Please note that this is a general syllabus and specific details by semester will be provided by individual instructor syllabi. The grading may vary slightly from one instructor to another.

SOUTHERN CONNECTCUT STATE UNIVERSITY

CHE 121 - General Chemistry II

Spring Semester

Name: **Office:** **Phone:** **E-mail:**	**Office Hours:**

COURSE NUMBER CHE 121 **CREDIT HOURS**: 4
PREREQUISITES: CHE 120

COURSE TITLE: General Chemistry II

COURSE DESCRIPTION:

Physical properties of gases, liquids, solids and solutions. Study of reaction kinetics and development of rate law expressions. Examination of dynamic equilibrium, acid-base chemistry and buffer solutions. Study of thermochemistry and relationship to equilibrium situations. Practical applications of electrochemistry.

COURSE'S CONTRIBUTION:

CHE 121 is the second course in the general chemistry sequence. The course is a requirement for students pursuing the science education degree in chemistry. The course involves the further study of the

fundamental principles of chemistry as they pertain to the understanding of physical and chemical properties of matter.

The course emphasizes analytical thinking and applications to problem solving using both quantitative and qualitative approaches. Students are expected to apply new concepts as well as those discussed in the prerequisite course (CHE 120) to curricular material. A working knowledge of algebra is required and knowledge of basic calculus is strongly suggested.

The qualitative aspects of the course involve the extension of basic atomic theory and application to the properties of matter that can be measured and assessed in every day life. Quantitative aspects of the course address the use and manipulation of established mathematical data and equations. Application of these equations requires an understanding of the underlying theories and the limitations that may be imposed by using such approaches. Both qualitative and quantitative approaches are used to develop critical thinking skills that can be extended to a wide variety of real life situations in an educational setting.

The laboratory experiments and problem sets are designed to place an emphasis on the key learning goals of the course. Laboratory conduct and practices are outlined and encompass an inquiry-based approach to learning, environmental concerns, safety in science instruction and methods for the creation of an appropriate learning environment. Experiments involve gathering and manipulating empirical data and relating outcomes to the theories discussed in lecture as well as assessing any limitations of the experimental approach.

- **LEAR**NER OUTCOMES & ASSESSMENT
- Identify the intermolecular and intramolecular forces existing between molecules of a pure substance and relate these to the observed differences in physical properties. (INTASC 1, 4; NSTA 1, 3, 4, 7; CCCT 1.2, 1.3, 1.4, 2.2, 2.5)
- Identify the effect of pressure and temperature on the physical states of matter with the use of phase diagrams and correlation to properties such as vapor pressure. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2, 2.5)
- Understand the basic types of structure and bonding of matter in the solid state. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4)

