallel circuit. [Minimum 200 word response for full credit]

Webinar Session (60 Minutes): The Webinar's topics and discussions will be directed toward the weeks learning objectives.

Week 2 Assignments

Assignment 1: The weekly assignment will 30 multiple choice, fill in the blank and true/false questions, based on the weeks reading and lecture topics.

Assignment 2: Complete a weekly 100-point quiz based on the learning objectives of the week.

Assignment 3: The lab will require research and creation of a basic electrical circuit which will enhance the understanding of one or more of the week's topics. In addition, Students will be required to submit both photographic and written portions to show their work.

Time-on-Task

The Time-on-Task for this module is 20 hours.

WEEK 3/MODULE 3 (Power, DC Circuits, and Magnetism)

Learning Objective 3: Understand the laws of electromagnetism and the role of magnets and magnetism in electronics.

TLO 1	Power and it's Relationship Between Resistance, Current and Voltage.
TLO 2	Analyze and Troubleshoot Series Circuits, Parallel Circuits and Series-Parallel Circuits.
TLO 3	Magnets and Magnetic Materials.

Module 3 Overview:

During module 3 students will learn about the different characteristics of series, parallel and series-parallel circuits, how electrical work is done and the effects of electrostatic charge in a DC circuit.

Week 3 Discussion Questions

Discussion Question (DQ) 1: As Biomedical Equipment Technicians you will work with a variety of Test, Measurement and Diagnostic Equipment (TMDE). Oscilloscopes, ohmmeters, ammeters, voltmeters, Safety analyzers, Ox1-OxSim and the list goes on. The Digital Multimeter (DMM) is another great tool for any technician. Using Chapter 6, Google or another search engine as reference discuss the abilities of a DMM and which TMDE you feel is essential for technicians to have in their toolbox. [Minimum 200-word response for full credit]

Webinar Session (60 Minutes): The Webinar's topics and discussions will be directed toward the weeks learning objectives.

Week 3 Assignments

Assignment 1: The weekly assignment will 30 multiple choice, fill in the blank and true/false questions, based on the weeks reading and lecture topics.

Assignment 2: Complete a weekly 100-point quiz based on the learning objectives of the week.

Assignment 3: The lab will require research and creation of a basic electrical circuit which will enhance the understanding of one or more of the week's topics. In addition, Students will be required to submit both photographic and written portions to show their work.

Time-on-Task

The Time-on-Task for this module is 21 hours.

WEEK 4/MODULE 4 (Laws of Electromagnetism/ Introduction to AC Circuits)

Learning Objective 4: Describe the laws of electromagnetism and understand basic concepts of AC voltage in circuits.

TLO 1	Laws of Electromagnetism.
TLO 2	Understanding AC Circuit Fundamentals.

Module 4 Overview:

During module 4 students will learn about the effects of electromagnetic field and the effects of electrostatic charge in a DC circuit and learn terminology and concepts of AC circuits.

Week 4 Discussion Questions

Discussion Question (DQ) 1: Do you have an analog or digital multimeter? If so, which one(s) do you have and if money were no object, which one would you prefer and why? Use last week's research if you do not have one. [Minimum 200-word response for full credit]

Webinar Session (60 Minutes): The Webinar's topics and discussions will be directed toward the weeks learning objectives.

Week 4 Assignments

Assignment 1: Read the assigned article and answer the applicable questions.

Assignment 2: Complete a weekly 100-point quiz based on the learning objectives of the week.

Assignment 3: The lab will require research and creation of a basic electrical circuit which will enhance the understanding of one or more of the week's topics. In addition, Students will be required to submit both photographic and written portions to show their work.

Time-on-Task

The Time-on-Task for this module is 20 hours.

WEEK 5/MODULE 5 (AC Measurements, Resistive, and Capacitive Circuits)

Learning Objective 5: Recall the operation of various meters in AC circuits, and the relationships of current voltage and power in capacitive circuits.

TLO 1	Operation of Various Meters for Electrical Measurements in AC Circuits.
TLO 2	Relationship of Resistance, Voltage, Current and Power in Resistive and Capacitive AC Circuits.

Module 5 Overview:

During module 5 students will learn about analog and digital multimeters used to measure AC circuits, will be introduced to the relationship between voltage, current and resistance in a basic AC resistive circuit and capacitive circuits.

Week 5 Discussion Questions

Discussion Question (DQ) 1: This week we will be going over inductors and their circuits. Discuss the relationship that inductors have with magnetism and electromagnetism? [Minimum 200-word response for full credit]

Discussion Question (DQ) 2: What other electronics rely on magnetism and electromagnetism? [Minimum 200-word response for full credit]

Webinar Session (60 Minutes): The Webinar's topics and discussions will be directed toward the weeks learning objectives.

Week 5 Assignments

Assignment 1: The weekly assignment will 30 multiple choice, fill in the blank and true/false questions, based on the weeks reading and lecture topics.

Assignment 2: Complete a weekly 100-point quiz based on the learning objectives of the week.

Time-on-Task

The Time-on-Task for this module is 18 hours.

WEEK 6/MODULE 6 (Inductive and Resonance Circuits, Transformers)

Learning Objective 6: Understand transformer theory and recognize the relationship of the electrical properties of resonant and reactive circuits.

TLO 1	Understand Transformer Theory.
TLO 2	Relationship of Resistance, Voltage, Current and Power in Inductive and Resonance Circuits.

Module 6 Overview:

During module 6, Students will learn about the phase relationships between voltage, current and resistance in basic inductive and capacitive AC circuits and transformer theory and applications.

