॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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शैक्षणिक वर्ष २०२४–२५ पासून राष्ट्रीय शैक्षणिक धोरणानुसार लागू केलेल्या विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर द्वितीय वर्षाचे सुधारीत (दुरुस्ती) अभ्यासक्रमाबाबत.

प रि प त्र क

जा.क्र.शै.–१ / परिपत्रक / एनईपीदुरुस्ती / S&T/2024-25/352

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक १५ मे २०२५ रोजी संपन्न झालेल्या मा. विद्यापरिषदेच्या बैठकीतील विषय क्रमांक १५/५९–२०२४ च्या अन्वये मान्यता दिल्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेअंतर्गत राष्ट्रीय शैक्षणिक धोरण–२०२० नुसार पदव्युत्तर द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ लागू करण्यात आले आहे. तथापी वरील संदर्भीय परिपत्रकान्वये प्रकाशित केलेल्या अभ्यासक्रमामध्ये अभ्यासमंडळांनी किरकोळ दुरुस्ती करुन अभ्यासक्रम सादर केला असून मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा यांच्या मान्यतेने दुरुस्ती केलेले अभ्यासक्रम लागू करण्यात येत आहेत.

01	M. Sc. II year Geology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१ / एनइपी / विवऋविपदवी / २०२५–२६ / 253
दिनांक १७.१०.२०२५

17/10

सहाय्यक कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : माहितीस्तव तथा कार्यवाहीस्तव.
१) मा. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
२) मा. प्र. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
३) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परीक्षा व मुंल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

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SWAMI RAMANAND TEERTH

MARATHWADA UNIVERSITY, NANDED - 431 606



(**Structure and Syllabus of Two Years Multidisciplinary Degree Program with Multiple Entry and Exit Option**)

TWO YEAR MASTERS PROGRAMME IN SCIENCE

Subject:**Geology**

Under the Faculty of
Science and Technology

Effective from Academic year 2023 – 2024
(As per NEP-2020)

From Desk of Chairman, Board of Studies of the Subject Geology

Preamble:

Syllabus of M.Sc. Geology program offered by the School of Earth Sciences has been prepared as per the Credit Framework guidelines of National Education Policy (NEP) 2020 and considering the syllabi of the UPSC Geologists examination, MPSC examination, CSIR-NET examination and the requirements of the industry. The M.Sc. program in Geology is imparted to the students for two academic years consisting of four semesters. Candidates will be examined and evaluated on grade basis at the end of each semester in different theory and practical papers as per the credits offered by each course.

The M.Sc. Geology program consists of Core Courses, Electives Courses, Research Methodology, Publication Ethics and On Job Training. This two year program is of total 88 credits, with 22 credits for each semester. The program includes Core and Elective Courses. Students can choose one Elective Course per semester from the list of Elective Courses provided. Students are also encouraged to select Open Elective courses from National Educational Platforms such as MOOCS/NPTL/SWAYAM. If a student wishes, he/she can take a few extra courses, which will be considered as add-on credits.

In addition to class-room teaching and laboratory, the M.Sc. Geology program offers geological field training to the students. After completion of field training, students have to submit a filed report to the School. Intensive On Job Training /Internships in the nationally reputed institutes shall also be provided to the M.Sc. Geology students. The semester breaks can also be utilized for the geological field training and internships.

Students will be assessed through Continuous Assessment (CA) and End Semester Assessment (ESA). Mode of Continuous Assessment (CA) will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting Two Tests (Test I on 40% curriculum) and Test II (remaining 40% syllabus). Average of the marks scored by a student in these two tests of the theory paper will make his CA score. The End Semester Assessment (ESA) (80% of the Maximum Marks) will be based on paper-pen pattern and laboratory experiments/calculations.

Every M.Sc. Geology student has to mandatorily submit dissertation thesis. The Research Project/Dissertation is of 10 Credits, 4 Credits are in third semester and 6 credits are in fourth semester. The dissertation work is based on either new data generated for the proposed scientific problem *OR* based on available large global data sets using innovative ideas. The thesis should be based on sound methodology and well defined objectives. Through dissertation work the student should be well-versed with the literature on the chosen topic, independently define a scientific problem, carry out focused study on a research topic, analyze and interpret large data sets, independently write thesis / project proposal and present and defend the dissertation work. The Dissertation must be submitted by the end of fourth Semester with a Seminar presentation in the presence of faculty members, students and external examiners for the purpose of evaluation. The School of Earth Sciences strongly encourages the M.Sc. Geology students to publish their dissertation work in SCI journals.

Prof. Dr. Dipak Baburao Panaskar
Chairman, Board of Studies of the Geology,
Swami Ramanand Teerth Marathwada University, Nanded

Details of the Board of Studies Members in Geology under the faculty of Science & Technology of S.R.T.M. University, Nanded

Sr No	*Name of the Member*	*Designation*	*Address*	*Contact No.*
1	*Dr. Dipak Baburao Panaskar*	*Senior Professor*	*School of Earth Sciences, S. R. T. M. University, Nanded*	*9403227259*
2	*Dr. Hari Shankarrao Patode,*	*Associate Professor*	*School of Earth Sciences, S. R. T. M. University, Nanded*	**9850209045**
3	*Dr. Shaikh MD Babar,*	*Professor*	**DSM 's College of Arts, Commerce and Science College, Parbhani**	**9890184699**
4	*Dr. Bhagwan Balasaheb Ghute,*	*Assistant Professor*	**Toshniwal Arts, Commerce & Science College, Sengaon, Tq. Sengaon, Dist Hingoli.**	**9130006333**
5	*Dr. Udaykumar Laxmikant Sahu,*	*Assistant Professor*	**Toshniwal Arts, Commerce & Science College, Sengaon, Tq. Sengaon, Dist Hingoli.**	**9860406757**
6	*Prof. D. C. Meshram*	*Professor*	**Department of Geology, S. P. Pune University, Pune**	**8275697166**
7	*Dr. A. N. Dongre*	*Associate Professor*	**Department of Geology, S. P. Pune University, Pune**	**9922410132**
8	*Dr. Sukanta Roy*	*Principal Scientist (F) & Project Director*	**BGRL, Ministry of Earth Sciences, Karad**	**9490469980**
9	*Prof. A. R. Kulkarni*	*Professor*	**SIBER, Kolhapur**	**7588470146**

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Credit Framework for Two Year PG Program

