



Course	CHEM 1301: General Chemistry for Engineers
Professor	Bruce Gnade
Term	Fall 2016
Meetings	Section 001: MWF 8:00 am – 8:50 am, SLC 1.102

Professor's Contact Information

Office Phones	972-883-6636
Office Locations	AD 3.210
Email Addresses	gnade@utdallas.edu
Office Hours	Mon and Wed. 12:00 (noon) – 3:00 pm in my office For all times: Feel free to stop by when my door is open
Other Information	Best way to contact me: email listed; I do not read eLearning email

General Course Information

Pre-requisites, Co-requisites, & other restrictions	One year of high school chemistry
Course Description	This course is designed to give engineering students the necessary knowledge to understand the correlation between the molecular structure and properties. The concepts covered in this course will allow the students to understand the relationship between theory and experimental data. The course covers the theoretical foundation for understanding concepts such as atomic structure, chemical bonding, thermodynamics, kinetics, and chemical equilibrium.
Learning Outcomes	<p><u>Expected Learning Outcomes</u> Upon successful completion of this course, students will therefore:</p> <ol style="list-style-type: none">1) Be able to recognize various representations of molecules such as formulas, models, and structural drawings.2) Be able to calculate mass% composition and determine a chemical formula from elemental analysis3) Be able to balance a chemical equation by applying the law of conservation of mass4) Calculate concentration of solutions and distinguish between electrolytes and non-electrolytes5) Calculate the amount of product expected to form in a reaction and identify a limiting reagent from a non-stoichiometric mixture of reactants6) Be able to perform simple gas calculations, understand the kinetic theory of gases, and the effect of temperature and molar masses on molecular speed7) Be able to describe waves in terms of frequency, wavelength, and amplitude.8) Be able to describe photoelectric effect and use Planck equation to calculate the energy of a photon from wavelength or frequency8) Be able to use energy level diagram to predict the wavelength or frequencies of light an atom will absorb or emit.9) Be able to define ionization energy and understand photoelectric spectroscopy10) Be able to understand uncertainty principle, recognize quantum numbers, and identify types of orbitals11) Be able to define atomic radius, ionization energy, electron affinity, classification in metals and non-metals12) Be able to define electronegativity and identify polar, non-polar, and ionic bonds by comparing electronegativities13) Be able to draw Lewis structures to describe chemical bonding in simple molecules14) Be able to define hybridization and predict geometries of a molecule from its Lewis structure15) Be able to describe bonding in metals and insulators and use band diagrams to represent bonding in an extended solid structure.16) Be able to draw band diagram for semiconductors and explain how electrical properties of metals, insulators, and semiconductors are correlated to their chemical bonding.17) Be able to define exothermic and endothermic reactions and calculate ΔE for chemical reactions18) Be able to define work and heat, define state functions, and use the first law of thermodynamics19) Be able to define enthalpy and use experimental data to determine ΔH and ΔE20) Be able to use Hess law to calculate the amount of energy produced or consumed in chemical

	<p>reactions from tabulated data</p> <p>21) Be able to explain entropy and deduce the sign of ΔS for chemical reactions by examining the physical state of the reactants</p> <p>22) Be able to state the second law of thermodynamics and use it to predict spontaneity of a reaction/process</p> <p>23) Be able to use Gibbs free energy relationship to explain implications of spontaneity</p> <p>24) Be able to state the third law of thermodynamics and use tabulated data to calculate ΔS for a chemical reaction</p>
Required Texts & Materials	<ol style="list-style-type: none"> 1. Textbook: Chemistry For Engineering Students by L.S. Brown and T.A. Holme 3rd edition, ISBN-13:978-1-285-46252-3 2. course materials located on class site at eLearning: http://elearning.utdallas.edu/

