SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Faculty of Science

CBCS Pattern Syllabus

B.Sc.II (Sem-III and IV)

GEOCHEMISTRY (IDS) (Paper I to IV)

With effect from June-2017

1) Preamble:

Syllabus for B.Sc. II Geochemistry is designed to provide an insight of applications and concepts of basics geochemistry, its principles, physicochemical properties of minerals, solar system and dynamics of various spheres of the earth and chemistry of the earth. In the theory course student can acquire the knowledge about the chemical and atomic properties of mineral matter, integrated study of solar and earth system. Also emphasis has been given on the chemical properties and pollutions of spheres of the earth. The chemical process operating on the earth surfaces as well as chemical reactions, origin of varies economic minerals has also included in the syllabus.

Practical course has been designed on the basis of theoretical approach and objectives of the course.

2) Objectives of the Course

1. Introduce students to applications of chemical concepts to predict the outcome of geologic processes and use of chemical data to solve applied, real-world problems;
2. Introduce students to basic concepts of geochemistry and several up-to-date issues which are widely discussed in the field of geochemistry;
3. To orient students to the current status of numerous chemical analysis techniques commonly used in the field of geochemistry;
4. To provide students with opportunities to use available analytical instruments in the department;
5. To provide students with opportunity to discuss about their research topics in terms of geochemistry.

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Syllabus for B.Sc. II- Geochemistry - (IDS)

Semester System

Choice Based Credit System (CBCS) Pattern

To be implemented from Academic Year- 2017 - 18

Course Structure –Total Credit 20 - (Theory (4 x 3) = 12+Practical (1 x 8) = 8)

Sr. No.	Semester	Paper No.	Title	No. of Lectures	Credit Point	Total Marks (UA + CA)
1	Semester III	I	Introduction to Geochemistry	45	3	100 = 70+30
		II	Introduction to Solar system and Geo-spheres	45	3	100 = 70+30
2	Semester IV	III	Principles of Geochemistry	45	3	100 = 70+30
		IV	Chemistry of the Earth	45	3	100 = 70+30
3	Semester III and IV	Practical Course	Practical Examination (Two Days)(Annual Pattern)		8	200 = 140 + 60
				Total	20	600 = 420 +180

IMPORTANT TO NOTE

- ✓ 70 marks for university examinations (UA) + 30 marks internal examinations (CA)
- ✓ Minimum passing percentage = 40%
- ✓ Separate passing for both university (UA) and internal examinations (CA) in Theory and Practicals

2. Distribution of each Theory paper (Marks 100)

University Assessment (UA) :70 Marks

College Assessment (CA) :30 Marks

3. Distribution of each Practical Marks (200)

Practical examination will be conducted annually i.e. at the end of fourth semester. It will be conducted for total 140 marks. Two separate days for Two Practicals (Each practical with 70 marks)

A. University Practical Examination for 140 Marks (UA):

1st day – Practical I **Total-70 marks**

Section A	A1	Estimation	20 marks	Total 40
	A2	Chromatography	20 marks	
Section B	B1	Colorimetric	20 marks	Total 30
	B2	Qualitative analysis	10 marks	

2st day – Practical II **Total-70 marks**

Section C	C1.	Pyroxene (One example)	15 marks	Total 45
	C2.	Norm (One example)	14 marks	
	C3.	Feldspars (Two examples)	16 marks	
Section D	D1.	Identification of minerals	15 marks	Total 25
	D2.	Certified Journal submission	10 marks	

B. Theory internal continuous assessment (CA):

1. 15 marks - home assignment and 15 marks - unit test.

   Total 30 marks for each paper / semester

C. Practical internal continuous assessment (CA):

1. Practical exam of 30 marks covering topics from sections A and B.
2. Practical exam of 15 marks covering topics from sections C and D.
3. 15 marks for Field visit / project / Oral / Seminar / group discussion.