Subject: Geology

Year & Level 1	Sem. 2	Major Subject (DSC) 3	Major Subject (DSE) 4	RM 5	OJT / FP 6	Research Project 7	Practicals 8	Credits 9	Total Credits 10
1	1	SGLGCT2401 Mineralogy (4 Cr) Theory SGLGCT2402 Structural Geology and Geotectonics (4 Cr) Theory SGLGCT2403 Palaeontology and Stratigraphy (4 Cr) Theory	SGLGET2401 Geochemistry (3 Cr) Theory SGLGEP2401 Geochemistry (1 Cr) Practical	**SGLGRM2401** *Research Methodology* **(3 Cr)**	--		SGLGCP2401 Mineralogy (1 Cr) Practical SGLGCP2402 Structural Geology and Geotectonics (1 Cr) Practical SGLGCP2403 Palaeontology and Stratigraphy (1 Cr) Practical	**22**	**44**
	2	SGLGCT2451 Igneous Petrology and Sedimentary Petrology (4 Cr) Theory SGLGCT2452 Thermodynamics and Metamorphic Petrology (4 Cr) Theory SGLGCT2453 Environmental Geology (4 Cr) Theory	SGLGET2451 Computer Applications in Geology (3 Cr) Theory SGLGEP2451 Computer Applications in Geology (1 Cr) Practical **OR** SGLGET2452 Geomorphology and Morphotectonics (3 Cr) Theory SGLGEP2452 Geomorphology and Morphotectonics (1 Cr) Practical	---	**SGLGOJ2451 (3 Cr)**	--	SGLGCP2451 Igneous Petrology and Sedimentary Petrology (1Cr) Practical SGLGCP2452 Thermodynamics and Metamorphic Petrology (1 Cr) Practical SGLGCP2453 Environmental Geology (1 Cr) Practical	**22**	

Exit option: Exit Option with PG Diploma *(after 2024-25)*									
2	**3**	SGLGCT2501 Economic Geology and Geology of Indian Mineral Deposits (4 Cr) Theory SGLGCT2502 Hydrogeology (4 Cr) Theory SGLGCT2503 Remote Sensing and Geographical Information System (4 Cr) Theory	SGLGET2501 Principles of Geophysics (2 Cr) Theory SGLGEP2501 Principles of Geophysics (1 Cr) Practical **OR** SGLGET2502 Engineering Geology (2 Cr) Theory SGLGEP2502 Engineering Geology (1 Cr) Practical (***From same Department / School)***	--		**SGLGRP2501** **(4Cr)** Research Project	SGLGCP2501 Economic Geology and Geology of Indian Mineral Deposits (1 Cr) Practical SGLGCP2502 Hydrogeology (1 Cr) Practical SGLGCP2503 Remote Sensing and Geographical Information System (1 Cr) Practical	**22**	**44**
	4	SGLGCT2551 Coal and Petroleum Geology (4 Cr) Theory SGLGCT2552 Geoexploration, Mining Geology and Mineral Economics (4 Cr) Theory	SGLGET2551 Disaster Management (3 Cr) Theory SGLGEP2551 Disaster Management (1 Cr) Practical (***From same Department / School)***	**SGLGPE2551** Publication Ethics (2 Cr)		**SGLGRP2551** **(6 Cr)** Research Project	SGLGCP2551 Coal and Petroleum Geology (1 Cr) Practical SGLGCP2552 Geoexploration, Mining Geology and Mineral Economics (1 Cr) Practical	**22**	
Total Credits		**44**	**15**	**05**	**03**	**10**	**11**	**88**	

M. Sc. Second Year Semester III *(Level 6.0)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	**SGLGCT2501**	Economic Geology and Geology of Indian Mineral Deposits	04	--	**04**	04	--
	SGLGCT2502	Hydrogeology	04	--	**04**	04	--
	SGLGCT2503	Remote Sensing and Geographical Information System	04	--	**04**	04	--
Elective (DSE)	**SGLGET2501 OR SGLGET2502**	Principles of Geophysics OR Engineering Geology	02	--	**02**	02	--
Research Project	**SGLGRP2501**	Research Project	--	04	**04**	--	04
DSC Practical	**SGLGCP2501**	Economic Geology and Geology of Indian Mineral Deposits	--	01	**01**	--	02
	SGLGCP2502	Hydrogeology	--	01	**01**	--	02
	SGLGCP2503	Remote Sensing and Geographical Information System	--	01	**01**	--	02
DSE Practical	**SGLGEP2501 OR SGLGEP2502**	Principles of Geophysics OR Engineering Geology	--	01	**01**	--	02
Total Credits			**14**	**08**	**22**	**14**	**12**

M. Sc. Second Year Semester III *(Level 6.0)*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits of individual paper)

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Avg of (T1+T2)/2 (6)	Total (7)	CA (8)	ESA (9)	
Major	**SGLGCT2501**	Economic Geology and Geology of Indian Mineral Deposits	20	20	20	80	--	--	100
	SGLGCT2502	Hydrogeology	20	20	20	80	--	--	100
	SGLGCT2503	Remote Sensing and Geographical Information System	20	20	20	80	--	--	100
Elective (DSE)	**SGLGET2501 OR SGLGET2502**	Principles of Geophysics OR Engineering Geology	10	10	10	40	--	--	50
Research Project	**SGLGRP2401**	Research Project	--	--	--		20	80	100
DSC Practical	**SGLGCP2501**	Economic Geology and Geology of Indian Mineral Deposits	--	--	--	--	05	20	25
	SGLGCP2502	Hydrogeology	--	--	--	--	05	20	25
	SGLGCP2503	Remote Sensing and Geographical Information System	--	--	--	--	05	20	25
DSE Practical	**SGLGEP2501 OR SGLGEP2502**	Principles of Geophysics OR Engineering Geology	--	--	--	--	05	20	25

M. Sc. Second Year Semester IV *(Level 6.0)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	**SGLGCT2551**	Coal and Petroleum Geology	04	--	**04**	04	--
	SGLGCT2552	Geoexploration, Mining Geology and Mineral Economics	04	--	**04**	04	--
Elective (DSE)	**SGLGET2551**	Disaster Management	03	--	**03**	03	--
Publication Ethics	**SGLGPE2551**	Publication Ethics	02	--	**02**	02	--
Research Project	**SGLGRP2551**	Research Project	--	06	**06**	--	06
DSC Practical	**SGLGCP2551**	Coal and Petroleum Geology	--	01	**01**	--	02
	SGLGCP2552	Geoexploration, Mining Geology and Mineral Economics	--	01	**01**	--	02
DSE Practical	**SGLGEP2551**	Disaster Management	--	01	**01**	--	02
Total Credits			**13**	**09**	**22**	**14**	**12**

M. Sc. Second Year Semester IV *(Level 6.0)*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits of individual paper)

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Avg of (T1+T2)/2 (6)	Total (7)	CA (8)	ESA (9)	
Major	**SGLGCT2551**	Coal and Petroleum Geology	20	20	20	80	--	--	100
	SGLGCT2552	Geoexploration, Mining Geology and Mineral Economics	20	20	20	80	--	--	100
Elective (DSE)	**SGLGET2551**	Disaster Management	15	15	15	60	--	--	75
Publication Ethics	**SGLGPE2551**	Publication Ethics	10	10	10	40	--	--	50
Research Project	**SGLGRP2551**	Research Project					50	100	150
DSC Practical	**SGLGCP2551**	Coal and Petroleum Geology	--	--	--	--	05	20	25
	SGLGCP2552	Geoexploration, Mining Geology and Mineral Economics	--	--	--	--	05	20	25
DSE Practical	**SGLGEP2551**	Disaster Management	--	--	--	--	05	20	25

