Programme	B. Sc. Geology				
Course Code	GEL3CJ201				
Course Title	**INTRODUCTORY GEOINFORMATICS**				
Type of Course	Major				
Semester	I				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	NIL				
Course Summary					

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Students will acquire knowledge of the key sciences and technologies involved in geoinformatics	U	F	Exam
CO2	Students will learn about the origin and development of GIS, its components and its core functions	Ap	C	Quiz
CO3	Students will understand the advantages and limitations of different GIS platforms	An	P	Assignment
CO4	Students will understand the principles and techniques of map-making, and map projection types	E	M	Viva
CO5	Students will grasp the fundamental concepts of remote sensing	Ap	F	Assignment
CO6	Students will be able to define and explain the meaning and scope of geoinformatics, and understand its importance in various fields	E	M	Assignment
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus: INTRODUCTORY GEOINFORMATICS

Module	Unit	Content	Hrs	Marks
I	**Introduction to GIS**		**15**	**20**
	1	Geoinformatics –Definition & scope		
	2	Sciences and technologies involved – Remote Sensing, GIS, Cartography, Photogrammetry		
	3	Origin and development of GIS		
	4	GIS – definition		
	5	Components – hardware, software, people, methods, data		
	6	Functions – data input and output, visualization, editing, analysis, map design		
	7	Desktop GIS, mobile GIS, web GIS		
	8	Limitations of GIS		
II	**Maps**		**10**	**15**
	9	Maps – to convey location and extent, characteristics, and spatial relationships		
	10	Classification of maps – topographic maps, thematic maps, cadastral maps		
	11	Elements of a map		
	12	Classification of projection – Cylindrical, Conical, Azimuthal		
	13	Map design		
III	**Introduction to Remote Sensing**		**15**	**20**
	14	History of Remote Sensing		
	15	Introduction to aerial photography: overlaps, flight lines, drift, crab, tilt, dead ground		
	16	Geometry of aerial photographs - scale, principal point, perspective centre, fiducial marks, nadir, focal length, airbase, photo base, isocentre, relief displacement.		
	17	Vertical & oblique aerial photographs		
	18	Visual image interpretation & elements of interpretation - tone, texture, shape, association, pattern, shadow, size		
	19	Stereoscopy - Pocket Stereoscope, Mirror Stereoscope, Parallax Bar		
IV	**Concept of Remote Sensing**		**8**	**15**
	20	Stages in Remote Sensing		
	21	Energy Source – EMR, characteristic of EMR –wave nature and particle nature. EMR spectrum		
	22	Blackbody radiation, Stefan Boltzmann's law, Wein's displacement law		
	23	Interaction of EMR with atmosphere – reflection, scattering, absorption		
	24	Interaction of EMR with earth's surface features – reflection, transmission		
	25	Spectral Reflectance of land covers – Vegetation, Soil, Water		
V	**Open Ended Module**		**12**	**10**
	1	Interpretation of aerial photographs		
	2	Interpretation of toposheets		
	3	Downloading of toposheets from various websites		

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	1	-	-	-	-	-							
CO 2	2	3	-	-	-	-							
CO 3	-	-	1	-	-	-							
CO 4	-	-	2	3	-	-							
CO 5	-	1	-	-	-	-							
CO 6	-	-	-	3	-	-							

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

External evaluation: 70 marks. Internal Evaluation: 30 marks

INTERNAL MARK SPLIT-UP (TOTAL 30 MARKS)			
	Components of Internal Evaluation	**4 Theory Modules (20)**	**Open ended Module (10)**
1	Test paper/ Mid semester Exam	10	4
2	Seminar/ Viva/ Quiz	6	4
3	Assignment	4	2

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Seminar	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

References:

1. Lo, C.P. and Yeung, A.K.W., 2007. Concepts and Techniques in GeographicInformation Systems.

Programme	B. Sc. Geology				
Course Code	GEL3CJ202				
Course Title	**CRYSTALLOGRAPHY & STRATIGRAPHY**				
Type of Course	Major				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	NIL				
Course Summary	The course has two parts. First part deals with classification of crystals into various systems and classes. Second part is an introduction to geoinformatics.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Students will be able to identify the basic crystal systems	U	F	Exam
CO2	Students will be able to identify the different forms present in crystals, based on their symmetry elements	Ap	C	Quiz
CO3	The students will be able to define various laws of stratigraphy	An	P	Assignment
CO4	The students will be able to differentiate physical and biological criteria of correlation	E	C	Viva
CO5	The students will be able to explain major events of mass extinction	Ap	F	Assignment
CO6	The students will be able to explain different types of stratigraphic classification	E	F	Assignment

