University of Asia Pacific (UAP)

Department of Computer Science and Engineering

Course Outline

Program:	Computer Science and Engineering (CSE)
Course Title:	Chemistry
Course Code:	CHEM 111
Semester:	Spring 2025
Level:	1/2
Credit Hour:	3.0

Name & Designation of Teacher: Nahida Aktar Tanjila, Department of BS&H, UAP

Office/Room: Department of BS&H, 4th Floor, RH Home center

Class Hours: Monday: 11:00-12.30 pm, Thursday: 11:00-12.30 pm (Sec A)
Wednesday: 12:30-2.00 pm, Thursday: 2:00-3.30 pm (Sec B)
Tuesday: 11:00-12.30 pm, Wednesday: 11:00-12.30 pm (Sec C)
Monday: 2:00-3.30 pm, Tuesday: 2:00-3.30 pm (Sec D)

Consultation Hours: By appointment at Department of BS&H, 4th Floor, RH Home center

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Mobile: 01765797888

Rationale: N/A

Pre-requisite (if any)**:N/A**

Course Synopsis:

Atomic Structure: Atomic structure & quantum theory, Different atom models, Heisenberg's uncertainty principle.

Periodic Table: Electronic configurations, Periodic classification of elements, Periodic properties of elements, Properties and uses of noble gases.

Chemical Bonding: Types and properties, Lewis theory, VBT, MOT, Hybridization and shapes of molecules.

Solutions: Solutions and their classification, Unit expressing concentration, Colligative properties and dilute solutions, Raoult's law, Van't Hoff's law of osmotic pressure.

Electrical properties of Solution: Conductors and nonconductors, Difference between electrolytic and metallic conduction, Electrolytic conductance, Factors influencing the conductivity of electrolytes, Kohlrausch Law and conductometric titrations.

Thermochemistry: Laws of thermochemistry, Enthalpy, Hess's law, Heat of formation, Heat of neutralization, Heat of reaction.

Chemical Kinetics: Pseudo and zero order reaction, Half-life, Determination and factors affecting the rate of a reaction, First order reaction, Second order reaction, Collision theory, Transition state theory.

Chemical Equilibria: Equilibrium law/constant, Kp and Kc, Homogeneous and heterogeneous equilibria, Le Chatelier's principle.

Selective Organic Reactions: Oxidation-reduction, Substitution, Addition, Polymerization, Alkylation reactions

pH: Different concepts of acids-bases, Buffer solution, Mechanism of buffer solution, Henderson-Hasselbalch equation, Water chemistry and pH of water

Course Objectives: The objectives of this course are to:
1. Understand the fundamental properties of materials in terms of the structure of atoms and their bonding in materials
2. Explain the basic physical and chemical change of materials applicable to engineering study
3. Critically analyze a problem and able to make a strategy for the solution

Course Outcomes (CO) and their mapping with Program outcomes (PO) and Teaching-Learning Assessment methods:

CO No.	CO Statements: Upon successful completion of the course, students should be able to:	Corresponding POs (Appendix-1)	Bloom's taxonomy domain/level (Appendix-2)	Delivery methods and activities	Assessment Tools
CO1	Understand the fundamental properties of materials in terms of the structure of atoms and their bonding in materials	PO2	Understand, Apply	Lecture, multimedia,	Quiz, Written exam
CO2	Explain the basic physical and chemical change of materials applicable to engineering study	PO1	Understand, apply and analyze	Lecture, multimedia,	Quiz, Written exam Open book exam
CO3	Critically analyze a problem and able to make a strategy for the solution	PO3	Analyze and evaluate	Lecture, Problem Solving, Group discussion	Written Examination, Viva

Weighting COs with Assessment methods:

Assessment Type	% weight	CO1	CO2	CO3
Final Exam	50%	10	30	10
Mid Term	20%	20		
Quiz Assignment Presentation	30%	10	10	10
Total	100%	40	40	20

Grading Policy: As per the approved grading policy of UAP (Appendix-3)

Course Content Outline and mapping with COs

Weeks	Topics / Content	Course Outcome	Delivery methods and activities	Reading Materials
1	Introduction to chemistry, why computer engineers need to learn chemistry, outline of the course	CO1	Lecture, multimedia	Supplied Content
2	Atomic structure: history, old atom models, Bohr atom model, photoelectric effect, Heisenberg's uncertainty principle, de Broglie relation, Schrodinger wave equation, Quantum numbers, size and shape of the orbitals	CO1	Lecture, multimedia, Problem-solving	Reference Books
3	Periodic table: Hund's rule, Aufbau principle, paramagnetic and diamagnetic substances,	CO1	Lecture, multimedia, discussion	Reference Books
4	periodic table, periodic properties	CO1	Lecture, multimedia, discussion	Reference Books