Schedule & Academic Calendar

Class Period	Day	Date	Topic	Chapter
1	Mon	Aug 22	Introduction, syllabus, grading, etc, units, significant figures, ratios	1
2	Wed	Aug 24		
3	Fri	Aug 26		
4	Mon	Aug. 29	Periodic table, inorganic vs. organic, atomic mass, Simple nomenclature, ion, bonding	2
5	Wed	Aug 31	Conservation of mass, balanced chemical equation,	3
6	Fri	Sept 2	Moles, molarity, non / electrolytes, ions, acids, bases	
No Class	Mon	Sept 5	Labor Day	
7	Wed	Sept 7	Combustion, balanced chemical reactions, limiting reagents, percentage yields, stoichiometry	4
8	Fri	Sept 9		
9	Mon	Sept 12		
	Wed	Sept 14	Exam 1	1,2,3,4
10	Fri	Sept 16	Ideal gas law, air pollution, mixtures of gases, kinetic theory of gases, non-ideal gases, pressure monitor	5
11	Mon	Sept 19		
12	Wed	Sept 21		
13	Fri	Sept 23	Frequency vs wavelength, photoelectric effect, Plank's equation, energy level diagram, Bohr model, electron orbitals, Pauli exclusion principle, Hund's rule	6
14	Mon	Sept 26		
15	Wed	Sept 28	Ionic bonds, electronegativity, polar and non-polar bonds, Lewis dot structures, hybridization, sigma bonds, pi bonds, resonance structures	7
16	Fri	Sept 30		
17	Mon	Oct 3		
	Wed	Oct 5	Exam 2	5,6,7
18	Fri	Oct 7	Graphite vs. diamond, band theory, metals, insulators, semiconductors, electrical properties vs. chemical bonding, boiling point, vapor pressure	8
19	Mon	Oct 10		
20	Wed	Oct 12		
21	Fri	Oct 14	Energy conversion, work, heat, 1 st Law of Thermo-Dynamics, ΔE , ΔH , ΔH_f , Enthalpy, Hess's Law, Heat capacity, phase change, electrical grid	9
22	Mon	Oct 17		
23	Wed	Oct 19		
24	Fri	Oct 21		
25	Mon	Oct 24	Enthalpy vs. spontaneity, Entropy, 2 nd Law of thermo, 3 rd Law of thermos, Gibbs free energy, Free energy and work, ΔG , recycling	10
26	Wed	Oct 26		
27	Fri	Oct 28		
28	Mon	Oct 31		
	Wed	Nov 2	Exam 3	8,9,10
29	Fri	Nov 4	Kinetics, rate law, average rate instantaneous rate, rate law, integrated rate law, 1 st / 2 nd order kinetics, Arrhenius eq., catalysis	11
30	Mon	Nov 7		
31	Wed	Nov 9		
32	Fri	Nov 11	Equilibrium, mass action, gas phase, K_p , K_c , polyprotic acids, equilibrium concentrations, LeChatelier's Principle, solubility, common ion, acid-base	12
33	Mon	Nov 14		
34	Wed	Nov 16		
35	Fri	Nov 18	Corrosion, oxidation-reduction, galvanic cells	13
	Mon	Nov 21	Fall Break	
	Wed	Nov 23	Fall Break	
	Friday	Nov 25	Fall Break	
36	Mon	Nov 28	cell potential, SRP, batteries, fuel cells, electrolysis	13
	Wed	Nov 30	Exam 4	11,12,13
37	Fri	Dec 4	Radioactivity, nuclear reactions, radioactive decay, Nuclear stability, binding energy, fission, fusion, Interaction of radiation with matter, medical uses	14
38	Mon	Dec 7		
39	Wed	Dec 9		

Exam Schedule:

Fri	Sept 14	Exam 1	8:00 to 8:50am	SLC 1.102
Mon	Oct 5	Exam 2	8:00 to 8:50am	SLC 1.102
Wed	Nov 2	Exam 3	8:00 to 8:50am	SLC 1.102
Wed	Nov. 30	Exam 4	8:00 to 8:50am	SLC 1.102
Final Exam		To be determined		