SGLGCT2501: ECONOMIC GEOLOGY AND GEOLOGY OF INDIAN MINERAL DEPOSITS (Theory: 4 credits & Practical: 1 credits)

Pre-requisites:

Basic (10+2) knowledge of chemistry and physics + completion of courses SGLGCT2401(Mineralogy), SGLGET2401(Geochemistry),SGLGCT2451(Igneous Petrology and Sedimentary Petrology) and SGLGCT2452(Thermodynamics and Metamorphic Petrology)

Course objectives:

1. Economic Geology is very significant branch of geology directly linked to National Economy.
2. This course in Economic Geology and Indian Mineral Deposits would help the students to understand distribution of economic minerals in Earth's crust, evaluate different processes of economic mineral formation, identify and characterize the minerals based on their physical, chemical and optical properties.
3. The student will study the basic principles behind the formation of ore deposits; how crustal abundance, physic-chemical conditions and fluids play a significant role in the formation of mineral deposits.
4. The course deeply discusses the spatio-temporal and tectonic controls of ore formation both at global level and especially in Indian context.
5. The course offers a detailed account of Indian mineral deposits.
6. The student will study how to identify the most common ore minerals in hand specimen and, by using optical techniques learn how to identify the common ore minerals in thin section.

Course outcomes:

At the completion of the course student would be able to

1. Describe geological distribution of a variety of ore deposits.
2. Understand different processes of mineral deposit formation.
3. Explain why certain ore deposits are restricted to certain epochs, provinces and tectonics.
4. Give a detailed account of Indian mineral deposits.
5. Identify and characterize ore minerals based on megascopic and microscopic observations.
6. Prepare global and Indian mineral deposit distribution.

Curriculum Details: *(There shall be FOUR Modules in each course)*

SGLGCT2501: ECONOMIC GEOLOGY AND GEOLOGY OF INDIAN MINERAL DEPOSITS (Theory: 4 credits)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction, Classification and Processes of Ore Formation**	**15**
	1.1	Introduction to the Ore deposits, Concept of ore bearing fluids, their origin and migration, Form, mineral assemblage, rock-ore association and relationship	
	1.2	Physical and optical properties of ore minerals, Ore textures, Wall-rock alteration,	
	1.3	Classification of Ore deposits, Processes of Ore formation, Magmatic, Sublimation, Hydrothermal, Oxidation and Supergene Sulfide Enrichment, Residual and Mechanical Concentration, Sedimentation, Evaporation,	
	1.4	Contact Metamorphism, Regional Metamorphism, Bacteriogenic, Fluid inclusions in ore mineral assemblage Stable isotopes in ore genesis	
2.0		**Controls on Ore Formation**	**15**
	2.1	Structural, physic-chemical and stratigraphic controls of ore localization	
	2.2	Paragenesis and Zoning, Stratiform and Stratabound deposits	
	2.3	Metallogenic Epochs and Metallogenic Provinces	
	2.4	Platetectonic controls on Distribution of Ore Deposits	
3.0		**Indian Ore deposits: Metallic Deposits**	**15**
	3.1	Geologic setting, field occurrence, ore mineralogy association, geochemistry, genesis and tectonic environment of Cu, Pb, Zn, Fe, Mn deposits	
	3.2	Geologic setting, field occurrence, ore mineralogy association, geochemistry, genesis and tectonic environment of Cr, Al, Ba, Sn, W deposits	
	3.3	Geologic setting, field occurrence, ore mineralogy association, geochemistry, genesis and tectonic environment of Mo, Au, Ag, Ni deposits	
	3.4	Geologic setting, field occurrence, ore mineralogy association, geochemistry, genesis and tectonic environment of PGE, Be, Hg, Mg, P deposits	
4.0		**Indian Ore deposits: Non-Metallic Deposits**	**15**
	4.1	Geologic setting, field occurrence, ore mineralogy, association, geochemistry, genesis and tectonic environment of Industrial minerals used in Refractory industry, Fertilizer industry	
	4.2	Geologic setting, field occurrence, ore mineralogy, association, geochemistry, genesis and tectonic	

		environment of Industrial minerals used in Ceramic industry, Cement industry, Chemical industry	
	4.3	Geologic setting, field occurrence, ore mineralogy, association, geochemistry, genesis and tectonic environment of Industrial minerals used in Glass industry, Paint industry, Abrasives, Building stones	
	4.4	Geologic setting, field occurrence, ore mineralogy, association, geochemistry, genesis and tectonic environment of Industrial minerals used in Diamond and other precious and semi precious stones	
		Total	**60**

SGLGCP2501: Practical based on SGLGCT2501 (1 Credits)

1. Study of ore minerals and industrial materials in hand specimens.
2. Study of characteristics structures observed in hand specimens.
3. Study of ore minerals, textures and structures in thin and polished sections.
4. Preparation of maps showing distribution of metallic and industrial minerals in India and also classical world mineral deposits.

Prescribed and Reference Books

- Economic Geology Principles and Practice: Metals, Minerals, Coal and Hydrocarbons – Introduction to Formation and Sustainable Exploitation of Mineral Deposits by Walter L. Pohl
- Economic Mineral Deposits by Mead L. Jensen and Alan M. Bateman
- Geochemistry of Hydrothermal Ore Deposits by H.L. Barnes
- Hand Book of Stratabouond and Stratiform Ore Deposits by Wolf, K.H. (1976-1981)
- Introduction to Ore-forming processes by L. Robb
- Metals and Society: An Introduction to Economic Geology by Nicholas Arndt, Stephen Kesler and Clément Ganino
- Mineral Economics: An Indian Perspective by Kirtikumar Randive and Sanjeevani Jawadand
- Mineral Resources, Economics and the Environment by S.E. Kesler and A.C. Simon
- Minerals and Allied Natural Resources and their Sustainable Development: Principles, Perspectives with Emphasis on the Indian Scenario (Springer Geology) by Mihir Deb and Sanjib Chandra Sarkar
- Ore Genesis – A Holistic Approach by A. Mookherjee
- Ore Geology and Industrial Minerals – An Introduction by A.M. Evans
- Ore microscopy and ore petrography by James R. Craig and David J. Vaughan
- Ore Petrology by R.L. Stanton
- The Geology of Ore Deposits by J.M. Guilbert and C.F. Park Jr.

The Ore Minerals and their Intergrowths by P. Ramdohr

- The World of Mineral Deposits: A Beginner's Guide to Economic Geology by
- Time and Strata Bound Ore Deposits by D.D. Klemm and H.J. Schneider

SGLGCT2502: HYDROGEOLOGY (Theory: 4 credits)

Pre-requisites:

Basic (10+2) knowledge of chemistry and physics + completion of courses SGLGCT2401(Mineralogy),SGLGCT2402(Structural Geology and Geotectonics) SGLGET2401(Geochemistry), and SGLGCT2451(Igneous Petrology and Sedimentary Petrology)

Course objectives:

1. To understood the hydro-geological cycle.
2. Occurrence of groundwater on the planet earth.
3. To study the groundwater aquifers, hydro geological properties, and movement of groundwater.
4. Exploration of groundwater occurrence in different geological formations.
5. To develop the writing skills based on research pattern/report writing which is useful in research institutes/govt. organizations/Pvt. organizations
6. To develop the skills of individual student so that he/she will be competent enough to get job in this field of specialization.

