Name of Institute: Institute of Sciences, Humanities & Liberal Studies (ISHLS)
Name of Faculty: Dr. Paras Patel

Course code: MCH0103
Course name: Physical Chemistry

Pre-requisites: Bachelor of Science in Chemistry

Credit points:

L	T	P	C
4	0	0	4

Offered Semester: I

Course Coordinator (weeks XX - XX)

Full Name: Dr. Paras Patel
Department with siting location: Chemistry Department, ISHLS,
B425 Room, 4th Floor, Bhanwar Building
Telephone: EXT: 3404
Email: paraspatel.gd@indusuni.ac.in
Consultation times: Friday, 02:30 pm to 05:00 pm

Course Lecturer (weeks xx - XX)

Full Name: Dr. Paras Patel
Department with siting location: Chemistry Department, ISHLS,
B425 Room, 4th Floor, Bhanwar Building

Telephone: EXT: 3404
Email: paraspatel.gd@indusuni.ac.in
Consultation times: Friday, 02:30 pm to 05:00 pm

Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Outcomes (CO)

Students will be able to…..

CO 1: Explain the theories of thermodynamics with partial molar properties. [BT-2]
CO 2: Analyse the reaction rates with order of reaction. [BT-4]
CO 3: Design the reactions with lower activation energy. [BT-6]
CO 4: Describe the ion solvent interaction with electrical double layer. [BT-2]
CO 5: Derived the dissociation constant of acids by conductometer and potentiometer. [BT-6]
CO 6: Discuss the phenomenon of adsorption and related theories. [BT-2]

Course Outline

(Key in topics to be dealt)

- **Chemical Thermodynamic**
- **Chemical Kinetics**
- **Electrochemistry**
- **Surface Chemistry**

Method of delivery

(Face to face lectures, Active Learning Techniques)

Study time

(04 Hours per Week)

CO-PO Mapping (PO: Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	-	-	3	1	2	-	-	**1**	**-**
CO2	2	-	2	3	-	1	-	-	**-**	**-**
CO3	2	-	2	3	1	1	-	2	**-**	**-**
CO4	2	2	-	3	1	1	-	-	**1**	**-**
CO5	-	-	3	2	2	-	3	-	**-**	**2**
CO6	2	-	-	1	1	2	-	-	**1**	**-**

Blooms Taxonomy and Knowledge retention (For reference)

(Blooms taxonomy has been given for reference)

