



Columbus State Community College
Construction Sciences and Engineering Technology Department
Bioscience Technology

COURSE: BISI 1101 – BioScience Tech I

CREDITS: 4

LECTURE HOURS PER WEEK: 3

LAB HOURS PER WEEK: 3

PREREQUISITES: None

DESCRIPTION OF COURSE

This applied course covers learning objectives found in the Bioscience Industry and includes the following topics: pressure, flow, level, and related units. Additional topics include temperature and pH. Good Manufacturing Practices and regulatory agencies related to biomanufacturing are also introduced.

COURSE GOALS

- essential knowledge of Good Manufacturing Practices and process control systems
- skills for process, thermal, and analytical control systems
- application of processes, regulatory, and safety related to Bioscience Technology industry.

Instruction will be provided on common types of process control systems including flow and liquid level, temperature control systems and the basic concepts of which systems are based. Students will learn to calibrate, adjust, install, operate, and connect these process control systems.

GENERAL EDUCATION GOALS

- Scientific and Technological Effectiveness
- Critical Thinking

STUDENT LEARNING OUTCOMES

At the completion of this course, the student will be able to:

- describe Good Manufacturing Practices and their importance in the bioscience manufacturing industry.
- perform various skills for process, thermal, and analytical control systems in a team environment.
- connect, operate, and troubleshoot manual and automated process controls systems.

TEXTBOOKS – REQUIRED AND OPTIONAL READING

Lecture and reading material will be provided in-class or online. Lab exercises will use Learning Activity Packets Supplied (LAPS) provided in lab or online. Reference publications are available in the Educational Resource Center (ERC) or online.

INSTRUCTIONAL METHODS

Instruction will include lecture, discussion, and demonstration of basic knowledge and principles needed to understand Bioscience Technology. In-class exercises and laboratories will be performed to emphasize applied skills needed for various processes as well as regulatory and safety guidelines. Written reports on various topics related to Bioscience Technology and lab reports will be prepared and submitted. Site visits to bioscience companies in the Columbus area will also be used to provide a broader understanding of the Bioscience Technology workplace, entry-level skills, and job opportunities. Individual assistance and tutoring is also available.

ASSESSMENT

Columbus State Community College is committed to assessment (measurement) of student achievement of academic outcomes. This process addresses the issues of what you need to learn in your program of study and if you are learning what you need to learn. The assessment program at Columbus State has specific and interrelated purposes: (1) to improve student academic achievement; (2) to improve teaching strategies; (3) to document best practices; (4) to identify opportunities for systematic improvements; (5) to provide evidence for institutional effectiveness. In class you are assessed and graded on your achievement of the outcomes for this course. You may also be required to participate in broader assessment activities.

METHODS AND STANDARDS OF EVALUATION

Students will be evaluated on participation, assignments, lab reports, and open-book quizzes. In addition, interim and final exams (closed book) will be given to evaluate comprehension and retention of course material which the student will need in the workplace.

GRADING SCALE

A	90-100%
B	80 to <90%
C	70 to <80%
D	60<70%
E	<60%

Activity	Weighting
Participation	20%
Assignments	20%
Lab Reports	20%
Quizzes	20%
Exams	20%

SPECIAL COURSE REQUIREMENTS

Students must have completed the Evaluation and Survey Exam and Interview prior to entering this course. The Policy and Procedure Acknowledgements must also have been signed.

A TI30 scientific calculator or other device with similar functions will be needed for math calculations. Access to a computer compatible with Microsoft XP operating system or higher and Microsoft Word 2003, Microsoft Excel 2003, and PowerPoint 2003 or higher. The computer system will need to include a printer and high-speed internet access. Adherence to Columbus State Community College policies regarding computer use and software licensing agreements is required.

Appropriate dress and behavior is expected in class, in lab, and during site visits.

All written assignments need to be typed on 8 ½" x 11" plain white paper and black ink using Microsoft Word or equivalent and 11 or 12 point Arial or Times Roman font.