Course outcomes:

At the completion of the course student would be able to

1. Understand Water-bearing formations.
2. Understand and model the flow of groundwater.
3. Explain chemistry of groundwater as controlled by natural and anthropogenic processes.
4. Detect groundwater potential and understand its management.
5. Analyze water for different chemical components.
6. Graphically represent variations groundwater chemistry.

Course contents:

SGLGCT2502: HYDROGEOLOGY (Theory: 4 credits)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction**	**15**
	1.1	Hydrological cycle; Occurrence and distribution of groundwater	
	1.2	Aquifer classification and characteristics of aquifers	
	1.3	Hydrological properties of rocks-Porosity, permeability	
	1.4	Hydrological properties of rocks-hydraulic conductivity, specific yield, storage coefficient, transmissibility, hydraulic resistivity, hydraulic diffusivity.	

2.0		**Classification of rocks from hydrological view**	**15**
	2.1	Classification of rocks from hydrological view- Properties; groundwater conditions in different geological formations.	
	2.2	Aquifer parameter analysis; Darcy's Law in homogenous and heterogenous media	
	2.3	Bernoulli equation; Reynold's number; pumping test and aquifer evaluations	
	2.4	Coastal conditions- seawater intrusion and its control	
3.0		**Groundwater management**	**15**
	3.1	Groundwater management; methods of recharge; artificial recharge	
	3.2	water budgeting and evaluation of perennial yield; Urbanization and demands on water	
	3.3	Water logging and conjunctive use; excessive use and alkalinity-saltation	
	3.4	Methods of water conservation; sustainable watershed development; groundwater level fluctuations; land subsidence; impact of global climate change on groundwater	
4.0		**Characteristics of groundwater and Groundwater exploration**	**15**
	4.1	Groundwater chemistry: Chemical characteristics of groundwater in relation to various uses – domestic, industrial and irrigation	
	4.2	Radioisotopes in hydro-geological studies; Groundwater contamination and problems of arsenic, fluoride and nitrates	
	4.3	Groundwater exploration: Surface investigation of groundwater - geologic, remote sensing, electrical resistivity, seismic, gravity and magnetic methods	
	4.4	sub-surface investigation of groundwater - test drilling, resistivity logging, spontaneous potential logging, radiation logging	
		Total	**60**

SGLGCP2502: Practical based on SGLGCT2502 (1 Credits)

In Laboratory:

Megascopic identification and description of hydrological properties of rocks. Hydrological problems, hydrochemical analysis of water, plotting the Gibb's diagrams, Piper Tri-linear diagrams etc.

In Field:

Study of weathering pattern with respect to percolation of surface water in to the ground water, study of primary and secondary porosity of rock formation; Well inventory etc.

Prescribed and Reference Books

- Geochemistry, Groundwater and Pollution by C.A.J. Appelo
- Geophysical Prospecting For Groundwater by Sankar Kumar Nath
- Ground Water and Wells by F.G. Driscoll
- Ground Water by H.M. Raghunath
- Ground Water Hydrology by D.K. Todd
- Groundwater Geochemistry by J. Merkel Broder
- Groundwater Geophysics in Hard Rock by Prabhat C. Chandra
- Groundwater Prospecting and Management by H. P. Patra, Shyamal Kumar Adhikari, and Subrata Kunar
- Hydrogeology by S.N. Davies and R.J.N. Dc-West
- Modern Groundwater Exploration: Discovering New Water Resources in consolidated Rocks Using Innovative Hydrogeologic Concepts, Exploration, Drilling, Aquifer Testing and Management Methods by Jay H. Lehr and Robert A. Bisson

SGLGCT2503: REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS (Theory: 4 credits & Practical: 1 credit)

Pre-requisites:

Basic understanding Geology, Geography and Physics (10 / 10+2 level).

Course objectives:

1. To attain fundamental knowledge of basics of Remote Sensing.
2. To identify different features with the help of Photo-interpretation Elements.
3. To apply Remote Sensing knowledge for different applications in Earth Sciences.
4. Introduce the students to the fundamental concepts of GIS and GPS technologies
5. It will make them familiar with the most essential GIS techniques with hands on practical experience.
6. Students will learn about creation and organization of spatial and non-spatial data.
7. Learn and use different GIS based techniques to identify and solve the natural, environmental and community problems.
8. Learn application of GIS and GPS in geology.

Course outcomes:

At the completion of the course student would be able to

1. Explain the Fundamental principles of Remote Sensing.
2. Explain basic properties of Remote Sensing, Data acquisition, Storage and Processing.
3. Identify different features with the help of Photo interpretation Elements.
4. Apply the knowledge of Remote Sensing for applications in different fields.
    1. Differentiate between different data types in GIS.
    2. Georeference the spatial data and work on spatial and non-spatial database.
    3. Describe various GIS tools and techniques.
    4. Explain the fundamental principles behind GPS technology.
    5. Visualize GIS outputs in different dimensions.
    6. Create digital GIS maps.
    7. Apply spatial data analysis for various applications to deal with geological problems.

Course contents:

SGLGCT2503: REMOTE SENSING and GEOGRAPHICAL INFORMATION SYSTEMS (Theory: 4 credits)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction and Aerial Photography**	**15**
	1.1	Introduction to Remote Sensing, Definition, Characteristics of EMR, Platforms, Fundamentals of Aerial Photography, History of Aerial Photographs	
	1.2	Types of Aerial Photographs- Vertical and Oblique Photographs, Aerial Cameras, Flying Plan,	

		Photogrammetry -- Basic Geometric Characteristics- Scale, Overlap, Tilt, Distortion and Displacement of Aerial Photographs	
	1.3	Advantages and Disadvantages of Aerial Photographs, EMR and its interaction with matter, Reflection, Absorption, Transmission, Scattering	
	1.4	Concept of Signatures- Photo Interpretation Elements	
2.0		**Satellite Remote Sensing and Applications of Remote Sensing**	**15**
	2.1	Principles of Remote Sensing, Process of Remote Sensing, Indian Remote Sensing Programme, Types of Satellites- Sun-synchronous and Geostationary Satellites, Launch Vehicles- PSLV, GSLV, Payloads, Active and Passive Remote Sensing, Classification of Remote Sensors	
	2.2	Resolution- Spatial, Spectral, Radiometric, Temporal, Microwave Sensors, SLAR	
	2.3	Digital Image Processing- Image Classification, Supervised and Unsupervised Classification, Image Enhancement, Filtering, PCA etc	
	2.4	Interpretation of Visual and Digital data, Applications in Geology	
3.0		**Introduction to GIS**	**15**
	3.1	Introduction to GIS, Definition, History of GIS, Scope and Importance of GIS, Development of GIS, Components of GIS	
	3.2	Data models in GIS - Raster data model, Vector data model, basic entities of GIS: line, point and polygon, Geodatabase	
	3.3	Map Projection, Types and Need of projection system, Spatial and Attribute data	
	3.4	Acquisition of spatial data: Scanning, Georeferencing, concept of layer, digitizing, error detection and correction, DBMS	
4.0		**Global Positioning Systems**	**15**
	4.1	Global Positioning Systems, History and developments in GPS, Trilateration process, types of GPS	
	4.2	GPS Surveys, Mapping and layout, Image processing, General processes involved in image processing	
	4.3	Mosaic, subset, Point interpolation techniques: Krigging, IDW, Data analysis, network analysis, DEM and DTM, Thematic maps	
	4.4	Geological Applications of GIS and GPS technology	
		Total	**60**