5	Chemical bond: Classification of bonds, ionic bonds and ionic size, Born Haber cycle, covalent bonds	CO1	Lecture, multimedia, discussion, problem solving	Reference Books
6	VSEPR theory and models, geometry of molecules		Lecture, multimedia, discussion, Problem solving	Reference Books
7	Solution: Types of solution, Effect of temperature and pressure, Concentration units and conversion	CO2	Lecture, multimedia, discussion, Problem solving	Reference Books
8	Colligative properties: Colligative properties, Boiling point elevation, freezing point depression, Osmotic pressure	CO2	Lecture, multimedia, discussion, Problem solving	Reference Books
9	Chemical Kinetics: Scope of chemical kinetics, rate and rete laws, order, molecularity, integrated rate expression, effect of temperature on reaction rate	CO2, CO3	Lecture, multimedia, discussion, Problem solving	Reference Books Supplied Content
10	Chemical Equilibria: Reversibility and equilibrium, thermodynamic equilibrium constant, equilibrium for selective reactions, direction of equilibrium, Le Chatelier's Principle	CO2, CO3	Lecture, multimedia, discussion, Problem solving	Reference Books
11	Thermochemistry: Different forms of energy, System, boundary, surrounding, state function and path function, Specific heat and heat capacity, Laws of thermochemistry, Heat of neutralization	CO2, CO3	Lecture, multimedia, discussion, Problem solving	Reference Books
12	pH: Self Ionization of water and pH	CO2	Lecture, multimedia, discussion, Problem solving	Reference Books
13	Phase rule: Phase Transitions, Clausius–Clapeyron Equation, Phase, Component, Degree of Freedom, Phase diagram of water, Carbon di oxide and Sulfur, Critical Temperature and Pressure	CO2, CO3	Lecture, multimedia, discussion, Problem solving	Supplied content
14	Discussion	CO3		

Required Reference(s):
1. Modern Inorganic Chemistry – S. Z. Haider
2. A Textbook of Organic Chemistry – Arun Bahl and B. S. Bahl
3. Principles of Physical Chemistry – Haque and Nawab
4. Essentials of Physical Chemistry – Bahl and Tuli

Special Instructions:
- Minimum Required Attendance: 70%
- Late presence: Not allowed
- Assignment submission rules: According to instruction
- Plagiarism policy: Yes

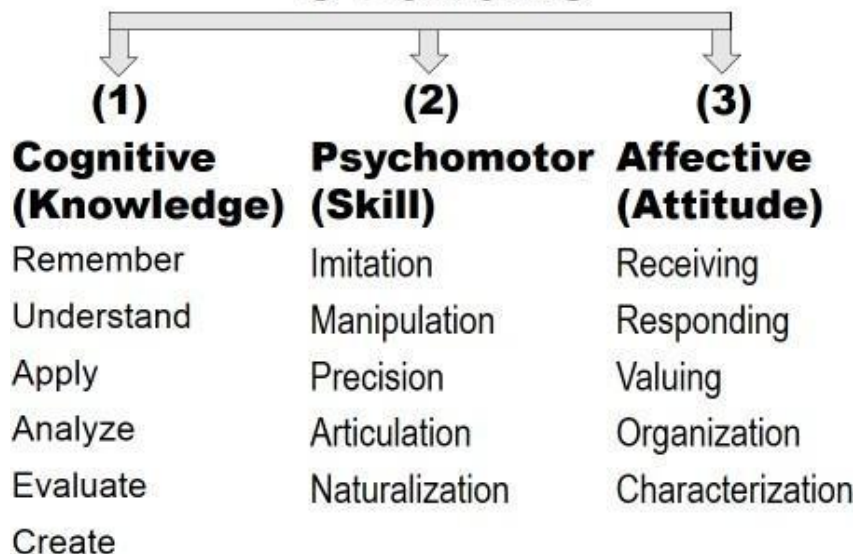| Prepared by	Checked by	Approved by
Course Teacher	Chairman, PSAC committee	Head of the Department

Appendix-1:
Washington Accord Program Outcomes (PO) for engineering programs:

No.	PO	Differentiating Characteristic
1	Engineering Knowledge	Breadth and depth of education and type of knowledge, both theoretical and practical
2	Problem Analysis	Complexity of analysis
3	Design/ development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified
4	Investigation	Breadth and depth of investigation and experimentation
5	Modern Tool Usage	Level of understanding of the appropriateness of the tool
6	The Engineer and Society	Level of knowledge and responsibility
7	Environment and Sustainability	Type of solutions.
8	Ethics	Understanding and level of practice
9	Individual and Team work	Role in and diversity of team
10	Communication	Level of communication according to type of activities performed
11	Project Management and Finance	Level of management required for differing types of activity
12	Lifelong learning	Preparation for and depth of Continuing learning.

Appendix-2

Bloom's Taxonomy (Taxonomy of Learning)
3 Domains

(1) Cognitive (Knowledge)	(2) Psychomotor (Skill)	(3) Affective (Attitude)
Remember	Imitation	Receiving
Understand	Manipulation	Responding
Apply	Precision	Valuing
Analyze	Articulation	Organization
Evaluate	Naturalization	Characterization
Create		

Appendix-3

UAP Grading Policy:

Numeric Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00