Lab reports are to be completed using the forms in the LAPS manual.

Safe practices are to be observed in the lab at all times.

Smoking is prohibited in all Columbus State buildings at all times and during all site visits.

Bioscience Training Grant requires notification of grant administrators regarding trainees not attending class or lab.

Please notify the Bioscience Training Grant Administrator if you are not able to complete the training program.

The use of electronic communication devices is not allowed in the classroom except for persons with disabilities.

No visitors or children are permitted in the class or lab.

Blackboard will be used for course syllabus, office hours, announcements, quizzes, grades, submitting reports, reading materials, and reference information.

ATTENDANCE POLICY

The college policy will be followed, and attendance will be taken each class period. Due to the comprehensive and intensive content of this course, students are expected to attend all classes. There will be no make-up classes. Contact the instructor if you are going to miss class. It is the student's responsibility to obtain course materials and to turn-in assignments on time, even if you cannot attend class.

STUDENT CODE OF CONDUCT

As an enrolled student at Columbus State Community College, you have agreed to abide by the Student Code of Conduct as outlined in the Student Handbook. You should familiarize yourself with the student code. The Columbus State Community College expects you to exhibit high standards of academic integrity, respect and responsibility. Any confirmed incidence of

misconduct, including plagiarism and other forms of cheating, will be treated seriously and in accordance with College Policy and Procedure 7-10.

AMERICANS WITH DISABILITIES ACT (ADA) POLICY

It is Columbus State policy to provide reasonable accommodations to students with documented disabilities. If you would like to request such accommodations because of physical, mental or learning disability, please contact the Department of Disability Services, 101 Eibling Hall, 614.287.2570 (V/TTY), <http://www.csc.edu/disability>. Delaware Campus students may also contact an advisor in the Student Services Center, first floor Moeller Hall, 740.203.8000. Ask for Delaware Campus advising, or www.csc.edu/delaware, for assistance.

INCLEMENT WEATHER OR OTHER EMERGENCIES

In the event of severe weather or other emergencies that could force the college to close or to cancel classes, such information will be broadcast on radio stations and television stations. Students who reside in areas that fall under a Level III emergency should not attempt to drive to the college even if the college remains open.

Assignments due on a day the college is closed will be due the next scheduled class period. If an examination is scheduled for a day the campus is closed, the examination will be given on the next class day. If a laboratory is scheduled on the day the campus is closed, it will be made up at the next scheduled laboratory class. If necessary, laboratory make-up may be held on a Saturday or by appointment.

Students who miss a class because of weather-related problems with the class is held as scheduled are responsible for reading and other assignments as indicated in the syllabus. If a laboratory or examination is missed, contact me as soon as possible to determine how to make up the missed exam or lab. Remember! It is the student's responsibility to keep up with reading and other assignments when a scheduled class does not meet, whatever the reason.

In the event the college is forced to close during Final Examination Week, exams scheduled for the first missed date will be rescheduled for (date), in the same location at the same time scheduled. Exams scheduled for a second missed date will be rescheduled for _____. Thus, our final exam is scheduled for (date) at _____ o'clock. If the college is closed that day, the exam will be held on (date) at _____ o'clock. If our exam is the second day the college has been closed, the exam will be held on (date) at _____ o'clock.

FINANCIAL AID ATTENDANCE REPORTING

Columbus State is required by federal law to verify the enrollment of students who participate in Federal Title IV student aid programs and/or who receive educational benefits through the Department of Veterans Affairs. It is the responsibility of the College to identify students who do not commence attendance or who stop attendance in any course for which they are registered and paid. Non-attendance is reported quarterly by each instructor, and results in a student being administratively withdrawn from the class section. Please contact the Financial Aid Office for information regarding the impact of course withdrawals on financial aid eligibility.