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B.Sc. II Geochemistry (CBCS Pattern) - IDS (Inter-Disciplinary Subject)

Theory

Semester -III

Paper- I: Introduction to Geochemistry

Total Marks - 100 (UA-70+CA-30)
(70 Marks) (credit 3)
(45 Periods)

Unit 1	Gibbs phase rule, one component system (water and sulphur), Goldschmidt's Mineralogical phase rule	(11 periods)
Unit 2	The states of matter, the crystalline state, principles of crystal structure, formation of crystal, lattice energy of crystals, radius ratio, coordination number, structure of Sodium Chloride, Cesium Chloride, Zinc Sulphide. Brief idea of radii of common ions in rock forming minerals. General rules of the three dimensional structure with the help of solid geometry	(12 periods)
Unit 3	Covalent bonds, general rules of bond type, electro negativity, atomic substitution	(11 periods)
Unit 4	Colloids-Definition, electrical, mechanical and optical properties of colloids, origin of charge, kinds of colloidal system, silica as chemical sediment, clay minerals as colloids	(11 periods)

Reference Books:

1. Brian Mason and C.B. Moore - Principles of Geochemistry
2. H.H. Read (ed.) - Rutley's Elements of Mineralogy
3.Krauskopf - Introduction to Geochemistry

Paper II - Introduction to solar system and Geo-spheres

Total Marks - 100 (UA-70+CA-30)
(70 Marks) (credit 3)
(45 Periods)

Unit 1	Nature of solar system, composition of the sun; Composition of Meteorites and their types; Cosmic abundance of the elements	(12 periods)
Unit 2	Zonal structure of the earth, Composition of the crust; Composition of the earth as a whole; primary differentiation of the elements, geochemical classification of the elements.	(11 periods)
Unit 3	Structure of atmosphere, composition of the atmosphere, variable constituents of the atmosphere; Evolution of the atmosphere and composition of the primeval atmosphere; Atmospheric additions and losses during geological time	(11 periods)
Unit 4	Nature of the hydrosphere, composition of seawater, composition of terrestrial waters; Gains and losses of elements in the oceanic water	(11 periods)

Reference Books:

1. Brian Mason and C.B. Moore - Principles of Geochemistry
2. Krauskopf - Introduction to Geochemistry
3. Standard Manuals - Procedures for analysis and estimations of ores, minerals & rocks

Semester- IV

Paper –III: Principles of Geochemistry

Total Marks - 100 (UA-70+CA-30)
(70 Marks) (credit 3)
(45 Periods)

Unit 1	Chemical equilibrium - The law of mass action, an example of equilibrium, hydrogen chloride, the effect of temperature, other examples as CO_2 in water and calcium sulphate. Le chateliar's rule, stability, Van't Hoff isotherm equation	(12 periods)
Unit 2	Acids and bases, Chemical definition, Geological usage, pH, Hydrolysis of Na_2CO_3; Estimation of ionic concentration, carbonate equilibrium, Temperature changes; Changes in pressure & organic activity	(11periods)
Unit 3	Organic material in sediments; The chemistry of carbon compounds, organic reactions, carbon in rocks, origin of petroleum, origin of coal, organic matter in black shale, carbon compounds as reducing agents	(11 periods)
Unit 4	Water pollution: types of water pollution, treatment on water pollutant by chemical oxygen demand (COD),biological oxygen demand (BOD) and Total dissolved solid (TDS)	(11 periods)

Reference Books:

1. Brian Mason and C.B. Moore - Principles of Geochemistry
2.Krauskopf - Introduction to Geochemistry
3. Kula C. Misra. 2012. Introduction to Geochemistry: Principles and Applications. Wiley and Blackwell

Paper IV- Chemistry of the Earth

Total Marks - 100 (UA-70+CA-30)
(70 Marks) (credit 3)
(45 Periods)

Unit 1	The earth as a physico-chemical system; Crust as a separate system Geochemical cycle	(09 periods)
Unit 2	Oxidation potentials- Oxidation and reduction, electrode reactions, standard potentials, use of the table of oxidation potentials; Redox potential, Ionic potential, Hydrogen ion concentration, Limits of pH and Eh in nature, Eh and pH diagrams.	(09 periods)
Unit 3	Formation of clay minerals, their classification, types, composition. Properties of soils	(09 periods)
Unit 4	Nature of chemical weathering, types- solution, hydration, Oxidation and hydrolysis. Agents of chemical weathering, Sequence of mineral alteration	(09 periods)
Unit 5	Environmental pollution: Definition of pollution, Brief introduction types and sources of Air, Water and Soil Pollutions	(09 periods)