- Use the close packing model of structures in the solid state to calculate properties such as the density of solids, bond distances in solids, number of molecules in the unit cell and the percent of empty space. (INTASC 1, 4; NSTA 1, 2, 3; CCCT 1.3, 1.4, 2.2, 2.5)
- Understand the solution process and correlation to thermodynamic properties based on intermolecular and intramolecular forces. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4)
- Perform calculations and conversions based on different concentration units for solutions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2, 2.5)
- Identify the factors affecting solubility of substrates in solution and calculations based on limits of a saturated system. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.3, 1.4, 1.6, 2.5)
- Identify types of colligative properties of solutions and perform calculations based on boiling point elevation, freezing point depression and vapor pressure lowering. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.3, 1.4)
- Develop expressions for reaction rates based on tables of kinetic data. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.3, 1.4, 1.6)
- Correlate the effect of solution concentration and temperature on the rate of reactions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2, 2.5)
- Postulate reaction mechanisms based on kinetic data and identify the effects of catalysis from a thermodynamic perspective. (INTASC 1; NSTA 1, 2, 3, 4, 7, 10; CCCT 1.2, 1.3, 1.4, 1.6)
- Understand the general concepts of solution equilibrium and the calculation of equilibrium constants. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.2, 1.3, 1.4, 2.2)
- Use LeChâtlier's principle to qualitatively and quantitatively demonstrate the effect of perturbations to a solution in equilibrium. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.3, 1.4, 1.6, 2.2, 2.5)
- Relate the concept of equilibrium to solutions of weak acids and bases and calculations of pH, pK_a and pK_b. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2)
- Understand the common ion effect and the relationship to buffer solutions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2)
- Calculate the pH of buffer solutions and intermediate solutions in the titration of acids and bases. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 1.5, 1.6, 2.2)
- Apply the concept of equilibrium to solution solubility and the precipitation and separation of ions for qualitative analysis of unknown solutions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.3, 1.4, 2.5)
- Apply the equilibrium concept to spontaneous processes and correlation with thermodynamic quantities. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.3, 1.4)
- Understand the concepts related to the operation of voltaic cells and calculations of cell electromotive force. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT 1.3, 1.4)
- Utilizing the cell potential in voltaic cells to determine the spontaneity of redox reactions. (INTASC 1, 4; NSTA 1, 2, 3, 4; CCCT 1.2, 1.3, 1.4, 2.2)
- Understand the composition commercial voltaic cells, electrolysis, and corrosion prevention. (INTASC 1, 4; NSTA 1, 2, 3, 4, 7; CCCT

1.3, 1.4, 2.5)
- Understand basic rules for naming organic compounds and identifying structure based on functional group identification. (INTASC 1, 4; NSTA 1, 2, 4; CCCT 1.3, 1.4)
- Relate the chemical concepts learned in class to experimental data obtained in the laboratory. (INTASC 1, 4; NSTA 1, 2, 3, 4, 5, 6, 7, 9, 10; CCCT 1.2, 1.3, 1.4, 1.5, 1.6, 2.2, 2.5, 2.6)

MODES OF LEARNING

Class lecture and discussion; problem solving; experimentation. Recitation sessions are voluntary and are conducted on Saturdays at a time to be announced.

COURSE CONTENT OUTLINE	**Topic**	**Assigned Reading**
Lectures 1-4	Liquids, Solids, and Phase Changes	Ch. 12,13
Lectures 5-7	Solutions and Their Properties	Ch. 14
Lectures 8-10	Chemical Kinetics	Ch. 15
Lecture 11	**Exam #1 Chapters 10 and 11**	
Lectures 12-14	Chemical Equilibrium	Ch. 16
Lectures 15-17	Aqueous Equilibria: Acids and Bases	Ch. 17,18
Lecture 18	**Exam #2 Chapters 12 and 13**	
Lectures 19-21	Applications of Aqueous Equilibria	Ch. 17,18
Lectures 22-24	Thermodynamics: Entropy, Free Energy, and Equilibrium	Ch. 20
Lecture 25	**Exam #3 Chapters 15 and 16**	
Lectures 26-28	Electrochemistry	Ch. 21
Lecture 29	Organic Chemistry	Ch. 25

REQUIRED TEXTS

1. *Chemistry*, *Matter and Its Changes, Fourth Edition* J. E. Brady, F. Senese, John Wiley and Sons, Inc. (2004) ISBN: 0-471-77129-5

<>2. *Catalyst*, *The Prentice Hall Custom Laboratory Manual*, Pearson Custom Publishing (2002) ISBN 0536711011

EVALUATION CRITERIA

Best 2 of 3 Term Examinations	40%
Best 10 Assignments / Quizzes	10%
Laboratory Grade	25%
Final Examination	25%

	100%

The following final grade scale will be used:

A+ = 96 - 100%

A = 91 - 95%

A- = 86 - 90%

B+ = 82 - 85%

B = 78 - 81%

B- = 74 - 77%

C+ = 70 - 73%

C = 66 - 69%

C- = 62 - 65%

D+ = 58 - 61%

D = 54 - 57%

D- = 50 - 53%

F = less than 50

The instructor reserves the right to adjust the grading scales for class average at the end of the semester.