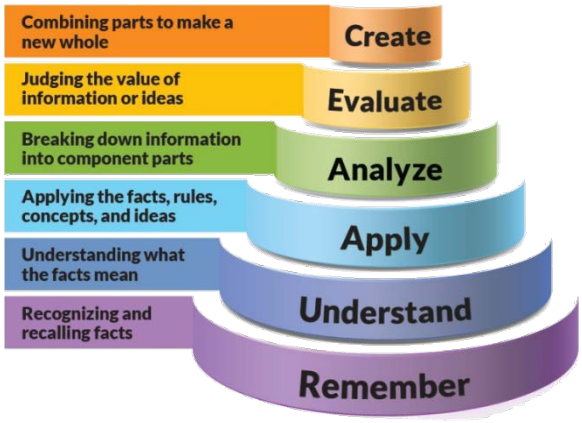

Figure 1: Blooms Taxonomy

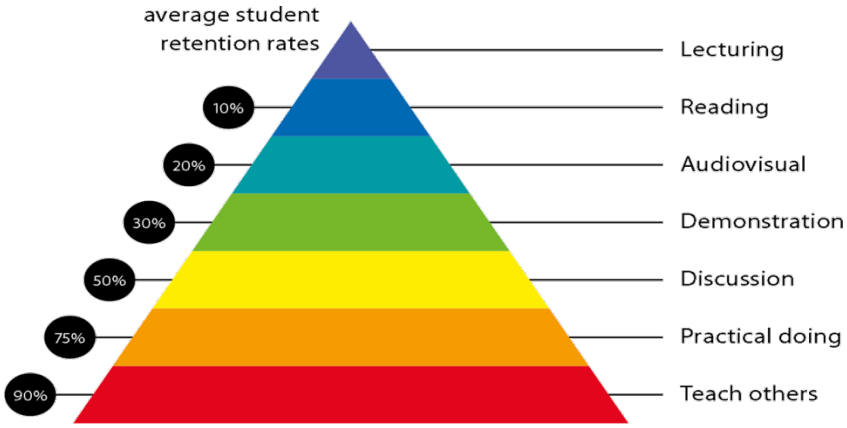

Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness:-** Student's will gain knowledge about chemistry subject in the both areas i.e. theory as well as practical's. Professionally students will know how chemistry is important in our daily life as well as to build up any industry. Students will be having knowledge/awareness about chemicals' such as how to use them and how hazardous they are for the environment.
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	**2 Information literacy, gathering & processing:-** Student's will be able identify the problems happening in the society as well as in the industry such as water quality, loss due to corrosion, pollutant coming from cement plant etc. with this basic information they will be having ability to gather the possible solutions.
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills:** Chemistry education provides students with the tools to solve problems. This means that students should be able to apply the scientific method: define a problem clearly, develop testable hypotheses, design and execute experiments, analyze data using appropriate statistical methods, and draw appropriate conclusions. Students should be able to integrate knowledge across chemical sub disciplines and apply this knowledge to solve problems.

	In the laboratory, in addition to the characteristics described above, students should understand the fundamental uncertainties in experimental measurements.
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication:-** Students should be able to retrieve specific information from the chemical literature, critically evaluate technical articles, and manage many types of chemical information. Students should develop proficiency with electronic searching of appropriate technical databases, including structure-based searching.
	6 Oral communication:- Students should orally able to use communication technology such as computerized presentations as well as software for word processing, chemical-structure drawing, and poster preparation and research paper presentation to any conferences.
	7 Teamwork:- Students should be able to Solve scientific problems often involves working in disciplinary and multidisciplinary teams. This is especially true in industry and increasingly in academic settings. Students should learn to work productively with a diverse group of peers in classroom and laboratory activities. Students should be able to lead portions of an activity or be effective followers, as dictated by the situation. Peer- and self-assessment is often an effective way to evaluate student contributions to group activities.
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact:** With this course students will know/ aware/ learn about the sustainable use of green products, proper management of renewable energy resources, and to find out new energy replacement sources. Students will be socially aware about the sources of pollutant that damages the water, soil, air etc. So they will be having capabilities/ knowledge how to tackled/ deal with different types of pollutions.

Practical work:

(Mention what practical work this Course involves)

N.A.

Lecture/tutorial times

(Give lecture times in the format below)

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

1. An Introduction to Chemical Thermodynamics, R. P. Rastogi and P. R. Misra, (Vikas Publishing House Pvt.Ltd.
2. Fundamentals of Chemical Thermodynamics, M. L. Lakhanpal, (Tata McGraw-Hill Publishing Company, New Delhi).
3. Elements of Physical Chemistry, Peter Atkins, Julio De Paula, David Smith,(Oxford University Press, 6th Edition)
4. Physical Chemistry, Ira N Levine (Tata McGraw-Hill Publishing Company, New Delhi, Fifth Edition).
5. Micelles, Theoretical and Applied Aspects, V. Moroi, Plenum Press
6. Modern Electrochemistry, Vol. I and Vol. II, J. O. M. Bockris and A. K. N. Reddy, Plenum press
7. Chemical Kinetics, K. J.Laidler, Mc-Graw Hill Publisher
8. Thermodynamics for Chemists, S. Glasstone, (East-West Edition, Third Edition)
9. Surfactants and Interfacial Phenomena, Milton J. Rosen, (Willey Interscience, 3rd Edition).
10. Colloid and Interface Science V3, 1st Edition- Milton Kerker
11. Essentials of Physical Chemistry by A. Bahl, B. S. Bahl, G. D. Tuli
12. A Textbook of Physical Chemistry by K. L. Kapoor
13. Principles of Physical Chemistry by B. R. Puri, L.R. Sharma and Madan S. Pathania
14. Advanced Physical Chemistry by Gurdeep Raj.