UNITS OF INSTRUCTION

Week	Session	Unit of Instruction	Learning Objectives/Outcomes	Assessment Method	Assignment	Assignment Due Date
1	1	Bioscience Technology Overview	Describe Bioscience Industry, Products, and Career Path	Exercise Report	Read Bioscience Technology Handouts Exercise on Bioscience Products Write paper on Bioscience Technology and You – Product, Process, and Skills	Session 2
	2	FDA	Describe FDA Role and History Use fractions, decimals, and percents in math calculations Describe Process Control System and Safety used in lab (Part 1)	Exercise Math Problems Report Quiz	Read FDA Role and History Handouts Exercise on FDA Perform Lab - LAPS 1 – Introduction to Process Controls, Part 1 and Self Review Problem set for fractions, decimals, and percents Write paper on FDA-Operator's Role Quiz on Week 1 Learning Objectives	Session 3
2	3	GMP	Describe GMP and Its Use in Biomanufacturing Use scientific notation, graphs, and range/tolerance in math calculations Describe Process Control System and Safety used in lab (Part 2)	Exercise Math Problems Report	Read FDA Guideline on GMP and related CFRs Exercise on GMP and CFRs Perform Lab - LAPS 1 – Introduction to Process Controls, Part 1 and Self Review Problem set for scientific	Session 4

					notation, graphs, and range/tolerance	
	4	Biomanufacturing Process Controls	<p>Describe Process and Process Controls</p> <p>Define QC, Audits & Inspections, Form 483, and Recalls</p> <p>Use Length Units, Equalities and Conversions for Calculations in US Standard and Metric Systems</p> <p>Describe Instrument Tags used in Process Control Systems</p>	Exercise Math Problems Report Quiz	<p>Write paper on What's in a Pill?</p> <p>Read Biomanufacturing Process and Control, FDA Audits, Form 483, and FDA CRFs for Process Controls</p> <p>Exercise on Process Controls</p> <p>Perform Lab - LAPS 2 – Instrument Tags and Self Review</p> <p>Problem set for Length Dimensional Units</p> <p>Write paper on FDA Recall</p> <p>Quiz on Week 2 Learning Objectives</p>	Session 5
3	5	Quality System	<p>Describe FDA Guidelines for Quality System</p> <p>Define Design Control, Document Control, and Purchasing Control</p> <p>Use Mass Units, Equalities and Conversions for Calculations in US Standard and Metric Systems</p> <p>Describe Piping and Instrumentation Diagrams for Process Control System</p>	Exercise Math Problems Report	<p>Read FDA Guidelines for Quality System and FDA CFRs for Design, Document, and Purchasing Controls</p> <p>Exercise on Quality Systems</p> <p>Perform Lab – LAPS 3 – Piping and Instrumentation Diagrams and Self Review</p> <p>Problem set for Mass Units using Equalities and Conversions for US Standard and Metric Systems</p> <p>Writing paper on What is Quality?</p>	Session 6

	6	Production Documentation	<p>Describe FDA guidelines for documentation, identification & traceability, production, acceptance activities, and SOPs</p> <p>Use Volume Units, Equalities and Conversions for Calculations in US Standard and Metric System</p> <p>Describe Loop Controllers for Process Control System</p>	Exercise Math Problems Report Quiz	<p>Read FDA Guidelines for documentation and CFRs for identification, production, and acceptance criteria</p> <p>Exercise on Documentation</p> <p>Perform Lab – LAPS 4 – Loop Controllers and Self Review</p> <p>Problem set for Volume Units using Equalities and Conversions for US Standard and Metric System</p> <p>Write paper on SOPs, Protocols, and Procedures</p> <p>Quiz on Week 3 Learning Objectives</p>	Session 7
4	7	Finished Product	<p>Describe FDA guidelines for labeling and packaging controls; handling, storage, distribution, and installation; and records</p> <p>Use Descriptive Statistics for Data Analysis</p> <p>Describe Final Control Elements for Process Control System</p>	Exercise Math Problems Report	<p>Read FDA Guidelines and CFRs for labeling and packaging; storage, distribution, and installation; and records</p> <p>Exercise on Finished Products</p> <p>Perform Lab – LAPS 5 – Final Control Elements and Self Review</p> <p>Problem set for descriptive statistics</p> <p>Write paper on Release Documents and Bill of Materials</p>	Session 8
	8	Production Facilities	Describe facility qualifications, training, calibration, maintenance, hygiene,	Exercise Math Problems Report	Read FDA Guidelines and CFRs for facility qualifications, training, calibration, maintenance,	Session 9

