**University of Management and Technology**

**Course Outline**

Course code……………………………...... Course title: Chemical kinetics

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| Program | BS (CH) |
| Credit Hours | 03 |
| Duration | One Semester |
| Prerequisites | Physical Chemistry-I / Physical Chemistry-II |
| Resource Person |  |
| Counseling Timing  (Room# ) |  |
| Contact |  |

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objective:**

Students will acquire knowledge and learning about reaction dynamics and kinetic theories. They will also know about the factors which can influence the rates of reactions under different reaction conditions.

**Learning Methodology:**

Learning through:

* Lectures
* Interactive class discussions
* Presentations on applications of kinetics
* Informative videos and animations
* Assignments

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

**Marks Evaluation Marks in percentage**

Quizzes 15 %

Assignments 10 %

Presentations 10 %

Mid Term 25 %

Attendance & Class Participation Nil

Term Project Nil

Final exam 40 %

Total 100 %

**Recommended Text Books:**

1. Atkins, P. and Paula, J. D., Atkin’s Physical Chemistry, 9th ed., Oxford University Press, (2010).
2. Santosh K. Upadhyay, Chemical kinetics and reaction dynamics, Springer, (2006)
3. Laidler, K. J., Chemical Kinetics, 3rd Edition, Prentice Hall. (1987)
4. Frost, A. A., and Pearson, R. G., Reaction Mechanism, 2nd Edition John Wiley and sons, Inc. (1961)
5. Espenson, J. H., Chemical Kinetics and Reaction Mechanism 2nd ed., McGraw-Hill, London (2002).

**Reference Books:**

1. Connors, K. A., Chemical Kinetics: The Study of Reaction Rates in Solution, VCH Publishers, Inc., (1990).
2. Silbey, R. J., Alberty, R. A. and Bawendi, M. G., Physical Chemistry, 4th ed., John-Wiley & Sons, (2005).
3. Houston, P. L., Chemical Kinetics and Reaction Dynamics, Dover Publications, (2006).
4. Levine, R., Molecular Reaction Dynamics, Cambridge University Press, (2005).
5. Benson, S. W., Foundation of Chemical Kinetics, Krieger Publication Co. (1980).

**Calendar of Course contents to be covered during semester**

**Course code……………………………...... Course title:** Chemical kinetics

**Course Contents**

**Reaction Kinetic:** Correlation between physical properties and concentration, Kinetics of the complex reactions, reversible, parallel, consecutive bimolecular reactions, Theory of absolute reaction rate, Lindemann’s theory of unimolecular reactions, bimolecular collision theory, transition state theory, comparison of collision and absolute reaction theories, Potential energy surfaces, Thermodynamic formulation of reaction rates, Calculation of entropy and enthalpy changes, Thermal decomposition of nitrogen pentaoxide.

**Reactions in solutions:** Influence of ionic strength on the reaction rate, effect of dielectric constant of the medium on the rate of the reaction, single sphere activated complex model, double sphere activated complex model, complex reactions, chain reactions, single chain carrier with second order breaking, one chain carrier with first order breaking, two chain carrier with second order breaking, experimental techniques for fast reactions.

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| --- | --- |
| **Week** | **Lecture Plan** |
| 1 | 1. Correlation between physical properties and concentration 2. Some basic terminologies |
| 2 | 1. Kinetics of the reversible reactions 2. Kinetics of the parallel reactions |
| 3 | 1. Kinetics of the consecutive bimolecular reactions 2. Kinetics of the chain reactions |
| 4 | 1. Kinetics of the opposing reactions 2. Kinetics of Photochemical Reactions |
| 5. | 1. H2-Br2 Reaction 2. H2 and Cl2 Reaction |
| 6. | 1. Kinetics of Polymerization 2. Kinetics of Catalyzed Reactions |
| 7. | 1. Acid-Base catalyzed reactions 2. Enzyme catalyzed reactions |
| 8. | 1. Step Growth Polymerization 2. Chain Growth Polymerization |
| 9. | 1. Lindemann’s theory of unimolecular reactions 2. bimolecular collision theory |
| 10. | 1. transition state theory 2. Mid Term Exams |
| 11. | 1. comparison of collision and absolute reaction theories 2. Thermodynamic formulation of reaction rates |
| 12. | 1. Calculation of entropy and enthalpy changes, 2. Thermal decomposition of nitrogen pentaoxide |
| 13. | 1. Influence of ionic strength on the reaction rate 2. effect of dielectric constant of the medium on the rate of the reaction |
| 14. | 1. single sphere activated complex model 2. double sphere activated complex model |
| 15. | 1. single chain carrier with second order breaking 2. one chain carrier with first order breaking |
| 16. | 1. two chain carrier with second order breaking 2. experimental techniques for fast reactions |