SGLGCP2503: Practical based on SGLGCT2503 (1 Credit)

1. Toposheet Reading
2. Calculation of the Scale of Aerial photograph and Satellite Imagery.
3. Identification of different features from the Aerial photograph with the help of Photo-interpretation Elements.
4. Identification of different features from Satellite Imagery with the help of Photo-interpretation Elements.
5. Study of Drainage patterns from Aerial Photograph/Satellite Imagery.
6. Preparation of Land use/Land cover Map from Aerial Photograph/Satellite Imagery.
7. Calculation of Land use/Land cover percentage from Aerial Photograph/ Satellite Imagery.
9. Geo-referencing of image.
10. Base layer preparation.
11. Error detection and correction.
12. Preparation of geodatabase and editing data.
13. Use of GPS instrument to collect way-point data.
14. Map Projections.
15. Importing GPS data into the computer using software.
16. Mosaiking.
17. Subsetting.
18. Point Interpolation techniques: Krigging, IDW.
19. Preparation of DEM/DTM.
20. Preparation of thematic maps
21. Practical based on geological applications of GIS.
22. Practical based on geological applications Google Earth.

Prescribed and Reference Books

- Image Interpretation in Geology by Drury
- Introduction to Remote Sensing by J. B. Campbell
- Photogrammetry by Miller and Miller
- Principles & Applications of Photogeology by S. N. Pande
- Remote Sensing & Image Interpretation by T. M. Lillesand and W. K Ralph
- Remote Sensing in Geology by Siegal
- Remote Sensing: Principles and Interpretation by F. F. Sabins
- An Introduction to Geographical Information Systems by I. Heywood, S. Cornelisus and S. Carver
- Concepts Techniques of Geographical Information Systems by C. P. Lo and A. W. Yeung Geographical Information Systems and Science by P. A. Longley, M. F. Goodchild, D. J. Maguire and D. W. Rhind
- Fundamentals of Geographic Information Systems by M. N. Demers
- Introduction to Geographic Information Systems by K. T. Chang
- Introduction to Global Positioning Systems by Ahmed E. L. Rabbany
- Introductory Digital Image Processing by J. R. Jensen
- Textbook of Remote Sensing and Geographic Information System by M. Anji Reddy
- Principles of Geographical Information Systems by P. A. Burrough and R. A. McDonnell

The GIS Book by G. B. Korte

SGLGET2501: PRINCIPLES OF GEOPHYSICS
(Theory: 2 credits & Practical: 1 credit)

Pre-requisites:

Basic knowledge about physical properties like density, magnetism, electrical properties, elastic and radioactive properties, general composition of the earth materials and their physical property variations.

Course Objectives:

The objective of this course is to develop basic knowledge of geophysics and its applications in understanding the Earth processes.

Course outcomes:

This course aims to enable the students

1. To gain an understanding of the basic principles and practice of exploration geophysics.
2. To gain an understanding of electrical and electromagnetic, gravity and magnetic surveying and well logging.
3. Be capable of explaining the principles of seismic refraction and reflection

Course contents:

SGLGET2501: PRINCIPLES OF GEOPHYSICS (Theory: 2 credits)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction**	
	1.1	Definition and scope of geophysics; Basic principles and concepts of geophysical study; Concepts of physical properties; Basic physical properties in the study of geophysics	**8**
	1.2	Physical properties of different rock formations; Introduction to major geophysical methods; Natural and artificial source geophysical methods	
	1.3	Ground and airborne geophysical methods; Heat flow studies; Gravitational field of the Earth, geoid-spheroid; Isostacy	
	1.4	Introduction to Geomagnetism and Paleo-magnetism; Introduction to seismology, concept of seismic waves and velocities and earthquakes; Geophysics and internal constitution of the Earth	
2.0		**Gravity Method and Magnetic Method**	
	2.1	Gravity Method: principles, units, gravity measurements, gravity measuring instruments. Gravity data collection, data presentation, gravity base, concept of gravity anomaly. Gravity data reduction	**8**
	2.2	Magnetic Method: Principle, units, magnetic	

		elements, instrumentation, concept of magnetic anomaly, magnetic base, survey procedures, corrections	
	2.3	Gravity and magnetic anomaly presentations, processing and interpretation, Regional and residual anomalies, concepts interpretation, applications of gravity and magnetic anomalies	
3.0		**Electrical and Electromagnetic Methods**	**7**
	3.1	Electrical Methods: Principles, various electrical properties used in electrical methods,	
	3.2	Classification of electrical methods, SP, Resistivity	
	3.3	Electromagnetic Methods – theory, survey procedures,	
	3.4	Electromagnetic Method data presentation and their various applications	
4.0		**Global Positioning Systems**	**7**
	4.1	Basic principles of seismic methods	
	4.2	Seismic reflection methods	
	4.3	refraction methods	
	4.4	Applications of above methods	
		Total	**30**

SGLGEP2501: Practical based on SGLGET2501 (1 Credit)

1. Physical property measurement, Variations of Physical property of Earth Materials.
2. Practical problems related to gravity and magnetic anomaly patterns, qualitative interpretation.
3. Electrical anomaly patterns (SP and resistivity) and applications.
4. Seismic data interpretation.
5. Exercises on application of Isostacy.

Prescribed and Reference Books

- An Introduction to Geophysical Exploration by Philip Kearey, Michael Brooks and Ian Hill
- Applied geophysics by W.W. Telford
- Exploration Geophysics by Kaul and Bhattachrya
- Fundamentals of Geophysics by Lowrie
- Geophysical methods in geology by G.R. Foulger and C. Peirce
- Gravity and Magnetic interpretation in Exploration Geophysics by I.V. Radhakrishna Murthy
- Gravity and Magnetic methods by B.S.R. Rao and I.V.R. Murthy
- Introduction to Geophysical prospecting by M.B. Dobrin
- Introduction to Geophysics – Lecture Notes by Jan Valenta
- Outline of Geophysical Prospecting by M.B. Ramchandra Rao.
- Outlines of Exploration Geophysics by V.L.S. Bhimasankaram

SGLGET2502: ENGINEERING GEOLOGY (Theory: 2credits & Practical: 1 credits)

Pre-requisites:

Basic (10+2) knowledge of rocks and their types. Physical properties of rocks + SGLGCT2401(Mineralogy) and SGLGCT2451 & SGLGCT2452 (Petrology courses).