Course Policies

Grading (credit) Criteria	Course Evaluation: <table><tr><td>(i) Quizzes</td><td>15%</td></tr><tr><td>(ii) Midterm Exams (4 x 15%)</td><td>60%</td></tr><tr><td>(iii) Final Exam</td><td>25%</td></tr></table>	(i) Quizzes	15%	(ii) Midterm Exams (4 x 15%)	60%	(iii) Final Exam	25%
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	(ii) Midterm Exams (4 x 15%)	60%					
	(iii) Final Exam	25%					
	<p>Our goal in this class is to help you develop an understanding (and appreciation) of how chemistry impacts your everyday lives. Our main focus will be on concepts and problem solving, and not just FACTS. Our teaching and testing will reflect this. A principle method for learning a concept is by working problems that test your understanding of that concept and how it relates to other concepts you already know. We have designed this course to empower you to succeed in learning chemical concepts. Important components of the course are as follows:</p> <p>1. Homework assignments (end of chapter problems):</p> <ul style="list-style-type: none">• assigned for each chapter from end-of-chapter exercises in <i>Brown and Holme</i>• large number of problems selected to cover majority of important concepts• these will not be collected or graded• all homework assignments for the next section will be posted the day after the previous exam <p>2. Quizzes (in class):</p> <ul style="list-style-type: none">• approximately one per chapter – date of quiz will be announced one day before• I will drop your 2 lowest quiz scores; the others will be averaged together to give your quiz average <p>3. Midterm exams:</p> <ul style="list-style-type: none">• each exam is 50 minutes long• ALL 4 MIDTERM EXAMS MUST BE TAKEN, at the scheduled time and on the scheduled day• There will be no makeup exams given• The lowest of the 4 exam scores will be automatically replaced by a higher final exam score. If you have an acceptable, documented reason for missing an exam (e.g., documented illness, auto accident, participation in UTD-sponsored event, observance of religious holiday), you will be allowed to replace the missed exam with your score on the final. Otherwise, you will receive a "zero" for that exam, that zero will not be replaced by the final, and will be included in the calculation of your final class grade• You may arrive late for an exam up until the first student finishes and leaves (only penalty being that you will have proportionally less time to finish the exam). After this grace period you will not be allowed to take the exam and will receive a score of "zero"• questions will focus on problems, concepts and material covered in class, homeworks, and quizzes <p>4. Final exam:</p> <ul style="list-style-type: none">• comprehensive exam• the final exam is 2 hours and 45 minutes long• The final exam must be taken and cannot be replaced by any other grade, so don't miss it• No makeup final will be given.						
Make-up Exams	There are no make-up exams (see above).						
Extra Credit	There is no extra credit .						
Class Attendance	Your attendance is CRITICAL for your ultimate performance in this class.						
Regrade Policy	Requests to have 1 or more questions of a quiz/exam regraded have to be made within 1 week of receiving the graded assignment. The request should be in the form of an email from your UTD email account to the instructor; the subject line should read, "quiz X regrade" or "exam X regrade", where X is the assignment number; the body of the email should contain your full name, the problem number and an explanation of						

	how the problem was graded incorrectly
Sharing confidential information	<p>Students considering sharing personal information in email, in person, or within assignments or exams should be aware that faculty members and teaching/research assistants are required by UT Dallas policy to report information about sexual misconduct to the UT Dallas Title IX Coordinator. Per university policy, faculty have been informed that they must identify the student to the UT Dallas Title IX Coordinator. Students who wish to have confidential discussions of incidents related to sexual harassment or sexual misconduct should contact the Student Counseling Center (972-883-2527 or after hours 972-UTD-TALK or 972-883-8255), the Women's Center (972-883-8255), a health care provider in the Student Health Center (972-883-2747), the clergyperson (or other legally recognized religious advisor) of their choice, or an off-campus resource (i.e., rape crisis center, doctor, psychologist). Students who are sexually assaulted, harassed, or victims of sexual misconduct, domestic violence, or stalking, are encouraged to directly report these incidents to the UT Dallas Police Department at 972-883-2222 or to the Title IX Coordinator at 972-883-2218. Additional information and resources may be found at http://www.utdallas.edu/oiec/title-ix/resources.</p>
Technical Support	<p>If you experience any issues with your UT Dallas account, contact the UT Dallas Information Resources Help Desk: assist@utdallas.edu or call 972-883-2911.</p> <p>UT Dallas provides eLearning technical support 24 hours a day/7 days a week. The services include a toll free telephone number for immediate assistance (1-866-588-3192), email request service, and an online chat service. Please use this link to access the UTD eLearning Support Center: http://www.utdallas.edu/elearninghelp.</p>
Field Trip Policies, Off-Campus Instruction and Course Activities	<p>Off-campus, out-of-state, foreign instruction/travel, and course-related field trip activities are subject to state law and University policies and procedures regarding travel and risk-related activities.</p> <p>Detailed information regarding this policy, in accordance to <i>Texas Education Code</i>, Section 51.950, can be accessed at the UT Dallas Policy Navigator, http://policy.utdallas.edu/utdbp3023, and at http://www.utdallas.edu/administration/insurance/travel. Additional information is available from the office of the school dean.</p>
Student Conduct and Discipline	<p>http://go.utdallas.edu/syllabus-policies</p> <p>The University of Texas System (Regents' Rule 50101) and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UT Dallas online catalogs (http://catalog.utdallas.edu).</p> <p>The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and</p>