Reference Books:

1. Brian Mason and C.B. Moore - Principles of Geochemistry
2. Khopkar S.M. - Environmental Pollution Analysis
3. K.S. Valdiya - Environmental Geology (Indian context)
4. Krauskopf - Introduction to Geochemistry
5. Standard Manuals - Procedures for analysis and estimations of ores, minerals and rocks

Syllabus of B Sc. (Part-II) Geochemistry Practical Course

Annual Pattern (CBCS)

Marks – 140 + 60 = 200
Credit – 8

Practical – I

Section A	Volumetric analysis and chromatography	
1.	Estimation of alumina in ore, Estimation of manganese in ore, Estimation of calcium and magnesium in carbonate rocks.	(5 experiments)
2.	Analysis of natural waters and soils. Estimation of Ca, Mg-carbonates, bicarbonates, chlorides, and sulphates.	(5 experiments)
3.	Detection of traces of metals by chromatography.	(5 experiments)
Section B	Qualitative and Colorimetric Analysis	
4.	Qualitative analysis of representative ores and minerals.	(5 experiments)
5.	Calorimetric determinations:	(5 experiments)
	a) Estimation of alumina b) Estimation of manganese,	
	c) Estimation of total Iron d) Estimation of copper	

Practical – II

Section C	Mineral and Rock Calculations	
1.	Pyroxene- Hess calculation from given chemical data.	(8 experiments)
2.	Plagioclase- Feldspar calculations	(6 experiments)
3.	Norm calculations from given chemical data (Persalic type only)	(8 experiments)
Section D	Mineral identification	
	Identification and description of following ores and industrial Minerals - Hematite, magnetite, pyrolusite, psilomelane, galena, graphite, chalcopyrite, malachite, chromite, bauxite, bituminous coal, anthracite coal, muscovite, biotite, calcite, dolomite, garnet, quartz, olivine, tourmaline, talc, barytes, kyanite, asbestos, plagioclase, orthoclase, and gypsum.	(3 experiments)

Practical Record

1. Certified record of the practical done by the student should be maintained as a journal and must be submitted at the time of annual practical examination.

2. Certified report of Field visit / Project / Oral / Seminar / Group discussion should be submitted before annual practical examination.

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1.	PI – Introduction to Geochemistry	PI – Introduction to Geochemistry
2.	PII – Introduction to Solar system and Geo-spheres	PII – Introduction to Solar system and Geo-spheres
3.	PIII – Principles of Geochemistry	PIII – Principles of Geochemistry
4.	PIV – Chemistry of the Earth	PIV – Chemistry of the Earth
5.	Practical course: Practical Examination (Annual Pattern) (Two days)	

Examination Structure-
Nature of Question Paper

Theory examination

1. The **Entire Theory examination** will consists of **Four Papers;Two Papers** in **Each Semester**

2. **Each paper of 70 marks** - As per University common pattern for Science faculty

Time: 3hours

Annual Practical examination at the end of 4th semester

Practical Examination

Practical examination will be conducted annually i.e. at the end of fourth semester only. It will be conducted for total 140 marks
Two separate days for Two Practical (Each practical with 70 marks)

1st day – Practical I				**Total-70 marks**
				Total-70 marks
Section A	A1	Estimation	20 marks	Total 40
	A2	Chromatography	20 marks	
Section B	B1	Colorimetric	20 marks	Total 30
	B2	Qualitative analysis	10 marks	
		2nd day- Practical II		**Total-70 marks**
Section C	C1	Pyroxene (One example)	15 marks	
	C2	Norm (One example)	14 marks	Total 45
	C3	Feldspars (Two examples)	16 marks	
Section D	D1	Identification of minerals	15 marks	Total 25
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