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Detailed Syllabus: CRYSTALLOGRAPHY & STRATIGRAPHY

Module	Unit	Content	Hrs	Marks
I		**Introduction to Crystallography and Symmetry Elements**	**10**	**15**
	1	Scope and applications of crystallography. Symmetry elements in crystallography	1	
	2	Crystallographic axes, notation, parameter system of Weiss and Miller indices. Axial ratio	2	
	3	Laws of crystallography	2	
	4	Symmetry elements and forms of Normal, pyritohedral, tetrahedral, and plagiohedral classes in the Cubic system		
	5	Symmetry elements and forms of Normal, Hemimorphic, Tripyramidal, Sphenoidal, and Trapezohedral classes in the Tetragonal system		
II		**Symmetry Elements and Forms in Various Systems**	**15**	**25**
	6	Symmetry elements and forms of Normal, Hemimorphic, Tripyramidal, Trapezohedral, Rhombohedral, Rhombohedral Hemimorphic, and Trapezohedral classes in the Hexagonal system	3	
	7	Symmetry elements and forms of Normal and Sphenoidal classes in the Orthorhombic system	4	
	8	Symmetry elements and forms of Normal classes in the Monoclinic and Triclinic systems	4	
	9	Twin crystals. Definitions and effects of twinning	4	
	10	Laws of twinning, composition plane, twinning plane, and twinning axis		
	11	Indices of twins: simple and repeated (polysynthetic twins), contact and penetration twins (secondary twins)		
III		**Stratigraphy**	**8**	**12**
	12	Laws of Stratigraphy: Concept of uniformitarianism	2	
	13	Law of order of superposition, Law of faunal succession and Law of original horizontality	1	
	14	Principle of Lateral Continuity, Principle of Inclusion, Law of cross-cutting relationship	2	
	15	Correlation: Physical criteria of correlation	1	
	16	Biological criteria of correlation and homotaxis		
IV		**Stratigraphy**	**12**	**18**
	17	Major events of Mass extinction: Ordovician-Silurian and late Devonian extinction events	2	
	18	Permian- Triassic and Cretaceous- Tertiary extinction events	3	
	19	Facies and facies changes: Litho and bio facies	3	
	20	Break in stratigraphic records: Unconformities and diastems	3	
	21	Stratigraphic classification: Biostratigraphic classification: Biozones, biohorizon, index fossil. Range zone, taxon range zone, concurrent range zone, interval zone, assemblage zone, Acme zone	3	
	22	Lithostratigraphic classification: Group, Formation, Member, Bed. Chronostratigraphic classification: Eonothem, erathem, system, series, stage	3	
V		**Practical**	**30**	**10**
	1	Practical involving identification of crystal forms of normal classes of all systems		

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	1	-	-	-	-	-							
CO 2	2	3	-	-	-	-							
CO 3	-	-	1	-	-	-							
CO 4	-	-	2	3	-	-							
CO 5	-	1	-	-	-	-							
CO 6	-	-	-	3	-	-							

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

External evaluation: 70 marks. Internal Evaluation: 30 marks

INTERNAL MARK SPLIT-UP (TOTAL 30 MARKS)			
	Components of Internal Evaluation	**4 Theory Modules (10)**	**Practical (20)**
1	Test paper/ **Continuous Evaluation of Practical Exercises**	5	**10**
2	Seminar/ **End Sem Exam &Viva-Voce**	3	7
3	Assignment / **Lab Record**	2	**3**

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Seminar	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

References:

1. Borchardt-Ott, W., 2011. Crystallography– An Introduction. Springer Heidelberg, 355p.
2. Dana, F.S., 1955. A Text Book of Mineralogy. Asia publishing House, Wiley.
3. Klen, C., Hurlbut, C.S., 1985. Manual of Minerology, John Wiley & Sons
4. Perkins, D., 2015. Mineralogy. Pearson Education (3Ed), 568 p
5. Boggs, S., 2016. Principles of Sedimentology and Stratigraphy. Pearson Education. 568 p.
6. Brookfield, M.E., 2003. Principles of Stratigraphy. Wiley-Blackwell, 340 p.
7. Nichols, G., 2016. Sedimentology and Stratigraphy. Wiley-Blackwell, 419 p.