Course objectives:

1. Rocks and their types as well as their mode of formation.
2. Physical and mechanical properties of rocks.
3. Textures and structures of rocks.
4. Chemical composition of rocks.
5. Structural features of rocks affecting civil construction.
6. Geological site investigation for civil construction.

Course outcomes:

Students who earn minimum grade should be able to

1. Interpret the field data and interpret structures and deformations.
2. Identify rock properties (mechanical properties).
3. Understand role of structural features of rocks in engineering geology.
4. Carry out geological cross section and interpretation of subsurface geology.
5. Understand role of chemical composition of rocks in engineering geology.
6. Carry out geological site investigation for civil construction.
7. Carry out seismic zone classification and seismic design of building.
8. Understand behaviour of rocks under stress.

Course contents:

SGLGET2502: ENGINEERING GEOLOGY (Theory: 2 credits)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Geology and Civil Engineering**	
	1.1	Engineering properties of rocks, and soils and their classifications and physical characteristics of building stones	**8**
	1.2	Concretes and other aggregates-mineral composition	
	1.3	Texture, structure, porosity, strength of rocks	
	1.4	Permeability, durability, heat resistance, etc	
2.0		**Structural weakness of geological materials**	
	2.1	Significance of structures in engineering geology; Concepts of stress, strain, Mohr circle and failure theories	**8**
	2.2	Discontinuities in rock masses. Weathering of rocks; Mass movements with special emphasis on	

		landslides and causes of hill slope instability. Rock slope stability, landslides and stability of structures	
	2.3	Engineering behaviour of rock materials and rock masses	
	2.4	Engineering aspects of weaker geological materials	
3.0		**Geological site investigation**	**7**
	3.1	Geological investigations in construction of dams, reservoirs	
	3.2	Geological investigations in construction of tunnels, bridges, highways	
	3.3	Coastal protection structures	
	3.4	Geologic considerations of construction materials	
4.0		**Remedial measures and Case Studies**	**7**
	4.1	Remedial measures for and reinforcements of weaker geological materials	
	4.2	Seismic design of buildings	
	4.3	Site investigations and important case studies	
		Total	**30**

SGLGEP2502: Practical based on SGLGET2502 (1 credit)

1. Rock studies in hand specimen, rock studies in thin sections.
2. Mechanical properties of rocks (texture, structure, porosity, strength of rocks, permeability, durability, heat resistance, etc,)
3. Geological cross sections.
4. Structural problems related to borehole data; stress-strain analyses.

Prescribed and Reference Books

- A Text Book Geology by P.K. Mukharjee
- Blue Planet by Skinner and Porter
- Engineering Geology by Purbin Singh
- Engineering Geology- Principle and Practice by Price and David George
- Experiments in Engineering Geology by K.V.G.K. Gokhale and D.M. Rao
- Foundations of Engineering Geology by Waltham
- Fundamentals of Engineering Geology by F.G. Bell
- Geology for Civil Engineers by McLean and Gribble
- Handbook of Mechanical Properties of Rocks by V.S. Vutukuri, R.D. Lama and S.S. Saluja
- Introduction to the Rock Physics by G. Yves and P. Victor
- Physical Geology by Arthur Holmes
- Principle of Engineering Geology by Johnson De Graff
- Principles of Engineering Geology by D.P. Krynine and W.P. Judd
- The Earth by Press and Seiver
- The Fracture of Rocks by J.L. Bles and B. Feuga
- The Physics of Rocks by V.Q. RzLevisky and G. Novik
- The Rock Physics by M. Garg, T. Mukherjee and J. Dvorkin

Wave Propagation in Elastic solids by J.D. Achenbach

SGLGCT2551: COAL AND PETROLEUM GEOLOGY

(Theory: 4 credits & Practical:1 credits)

Pre-requisites:

Basic (10+2) knowledge of chemistry and biology + Stratigraphy and Palaeontology.

Course objectives:

1. To understood the origin, formation and occurrence of coal.
2. To understood the origin, formation and occurrence of petroleum.
3. To study the geographical and geological distribution of coal and petroleum.
4. To study the geological and geochemical prospecting for coal and petroleum
5. To develop the writing skills based on research pattern/report writing which is useful in research institutes/govt. organizations / pvt. organizations
6. To develop the skills of individual student so that he/she will be competent enough to get job in this field of specialization.

Course outcomes:

At the completion of the course students would be able to

1. Understand the theories of origin of coal and petroleum.
2. Explain distribution of coal and petroleum in different geological environments.
3. Identify different types of coal.
4. Calculate coal and oil reserves.

Course contents:

SGLGCT2551: COAL AND PETROLEUM GEOLOGY (Theory:4 Credits)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Coal Geology: Introduction and Microscopic Studies**	**15**
	1.1	Definition and origin of coal; Sedimentology of coal bearing strata	
	1.2	Types of seam discontinuities and structures associated with coal seams; Chemical analysis of coal (proximate and ultimate analysis)	
	1.3	Coal Petrology – concept of 'Lithotype', 'Maceral' and 'Microlithotype'; Techniques and methods of coal microscopy	
	1.4	Classification of coal in terms of rank, grade and type	
2.0		**Structural weakness of geological materials**	**15**
	2.1	Indian classification for coking and non-coking coals; International classifications (I.S.O. and	

		Alpern's classification)	
	2.2	Geographical and geological distribution of coal and lignite in the world and in India	
	2.3	Indian coal reserves and production of coal in India	
	2.4	Coal bed methane – a new energy resource. Elementary idea about generation of methane in coal beds	
3.0		**Petroleum Geology: origin and Occurrence**	**15**
	3.1	Petroleum and its composition; Theories of Origin of Petroleum; Occurrence of Petroleum; Surface and sub-surface occurrences	
	3.2	Reservoir Rocks: Fragmental, Chemical and Miscellaneous	
	3.3	Marine & Non-Marine Reservoir Rocks	
	3.4	Introduction to pore space, fluid content, reservoir traps; Reservoir Conditions - effect of temperature & pressure	
4.0		**Remedial measures and Case Studies**	**15**
	4.1	Migration & accumulation of Petroleum; Petroleum Provinces - sedimentary basins, carbon-ratio theory, unconformities	
	4.2	Petroleum exploration techniques & strategies, Major Petroleum Provinces	
	4.3	Classification and stratigraphy of petroliferous basins of India. Oil and source rock correlation	
	4.4	Locating petroleum prospects based on principles of petroleum generation and migration (geological modeling). Quantitative evaluation of oil and gas prospects through geochemical modeling	
		Total	**60**

SGLGCP2551: Practical based on SGLGCT2551 (1 Credits)

In Laboratory:

Megascopic identification, classification and description of coal. coal seam problems; Coal mining problems; Problems related to petroleum deposits. Study of geological maps and sections of important oil fields of India. Calculation of coal reserves; Calculation of oil reserves.