Text books

1. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma, Madan S. Pathania, Vishal Publishing Co.
2. Advance Physical chemistry, Gurdeep Raj Chatwal, Goel Publishing House
3. Elements of Physical Chemistry, Peter Atkins, Julio De Paula, David Smith,(Oxford University Press, 6th Edition)

Additional Materials

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Example:

- **CIE (60 Marks)**

1. Mid Sem Exam = 40 Marks
2. Assignment = 10 Marks (2 assignment)
3. Presentation = 05 Marks
4. Attendance = 05 Marks (bonus for student having >80% attendance)

CIE Total = 60 Marks

- **ESE (40 Marks)**

1. ESE exam = 40 Marks

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment)

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Course schedule (subject to change)

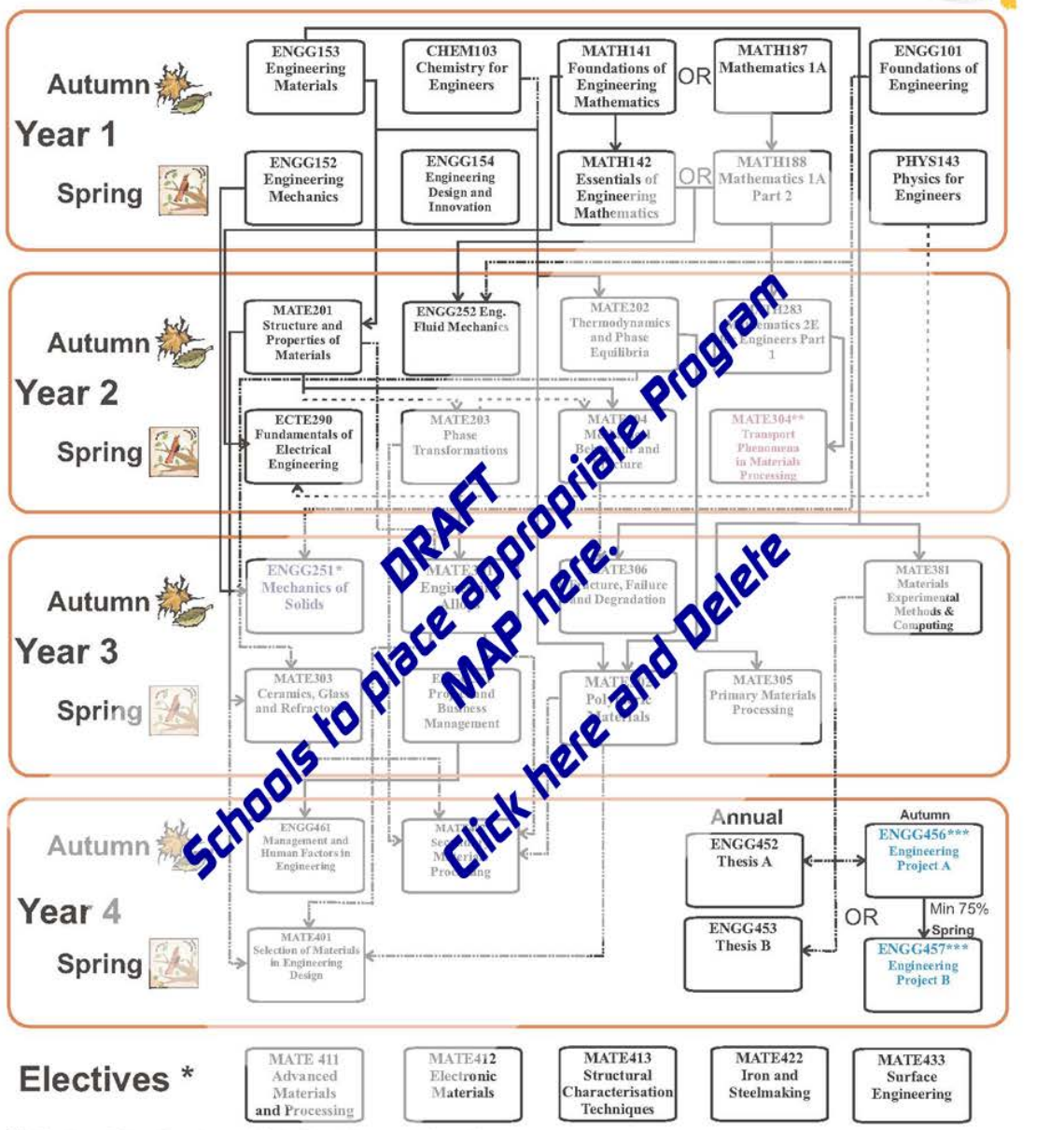
(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Week 1	**Unit- II** **Chemical Kinetics:** Chemical kinetics and its scope, rate of reaction, factors influencing the rate of a reaction, measurements of reaction rates,	2	
	Week 2	differential and integral rate laws, rate laws and equilibrium constants for elementary reactions, temperature dependence of rate constants, Arrhenius equation, concept of activation energy,	3	
	Week 3	reaction mechanisms and examples; - uni-molecular reactions, bi-molecular reactions, trimolecular reactions,	2	
	Week 4	**Complex reactions** - Opposing reactions, Consecutive reactions, Parallel reactions, Chain reactions, Ionic reactions and salt effect, enzyme catalyzed reactions, kinetics of fast reactions.	2	
	Week 5	**Unit- I** **Chemical Thermodynamics**: Brief resume of concepts of laws of thermodynamics, free energy, Chemical potential and entropies. Partial molar properties: partial molar free energy,	1	
	Week 6	partial molar volume and partial molar heat content and their significances. Determinations of these quantities. Concept of fugacity and determination of fugacity.	1	
	Week 7	Non-ideal systems: Excess functions for non-ideal solutions, Activity, activity coefficient,	1	