	<p>described in the Student Discipline and Conduct, UTDSP5003 (http://policy.utdallas.edu/utdsp5003). Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SSB 4.400, 972-883-6391) and online at http://www.utdallas.edu/deanofstudents.</p> <p>A student at the University neither loses their rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating its standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.</p>
Academic Integrity	<p><i>Academic Dishonesty:</i> The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrates a high standard of individual honor in his or her scholastic work.</p> <p>Academic dishonesty can occur in relation to any type of work submitted for academic credit or as a requirement for a class. It can include individual work or a group project. Academic dishonesty includes, plagiarism, cheating, fabrication and collaboration/collusion. In order to avoid academic dishonesty, it is important for students to fully understand the expectations of their professors. This is best accomplished through asking clarifying questions if an individual does not completely understand the requirements of an assignment.</p> <p>Additional information related to academic dishonesty and tips on how to avoid dishonesty may be found here: http://www.utdallas.edu/deanofstudents/maintain.</p>
Copyright Notice	<p>It is the policy of the University of Texas at Dallas to adhere to the requirements of the United States Copyright Law of 1976, as amended, (<i>Title 17, United States Code</i>), including ensuring that the restrictions that apply to the reproduction of software are adhered to and that the bounds of copying permissible under the fair use doctrine are not exceeded. Copying, displaying, reproducing, or distributing copyrighted material may infringe upon the copyright owner's rights. Unauthorized distribution of copyrighted material, including unauthorized peer-to-peer file sharing, may subject students to appropriate disciplinary action as well as civil and criminal penalties. Usage of such material is only appropriate when that usage constitutes "fair use" under the Copyright Act. For more information about the fair use exemption, see http://copyright.lib.utexas.edu/copypol2.html. As a UT Dallas student, you are required to follow UT Dallas' copyright policy (UTDPP1043 at http://policy.utdallas.edu/utdpp1043) and the UT System's policy at http://www.utsystem.edu/ogc/intellectualproperty/copyright/home.htm.</p>
Email Use	<p>The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. All official student email correspondence will be sent only to a student's</p>

	<p>UT Dallas email address and UT Dallas will only consider email requests originating from an official UT Dallas student email account. This allows the University to maintain a high degree of confidence in the identity of each individual's corresponding via email and the security of the transmitted information. The University of Texas at Dallas furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources provides a method for students to have their UT Dallas mail forwarded to other email accounts. To activate a student UT Dallas computer account and forward email to another account, go to http://netid.utdallas.edu.</p>
Class Attendance	<p>Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty. Absences may lower a student's grade where class attendance and class participation are deemed essential by the instructor. In some courses, instructors may have special attendance requirements; these should be made known to students during the first week of classes.</p>
Withdrawal from Class	<p>The administration at UT Dallas has established deadlines for withdrawal from any course. These dates and times are published in the Comet Calendar (http://www.utdallas.edu/calendar) and in the Academic Calendar (http://www.utdallas.edu/academiccalendar). It is the student's responsibility to handle withdrawal requirements from any class. In other words, a professor or other instructor cannot drop or withdraw any student unless there is an administrative drop such as the following:</p> <ul style="list-style-type: none"> • Have not met the prerequisites for a specific course • Have not satisfied the academic probationary requirements resulting in suspension • Judicial affairs request • Have not made appropriate tuition and fee payments • Enrollment is in violation of academic policy • Was not admitted for the term in which they registered <p>It is the student's responsibility to complete and submit the appropriate forms to the Registrar's Office and ensure that he or she will not receive a final grade of "F" in a course if he or she chooses not to attend the class after being enrolled.</p>
Student Grievance Procedures	<p>Procedures for student grievances are found in university policy UTDSP5005 (http://policy.utdallas.edu/utdsp5005). In attempting to resolve any student grievance regarding disputes over grades, application of degree plan, graduation/degree program requirements, and thesis/and dissertation committee, advisor actions and/or decisions, evaluations, and/or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originated.</p>
Incomplete Grades	<p>As per university policy, incomplete grades may be given, at the discretion of the instructor of record for a course, when a student has completed at least 70% of the required course material but cannot complete all requirements by the end of the semester. An incomplete course grade (grade of 'I') must be resolved completed within the time period specified by the instructor, not to exceed eight (8) weeks from the first day of the subsequent long semester. Upon completion of the required work, the symbol 'I' may be converted into a letter grade (A through F). If the grade of Incomplete is not removed by the end of the specified period, it will automatically be changed to F.</p>