STANDARDS GUIDELINES

INTASC [Interstate New Teachers' Assessment & Support Consortium]	Professional Standards National Science Teacher's Association	CCCT {CONNECTICUT COMMON CORE OF TEACHING]
Scholarship 1. Knowledge of subject matter 2. Knowledge of human development & learning 3. Instruction adapted to meet diverse learners 4. Use of multiple instructional strategies & resources **Attitudes and Disposition** 5. Effective learning environment created 6. Effective communication 7. Lesson planning **Integrity** 9. Reflection and professional development **Leadership** 8. Assessment of student learning to improve teaching **Service** 10. Partnership with school and community	1. Content - Structure and interpret the concepts, ideas and relationships in science 2. Nature of Science - Define the values, beliefs and assumptions inherent to the creation of scientific knowledge within the scientific community 3. Inquiry - Formulating solvable problems, constructing knowledge from data, exchanging information for seeking solutions, developing relationships from empirical data 4. Context of Science - Relate science to daily life: technological, personal, social and cultural values. 5. Skills of Teaching - Science teaching actions, strategies and methodologies, interaction with students, effective organization and use of technology. 6. Curriculum - Extended framework of goals, plans, materials and	DEMONSTRATIONS OF KNOWLEDGE 1.1 understanding of student learning & development 1.2 understanding of need for different learning approaches 1.3 proficiency in reading, writing and mathematics 1.4 understanding of central concepts & skills, tools of inquiry and structures of discipline(s) 1.5 knowledge of how to design and deliver instruction 1.6 recognition of need to vary instructional methods APPLICATION OF KNOWLEDGE THROUGH 2.1 instructional planning based upon knowledge of subject, students, curriculum & community 2.2 selection and/or

	resources for instruction. 7. Social Context - Social and community support network, relationship of science to needs and values of the community, involvement of people in the teaching of science. 8. Assessment - Alignment of goals, instruction and outcomes, evaluation of student learning. 9. Environment for Learning - Physical spaces for learning, psychological and social environment, safety in science instruction. 10. Professional Practice - Knowledge and participation in the professional community, ethical behavior, high quality of science instruction, working with new colleagues as they enter the profession.	creation of learning tasks that make subject meaningful for students 2.3 establishment and maintenance of appropriate behavior standards and creation of positive learning environment 2.4 creation of instructional opportunities supporting students' academic, social and personal development 2.5 use of verbal, nonverbal and media communication fostering individual and collaborative inquiry 2.6 employment of various instructional strategies in support of critical thinking, problem solving and skills demonstration 2.7 use of various assessment techniques to evaluate student learning & modify instruction DEMONSTRATION OF PROFESSIONAL RESPONSIBILITY THROUGH: 3.1 professional conduct in accordance with the Code of Professional Responsibilities for Teachers 3.2 shared responsibility for student achievement and well-being 3.3 continuous self-evaluation regarding choices & actions on students and school

	community 3.4 commitment to professional growth 3.5 leadership in the school community 3.6 demonstrations of a commitment to students and a passion for improving the profession

TENTATIVE COURSE CALENDAR

See "Course Content Outline" above.

DISABILITY ACCOMMODATION STATEMENT

As a student with a disability, before you receive course accommodations, you will need to make an appointment with the Disability Resource Office located in EN 15 to arrange for approved accommodations. However, if you have other information you would like to speak with me about, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. My office is located in Jennings Hall (JE 308) and my office hours are listed on the first page. Every effort will be made to accommodate students in this course.

Cheating on exams, laboratory reports, quizzes, and assignments will not be tolerated in this class. All students are expected to behave according to the code of conduct outlined in the student handbook. Apparel such as baseball caps that conceal your eyes during examinations will not be permitted. Programmable calculators will not be permitted unless you make prior arrangements with the instructor to demonstrate that all memory functions are free of equations or other information. Strict disciplinary action will be taken if these rules are not followed!