	Week 8	Debye-Huckel theory for activity coefficient of electrolytic solutions; determination of activity and activity coefficients; ionic strength.	4	
	Week 9	**Unit IV** **Surface Chemistry**: **Physical and chemical adsorption**, Special features of chemisorption-kinetics of chemisorption and heat of chemisorption,	6	
	Week 10	**BET theory** for multilayer adsorption, Experimental methods of determining gas adsorption-Volumetric and gravimetric method,	6	
	Week 11	**Gibbs adsorption isotherm** equation, Experimental results of the Gibbs equation,	6	
	Week 12	verification of the Gibbs equation**-Domain and Barker Method,** The tracer method.	6	
	Week 13	**Unit III** **Electrochemistry** **Basic electrochemistry of solutions**. **Ion solvent interactions:** Debye-Huckel-Onsager treatment and its extension,	4	
	Week 14	Debye-Huckel-Jerummode.Bjerrum's theory of ion association in electrolyte solutions. **The electrical double layer**: Gouy-Chapman and Stern model.	4	
	Week 15	**Application**: Determination of dissociation constant of monobasic acids by conductometry, Determination of dissociation constants of monobasic and polybasic acids by potentiometry	5	
	Week 16	Determination of interfacial tension of mercury as a function of potential across the interface.	4	

PROGRAM MAP for Bachelor of Engineering (Materials Engineering)

DEGREE - 2012



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Schools to place appropriate Program MAP here.
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* Note: Students will take three electives
Some electives are only offered every 2nd year

ENGG251* Note: Full time students entering Year 3 in 2012 will need to take one elective in Autumn as they have already completed ENGG251

MATE304** Note: Full time students entering Year 3 in 2012 will need to take MATE304 in Spring of their 4th year or take it in 2012 and defer another subject to Spring 2012

ENGG456***Note: If ENGG456 Engineering Project A (6cp) is done instead of a thesis, a student needs to complete 4 electives and is not eligible for honours