In Field:

Field visit to coal mines; Collection of different coal samples; Study of coal and petroleum prospective areas.

Prescribed and Reference Books

- Coal and Coal-bearing strata: Recent Advances. The geological Society of London, Publication no. 32 (1987) by A.C. Scott
- Coal and organic Petrology by Singh, M.P. (Ed.)
- Elements of Petroleum Geology by R.C. Selley
- Hydrocarbon exploration and production by F. John, M. Cook and M. Graham
- Introduction of Petroleum Geology by G.D. Holson and E.N. Tiratso
- Micropaleontology in Petroleum Exploration by R.W. Jones
- Organic Petrology by G.H. Taylor, M. A. Teichmuller, Davis, C.F.K. Diesel, R. Little, and P. Robert
- Petroleum Formation and Occurrence by B.P. Tissot and D.H. Welte
- Petroleum Geochemistry and Geology by J.M. Hunt
- Petroleum Geology by F.K. North
- Textbook of Coal (Indian context) by D. Chandra, R.M. Singh and M.P. Singh
- Textbook of Coal petrology by E. Stach, M-Th. Mackowsky, G.H. Taylor, D. Chandra, M. Teichumullelr and R. Teichmuller
- Thermal Modeling of Petroleum Generation by C. Barker

SGLGCT2552: GEOEXPLORATION, MINING GEOLOGY AND MINERAL ECONOMICS (Theory: 4 credits & Practical: 1 credits)

Pre-requisites:

Basic (10+2) knowledge of chemistry and physics + SGLGCT2401 (Mineralogy) and SGLGCT2451 & SGLGCT2452 (Petrology courses).

Course objectives:

1. To understood the concept and scope of geo-exploration.
2. To understood the economy of mineral resources.
3. To study the mineral dispersion and there identification.
4. To understand different mining techniques
5. To develop the writing skills based on research pattern/report writing which is useful in research institutes/govt. organizations / Pvt. organizations.
6. To develop the skills of individual student so that he/she will be competent enough to get job in this field of specialization.

Course outcomes:

At the completion of the course students would be able to

1. Understand the different mineral exploration methods.
2. Understand different sampling and mining techniques.
3. Understand the role of minerals in global and national economy.
4. Calculate mineral reserves.
5. Interpret different exploration data sets.
6. Represent mineral data through various graphs.

Course contents:

SGLGCT2552: GEOEXPLORATION, MINING GEOLOGY AND MINERAL ECONOMICS (Theory: 4 credits)

Module No.	UnitNo.	Topic	Hrs. Required to cover the contents
1. 0		**Geoexploration**	**15**
	1.1	Classification of mineral deposits for exploration	
	1.2	Host rocks of mineral deposits	
	1.3	Methods of exploration - mapping on different scales, surveying, pitting/trenching, drilling, logging	
	1.4	Sampling - general principles and methodologies	
2.0		**Geoexploration Methods**	**15**
	2.1	Geological exploration: Geological criteria and guides for exploration of mineral deposits. Gossan and capping. Structural, Lithological and Stratigraphic Guides	
	2.2	Geophysical exploration - gravity, magnetic, seismic and electrical methods, field procedures and interpretation of the data	
	2.3	Brief description and application of radioactive methods. Geochemical exploration - soil, bed rock sampling, water	

		sampling. mobility and geochemical associations of elements	
	2.4	Geochemical prospecting methods. Primary and secondary geochemical dispersion patterns. Geo-botanical exploration methods	
3.0		**Mining Geology**	**15**
	3.1	Definition, basic concepts, terminology, broad classification of mining methods	
	3.2	Placer mining methods, open pit methods, Underground mining methods, Coal Mining methods and Ocean bottom mining methods	
	3.3	Mining of surface and underground mineral deposits Geological factors considered for the selection of mining method	
	3.4	Mining hazards and safety measures; Mines & Minerals Regulation & Development Act	
4.0		**Mineral Economics**	**15**
	4.1	Mineral economics and its concepts. Peculiarities inherent in mineral industry. Tenor, grade and specification	
	4.2	Strategic, critical and essential minerals. Conservation and substitution	
	4.3	Changing pattern of mineral requirement; Importance of minerals in national economy	
	4.4	Marine mineral resources and laws of the sea; Indian mineral policy and legislation; Mineral Concession Rules	
		Total	**60**

SGLGCP2552: Practical based on SGLGCT2552 (2 Credits)

In Laboratory:

Estimation of grade and ore reserves: Bedded type and vein type (Extended area and included area methods); Surveying - Plane table survey, chain survey, prismatic compass survey, abney level survey. Bore hole problems; Gravity, magnetic and electrical survey related problems and calculations. Cross section of mines with the help of available data; Preparation of mineral maps of India; Graphical representation of production, export and import of important minerals.

In Field:

Techniques of stream sampling; Magnetic and electrical surveys in the field and interpretation of data; Field report on nearest mines.

Prescribed and Reference Books

- Biological Methods of Prospecting for Minerals by R.R. Brooks
- Courses in Mining Geology by R.P.N. Arogyaswami
- Economic Geology Principles and Practice: Metals, Minerals, Coal and Hydrocarbons – Introduction to Formation and Sustainable Exploitation of Mineral Deposits by Walter L. Pohl
- Elements of Geochemistry, Geochemical Exploration and Medical Geology by K.R. Randive
- Elements of Mining by G.J. Young
- Elements of Mining by R.A. Lewis and G.A. Clark
- Elements of Prospecting and Exploration by T.C. Bagchi, D.K. Sengupta and S.V.L.N. Rao
- Elements of prospecting for non-fuel mineral deposits by P.K. Banerjee and S. Ghosh
- Geobotany and Biogeochemistry in Mineral Exploration by R.R. Brooks
- Geochemical exploration methods for mineral deposits by A. A. Beus and S. V. Grigorian
- Geological Prospecting & Exploration by V. M. Kneiter
- Introduction to Mineral Exploration by A.M. Evans

- Introduction to Mining Engineering by H.L. Hartman
- Mineral Economics by R.K. Sinha and N.L. Sharma
- Mineral Economics: An Indian Perspective by Kirtikumar Randive and Sanjeevani Jawadand
- Mineral Exploration: Principles and Applications by Swapan haldar
- Mining Geology by H.E. Mckinstry
- Mining of Mineral deposits by L. Sheryanthov
- Plants for Geobotanical Prospecting: Indicator Plants Used for Sampling for Geochemical Prospecting by Donald Leslie Masson
- Principles of Geochemical Prospecting by I. I. Ginzburg
- Principles of Mine Planning by Jayanth Bhattacharya

SGLGET2551: DISASTER MANGEMENT (Theory: 3 credits & Practical: 1 credit)

Pre-requisites:

This course may offer specializations in areas like threat response, disaster management, disaster preparedness or public administration. These specialization degrees will require specific prerequisites. It also requires prerequisites in leadership, organizational behavior, emergency services, public administration, strategic planning, and occupational safety and health. Students will learn how to plan for disasters and emergencies while applying the common concepts of disaster management. Students will explore documented case studies in order to understand how real disaster situations interrupt operational efficiency and effectiveness.