Week 6 Discussion Questions

Discussion Question (DQ) 1: What happens when we encounter a circuit that has all 3 components in series? Parallel? [Minimum 200-word response for full credit]

Discussion Question (DQ) 2: How do we figure out what our phase relationship in a series reactance and resistive circuit? Parallel? [Minimum 200-word response for full credit]

Webinar Session (60 Minutes): The Webinar's topics and discussions will be directed toward the weeks learning objectives.

Week 6 Assignments

Assignment 1: The weekly assignment will 30 multiple choice, fill in the blank and true/false questions, based on the weeks reading and lecture topics.

Assignment 2: Complete a weekly 100-point quiz based on the learning objectives of the week.

Time-on-Task

The Time-on-Task for this module is 18 hours.

Note: Please remember to complete the end of course survey prior to the last day of class.

Course Grade Distribution

Discussion Board/Webinars (Participation)	35%
Weekly Assignments (Homework)	35%
Weekly Quizzes	30%

Discussion Board Grading Criteria (17.5% of overall grade)

Students are required to respond to all weekly discussion board topics and instructor-directed prompts. Responses must be substantive and meet the minimum word count requirement. Additionally, students must engage with peers by responding to no fewer than two peer-to-peer responses per week. The following rubric is used as a guide by instructors to evaluate and grade student responses to discussion questions and peer-to-peer engagement:

	Beginning	Developing	Accomplished	Exemplary
Activity: Provides correct number of postings at designated times. (20 Points)	0-25 Points Contributes fewer than the required 2 Discussion Question (DQ) responses.	25-50 Points Contributes 2 Discussion Question (DQ) responses but one or both fail to meet minimum word-count requirements for the DQ.	50-75 Points Contributes by providing 2 Discussion Question (DQ) responses and meets the minimum word count requirements for the DQ.	75-100 Points Exceeds required DQ word count requirements and/or provides an exemplary response to a DQ.
Engagement: Provides analysis, and responses to student/teacher posts (20 Points)	20 to >17 pts Contributes fewer than the required peer-to-peer responses in the discussion forum.	17 to >15 Points Contributes 2 peer-to-peer responses in the discussion forum but fails to meet minimum word-count requirements and lacks substance.	15 to >13 Points Contributes by providing 2 peer-to-peer responses and meets the minimum word count requirement for the peer-to-peer response.	13 to >0 pts Exceeds required peer-to-peer response requirements by meeting the minimum word count requirement and providing substantive responses to peers.
Content Posts are well thought out, well written, researched, cited (as required), and follow along with topics established by the instructor. (60 Points)	60 to >53 pts Postings in the discussion forum are not relevant to the assigned topic, are inaccurate, or misrepresented.	53 to >47 pts Postings in the discussion forum address peripheral topics, are generally accurate, but may contain factual omissions and/or errors.	47 to >41 pts Postings are generally substantive; however, responses rely too heavily on opinion than fact. Postings meet word count requirements but lack scholarly tone or appropriate references.	41 to >0 pts Discussion Question and Peer-to-Peer postings consistently contribute to the discussion, contain substantive comments backed by relevant references and encourage open dialogue and additional discussion in the class.

Weekly Live Webinars (17.5% of overall grade)

Mandatory instructor-led webinars will be conducted at least once per week (60 Minutes). Webinars are not optional; however, we understand that from time-to-time students may not be able to attend in person. If you cannot attend a live session, the webinars will be posted in CANVAS for review. Instructors will assign weekly assignments associated with the live webinars.

Weekly Quizzes (30%)

Students will be assigned homework on a weekly basis. Homework may consist of a wide variety of deliverables. Quizzes are assigned in weeks one, two, and five. Worksheets are assigned in weeks two and four. Homework may include a wide array of requirements, ranging from written assignments, research projects, Power-Point presentations, and a host of other activities. In all cases, instructors will endeavor to ensure that students possess a clear understanding of the requirements and expectations.

Grading System for the College of Biomedical Equipment Technology

A	90-100	4.0	F	59 & Below	0.0
B	80-89	3.0	W	Withdrawal	N/A
C	70-79	2.0	I	Incomplete	N/A
D	60-69	1.0	T	Transfer	N/A

To receive an incomplete “I”, the student must petition the instructor for an extension to complete the required coursework. The student must be able to pass the course with the completed work and garner a grade of 70 or better. Incomplete grades that are not completed within 7 business days after the beginning of the next session will be converted to the existing grade earned in the course and will affect the student’s GPA accordingly. CBET reserves the right to extend the time needed to fulfill the incomplete.

An “I” does not count towards the Grade Point Average (GPA) until a grade is assigned. A “W” is given when a student is dropped from the roster during the course and does not replace the previous grade(s). Grades of “W” and “F” are recorded in the academic transcript and reflected in the GPA. When a course is repeated after failure or withdrawal, the later grade will replace the first grade in calculating the CGPA. The clock hours of the course repetition are counted toward the maximum timeframe. CBET shall record a grade of “incomplete” for a student who withdraws but is not entitled to a refund if the student requests the grade at the time the student withdraws, and the student withdraws for an appropriate reason unrelated to the student’s academic status.

A student must repeat a course in which a grade of “F” was received. A student can repeat each course once, however, once they reach 1.5 times the length of time required for graduation, they will be dropped from the program. If a student fails any course a second time, he/she will be dropped from the program. A failed course will be rescheduled for the earliest possible module at the discretion of the Director of Education. Students will be charged to retake the course.

Additional Resources and Points of Contact

Students requiring additional administrative support are encouraged to contact the Colleges Student Advocate, Mrs. Terri Gomez, at 210.233.1102 or via e-mail at tgomez@cbet.edu

For a complete list of administrative policies and regulations refer to the CBET Catalog at <https://cbet.edu/course-catalog>

NOTE: THE INSTRUCTOR RESERVES THE RIGHT TO MODIFY THIS SYLLABUS and COURSE OUTLINE