			<p>automation, and electronic system and signatures</p> <p>Use Significant Figures and Rounding in Math Calculations</p>		<p>hygiene, and electronic systems and signatures</p> <p>Exercise on Product Facilities</p> <p>Perform Lab Project for Process Control System</p> <p>Problem set for significant figures and rounding</p> <p>Write paper on What is System Suitability?</p>	
5	9	Other Regulatory Agencies	<p>Describe other regulatory agencies for bioscience industry such as USDA, EPA, DOT, OSHA, ISO, EMEA</p> <p>Define sterile process controls</p>	In-Class Exercise Quiz Report	<p>Read descriptions of various regulatory agencies and FDA Guidance on Sterile Processing</p> <p>Exercise on Other Regulatory Agencies</p> <p>Perform Lab Project for Process Control System</p> <p>Write paper on Safety and the Workplace or The Environment and Manufacturing</p>	Session 10
	10	Midterm 1 Review			Review of Midterm 1 Exam	Session 10
6	11	Midterm Exam & Lab Practical		Exam (Weeks 1-6)		Session 11
	12	Mechanical Forces	<p>Define forces, energy, flow rates</p> <p>Determine level measurement</p>	Exercise Math problems Report	<p>Read handout for mechanical forces</p> <p>Exercise on mechanical forces</p> <p>Perform Lab – LAPS 6 - Level Measurement and Self Review</p> <p>Problem set for level</p>	Session 13

					measurement	
7	13	Mechanical Energy	Describe energy, work, and power Define sources of energy Use Excel for graphing data	Exercise Math problems Report Quiz	Write paper on Density of Water Read handout for mechanical energy Exercise on Mechanical Energy Perform Lab – LAPS 7 - Liquid Level Control and Self Review Graph data set from LAPS 7 Write paper on Forms of Energy	Session 14
	14	Pressure – Liquids	Describe pressure and hydraulics Define density, specific gravity, and viscosity of materials Use Excel for graphing data Perform flow measurement calculations	Exercise Math problems Report Quiz	Read handout for Pressure - Liquids Exercise on liquid pressure Perform Lab – LAPS 8 - Liquid Level Control and Self Review Graph data set from LAPS 8 Write paper on Hydrostatic Pressure Quiz on Weeks 6 and 7 Learning Objectives	Session 15
8	15	Pressure - Gases	Describe gas pressure pneumatics Describe Boyle's Law, Pascal's Principle, Bernoulli's Principle Perform flow measurement calculations	In-Class Exercise Quiz Report	Read handouts for Pressure – Gas Exercise on gas pressure Perform Lab – LAPS 9 – Basic Flow Measurement & Control and Self Review	Session 16