Salient features:

The course may be learned by any students of any discipline as Disaster Management (DM) is multi disciplinary and draws its knowledge base from a range of disciplines. The overall aim of this is to provide broad understanding about the basic concepts of Disaster and its management.

Course objectives:

1. The aim of Approaches to Disaster Risk Reduction is to enhance the knowledge by providing existing models in risk reduction strategies to prevent major. causalities during disaster.
2. To promote Prevention and Preparedness plan for disaster mitigation.
3. To undertake the role of individual/volunteer in mitigation & Risk Reduction steps.
4. To prioritize Rescue and Relief operation during disaster.
5. To understand the causes, effects and remedial measures for disaster.

Course outcomes:

1. It helps to learn the concept of Disaster Management and its application during on site and off site emergency.
2. The project/field work is meant for students to understand vulnerabilities and to work on reducing disaster risk, project/case studies are conceived creatively based on the geographic location and hazard profile of given region etc.
3. It may help to individual to create the ability for mitigate the disaster risk.
4. It is important to learn the Preparedness plans for disaster response.
5. It creates the ability monitoring and evaluation plan for disaster response and its functioning at national/state/district level.
6. It may helps to learners to create hazard/risk profile maps of any geographical area.

Course contents:

SGLGET2551: DISASTER MANGEMENT (Theory: 3 credits)

Module No.	UnitNo.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction of Disaster**	**15**
	1.1	Introduction of Disaster, Types/Classification of Disasters, Natural and Manmade disasters	
	1.2	Flood, Landslide, Earthquake, Volcanism, Cyclones, Drought, Tsunami	

	1.3	Fire, Mining, Wind storms, Nuclear/Biological/Chemical disasters, Environmental pollution, Global warming	
	1.4	Road/Rail accidents, endemic/pandemic disasters etc., Disaster potential in India	
2.0		**Disaster Impacts**	**10**
	2.1	Disaster loss, Social and economic impacts, Environmental Impacts	
	2.2	Reconstruction and Rehabilitation problems, Damage assessment	
	2.3	Hazard identification, Disaster Risk and Vulnerability, Disaster risk reduction, Risk analysis techniques	
	2.4	Primary and secondary impacts of disasters etc	
3.0		**Disaster Management and Legislation**	**10**
	3.1	Disaster management Act- 2005, National/State/District level disaster management	
	3.2	Disaster prediction, Disaster mitigation strategies, Disaster management cycle	
	3.3	Disaster prevention, Disaster preparedness, disaster preparedness plan for people and infrastructure	
	3.4	Community based disaster preparedness plan, Early warning system model in disaster preparedness	
4.0		**Disaster Relief and Case Studies**	**10**
	4.1	Basic components of disaster relief (Water, Food, Sanitation, Shelter, Health, Waste management etc)	
	4.2	Disaster mitigation, Role of International agencies, NGO's, Community based Organisations (CBO's), Role of individual, voluntary organization	
	4.3	Disaster monitoring and evaluation, Disaster relief fund, Disaster related case studies	
	4.4	The project/field work is meant for students to understand vulnerabilities and to work on reducing disaster risk, project/case studies are conceived creatively based on the geographic location and hazard profile of given region etc	
		Total	**45**

SGLGEP2551: Practical based on SGLGET2551 (2 Credits)

1. Prepare a Map showing Major Disasters of India
2. Prepare a Map showing Disaster Vulnerability of India
3. Prepare a Map showing Seismic Zonation of India
4. Calculate the Distance to the Epicenter
5. Prepare a Table Showing MM Scale VS. Ritcher Scale Relationship
6. Prepare a Map showing Landslide Zonation of India
7. Prepare a Map showing Flood Zonation of India
8. Prepare a Map showing Tsunami Zonation of India
9. Prepare a Map showing Cyclone Zonation of India
10. Write Do's and Dont's Before, During and After Disaster for Earthquake Disaster, Landslide Disaster, Cyclone Disaster, Flood Disaster, Tsunami Disaster

In Field:

Field visits to earthquake, tsunami, landslide flood and avalanche vulnerable areas and visits to National laboratories involved in disaster mitigation and management.

Prescribed and Reference Books

- Disaster Management by Dr. S. R. Singh
- Disaster Management by Shailendra K. Singh, Subhash C. Kundu and Shobhue Singh Disaster Preparedness in India by Narendra Kumar Jain and Adhyatma Sadhana Kendra
- Disaster Management by H. Sarvothaman and K. J. Anandha Kumar
- Environmental Science by S. C. Santra
- Natural Disaster by R. K. Sharma and G. Sharma (2005) (ed)
- Natural Disaster Reduction by Girish K.M. and G.C.Mathur
- Natural Hazard by Bryant Edwards
- Space technology for disaster management: A remote sensing and GIS perspective, Indian institute of Remote sensing (NRSA), Dehradhun

SGLGRP2551: RESEARCH PROJECT
(Thesis: 4 credits & Presentation: 2 credits)

Pre-requisites:

Completed all required credits of Theory and Practicals.

Course objectives:

1. To independently work on a scientific problem.
2. To able to generate new data OR able to synthesize and analyze available large global data sets.
3. To interpret the data and derive scientifically robust conclusions.
4. To learn software required for thesis work.
5. To develop the writing skills based on research pattern/report writing which is useful in research institutes / govt. organizations / Pvt. organizations.
6. To develop the analytical and interpretative skills so that he/she will be competent enough to get job in this field of specialization.

Course outcomes:

At the completion of the course students would be able to

1. Well versed with the literature on the chosen topic.
2. Independently define a scientific problem.
3. Carry out focused study on a research topic.
4. Analyze and interpret large data sets.
5. Independently write thesis / project proposal.
6. Present and defend the scientific work.

Dissertation (Thesis - 4 Credits):

Every Post-graduate student has to mandatorily submit dissertation thesis. The dissertation work is based on either new data generated for the proposed scientific problem OR based on available large global data sets using innovative ideas. The thesis should be based on sound methodology and well defined objectives.

Presentation based on Dissertation (Thesis - 2 Credits)

Every student has to present his/her thesis in open house and defend their work.

Guidelines for Course Assessment:

A. Continuous Assessment (CA) (20% of the Maximum Marks):

This will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (remaining 40% syllabus). Average of the marks scored by a student in these two tests of the theory paper will make his **CA** score (col 6).

B. End Semester Assessment (80% of the Maximum Marks):

1. **ESA Question paper will consists of 6 questions, each of 20 marks.**
2. **Students are required to solve a total of 4 Questions.**
3. **Question No.1 will be compulsory and shall be based on entire syllabus.**
4. Students need to solve **ANY THREE** of the remaining Five Questions (Q.2 to Q.6) and shall be based on entire syllabus.

Note: **Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course 45 lectures.**

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