<p>AccessAbility Services</p>	<p>It is the policy and practice of The University of Texas at Dallas to make reasonable disability-related accommodations and/or services for students with documented disabilities. However, written notification from the Office of Student AccessAbility (OSA) is required (see http://www.utdallas.edu/studentaccess). If you are eligible to receive disability-related accommodations and/or services and to ensure accommodations will be in place when the academic semester begins, students are encouraged to submit documentation four to six weeks in advance. Students who have questions about receiving accommodations, or those who have, or think they may have, a disability (mobility, sensory, health, psychological, learning, etc.) are invited to contact the Office of Student AccessAbility for a confidential discussion.</p> <p>The Office of Student AccessAbility provides:</p> <ol style="list-style-type: none"> 1. Academic accommodations for eligible students with a documented permanent physical, mental or sensory disability 2. Facilitation of non-academic and environmental accommodations and services 3. Resources and referral information, and advocacy support as necessary and appropriate. <p>OSA is located in the Student Services Building, suite 3.200. They can be reached by phone at 972-883-2098, or by email at studentaccess@utdallas.edu.</p>
<p>Religious Holy Days</p>	<p>The University of Texas at Dallas will excuse a student from class or other required activities, including examinations and travel time for the observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, of the <i>Texas Tax Code</i>.</p> <p>Students are encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment.</p> <p>Excused students will be allowed to take missed exams or complete assignments within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.</p> <p>If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the President of UT Dallas or from the President's designee. The chief executive officer or designee must take into account the legislative intent of <i>Texas Education Code 51.911(b)</i>, and the student and instructor will</p>

	abide by the decision of the chief executive officer or designee.
Resources to Help you Succeed	<p>The Office of Student Success operates the Student Success Center (SSC, http://www.utdallas.edu/studentsuccess), which offers assistance to students in the areas of writing, mathematics, communication, multiple science fields, reading, study skills, and other academic disciplines. These services are available through individual and small group appointments, workshops, short courses, and a variety of online and instructional technologies. All students enrolled at UT Dallas are eligible for these services.</p> <p>The Math Lab gives short-term and semester long support for a variety of introductory and advanced mathematics courses. Students may drop in to visit with a math tutor on a regular basis. Comet card is required.</p> <p>The Writing Center offers a collaborative learning environment for one-to-one and small group assistance with general and advanced writing assignments and overall writing skills. Scheduling an appointment is strongly recommended, but walk in appointments are possible if a tutor is available.</p> <p>The Peer Tutoring program offers free tutoring assistance in multiple locations for many of the historically challenging undergraduate subjects at UT Dallas. Tutoring sessions, offered every weekday on a drop-in basis, are one-on-one or in a small group format. The sessions are designed to meet students' individual questions and needs related to course/subject concepts. All peer tutors are current UT Dallas students who made an A- or better in the course and have a strong faculty/staff recommendation. Students should check the Student Success Center website each semester for subject offerings and session times.</p> <p>The Peer-Led Team Learning (PLTL) program provides an active, engaged learning experience for students who meet in small groups once a week with a Peer Leader who helps guide them through potentially difficult gateway course. Students that attend sessions regularly typically earn a half to a whole letter grade higher than students that do not participate in the PLTL program.</p> <p>Supplemental Instruction (SI) provides free, peer-facilitated weekly study sessions for students taking historically difficult courses. SI sessions encourage active, collaborative learning based on critical thinking and transferable study skills. SI leaders attend lectures, take notes, and read assigned material just like the enrolled students. Students should check the SSC website for subject and session times.</p> <p>The Communication Lab (CommLab) offers one-on-one and group consultations where you will gain practical feedback for improving oral and group presentations.</p> <p>Success Coaches are available for individual student appointments to discuss study skills, time management, note taking, test taking and preparation, and other</p>

	<p>success strategies.</p> <p>The Student Success Center's main office is located in the McDermott Library Building and can be contacted by calling 972-883-6707 or by sending an email to ssc@utdallas.edu.</p> <p><i>Content of this document was last modified by the Office of Institutional Effectiveness, 2016-06-01</i></p> <p><i>Webpage updated by the Provost's Technology Group, 2016-06-03</i></p>
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These descriptions and timelines are subject to change at the discretion of the Professor.