					Problem Set for flow measurement	
	16	Electrical Energy	Describe static and current electricity Define types of current and circuits and Ohm's Law Use Excel for graphing data	Exercise Math Problems Report Quiz	Write paper on Water Density Read handout for Electricity and Currents Exercise on Static and Current Electricity Perform Lab – LAPS 10 – Control Loop Performance Graph data set for LAPS 10 Write paper on Sensors & Process Control Quiz on Week 8 Learning Objectives	Session 17
9	17	Magnetism and Electromagnetic Energy	Describe electric currents and magnetic fields and generators & motors, transformers, and power Define Faraday's Law	Exercise Math Problems Report	Read handout on Magnetism and Electricity Exercise on Magnetism and Electromagnetic Induction Perform Lab – LAPS 11 - Ultrasonic Level Measurement and Control and Self Review Write paper on Application of Magnetics	Session 18
	18	Sound/Acoustic Energy	Describe electromagnetic spectrum, wave characteristics, and sound properties Define waves, vibrations, resonance, wavelength, frequency, and hertz	Exercise Math Problems Report Quiz	Read handout on Sound and Applications Exercise on Sound and Waves Perform Lab – LAPS 12 - Differential Pressure Flow Measurement and Control and	Session 19

			Perform sound measurement calculations		Self Review Problem set on sound measurements Perform Lab Project on Process Control Systems Write paper on Sound Properties Quiz on Week 9 Learning Objectives	
10	19	Light Energy	Describe light properties Define color spectrum, light diffraction, and interference	Exercise Report	Read handout on Light Waves Exercise on Light Waves and Properties Perform Lab Project on Process Control Systems Write paper on Light Properties	Session 20
	20	Midterm 2 Review			Review of Midterm 2 Exam	Session 20
11	21	Midterm 2 Exam & Lab Practical				Session 21
	22	Thermal Energy Lab – Thermal Energy	Describe temperature, heat, expansion, and states of matter Define BTU, Therms, calories, and joules Use Temperature Units, Equalities, and Conversions for Calculations in US Standard and Metric Systems	Exercise Math Problems Report	Read handout on temperature, heat, expansion, and states of matter Exercise on temperature, heat, and thermodynamics Perform Lab - LAPS 1 - Thermal Control System Familiarization Problem set on temperature measurements Write paper on Water - States of Matter	Session 23

12	23	Heat Transfer	Describe conduction, convection, and radiation Define Newton's Law of Cooling, Heat Transfer and Change of Phase, Boiling, Melting, Freezing, Change of Phase, and Freeze Drying Perform math calculations for heat transfer	Exercise Math Problems Report	Read handout on conduction, Convection, and radiation Exercise on Heat Transfer and Phase Change Perform Lab – LAPS 5 - Basic Temperature Control Elements Problem set for heat transfer	Session 24
	24	Sensors	Describe sensors and transducers Perform math calculations for heat transfer	Exercise Math Problems Report Quiz	Read handout on sensors and transducers Exercise on Sensors and Transducers Perform Lab – LAPS 8 - Temperature Sensors and Self Review Problem set for heat transfer Write paper on Temperature Sensors Quiz on Week 12 Learning Objectives	Session 25
13	25	Transmitter	Describe transmitters Perform math calculations for heat transfer	Exercise Math Problems Report	Read handout on transmitters Exercise on Transmitters Perform Lab – LAPS 9 - Temperature Transmitters and Self Review Problem set for heat transfer	Session 26
	26	System Integration	Describe system integration and feedback control analysis	Exercise Math Problems Report	Read handout on industrial automation and types of plants and controls; solution scenario	Session 27

				Quiz	<p>validated pharmaceutical plant</p> <p>Exercise on System Integration and Feedback Control Analysis</p> <p>Perform Lab – LAPS 10 - Basic Temperature Control</p> <p>Write paper on System Integration or Feedback Control Analysis</p> <p>Quiz on Week 13 Learning Objectives</p>	
14	27	Automation and PLC	Describe Plant Automation and PLC	Midterm	<p>Read handout on PLC Introduction and Building Automation with 800xA</p> <p>Exercise on Automation and PLC</p> <p>Perform Lab – LAPS 11 - Methods of Automatic Control on Thermal Process System and Self Review</p>	Session 28
	28	Lab Practical	System Integration	Lab Exercise	Write Technical Report	Session 31
15	29	Holiday Time				
	30	Holiday Time				
16	31	Final Exam Review			Review of Final Exam	Session 32
	32	Final Exam & Lab Practical				