MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI – 627 012
B.Sc., GEOLOGY
2017-2018

I. Course Objectives:

i) To enable the students to have a thorough exposure to the different branches of the Science of Geology so as to grasp a comprehensive knowledge of Geology.

ii) To facilitate the students of B.Sc., Geology to join post graduate studies which in turn offer them both job opportunities and research pursuits.

iii) To cultivate logical thinking and analytical skills this entitles and sharpens faculties such as concentration and patience to grapple with life outside the campus.

iv) Upon successful completion of this course, students will have acquired a familiarity with the fundamentals of the scientific method, geology, geophysics and environmental earth science.

II. Eligibility Norms for Admission to B.Sc., Geology:

Candidates for admission to the B.Sc., Degree (Geology) Course shall be required to pass the final examination of the Plus 2 Higher Secondary Course (10+2 level) and equivalent there to with a minimum marks under academic stream (any Science group) or a course of studies recognized and approved by the syndicate of the Manonmaniam Sundaranar University, Tirunelveli.

III. Transitory Provision:

Candidates admitted to this course of studies which come into effect from June 2017 should complete the course before June 2030. Those who fail to complete the course the aforesaid stipulated time have to pass equivalent papers to be decided by the prospective U.G. Chairman of Board of Studies, Manonmaniam Sundaranar University.

MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI – 627 012

B.Sc., GEOLOGY

(For those who joined the course from the academic year 2017-2018 onwards)

Sem	Part I/II/III IV/V	Sub. No	Subject Status	Subject Title	Course / Paper	Hrs./ Week	L Hrs/ Week	T Hrs/ Week	P Hrs/ Week	C Credits
Semester III	I	17	Language	Tamil / Other Languages	1	6	6	0	0	4
	II	18	Language	English	1	6	6	0	0	4
	III	19	Core-Theory	Structural Geology	1	4	4	0	0	4
	III	20	Major Practical-III	Practical– Structural Geology	1	2	0	0	2	2
	III	21	Allied-III	Physics	1	4	4	0	0	3
	III	22	Allied Practical-III	Practical - Physics	1	2	0	0	2	2
	III	23	Skill based – Core I	Exploration Geophysics or Gemology	1	4	4	0	0	4
	IV	24	Non-Major Elective-I	Climatology or Fundamentals of Geology	1	2	2	0	0	2
	IV	25	Common	*Yoga	1	2	2	0	0	2
			Total		9	32	28		4	27
	**Yoga-Preparatory work for two hours (Extra hour)*									

Semester IV	I	26	Language	Tamil / Other Languages	1	6	6	0	0	4
	II	27	Language	English	1	6	6	0	0	4
	III	28	Core-Theory	Mineralogy	1	4	4	0	0	4
	III	29	Major Practical-IV	Practical– Mineralogy	1	2	0	0	2	2
	III	30	Allied-IV	Physics	1	4	4	0	0	3
	III	31	Allied Practical-IV	Practical- Physics	1	2	0	0	2	2
	III	32	Skill based – Core II	Disaster Management	1	4	4	0	0	4
	IV	33	Non-Elective-II Major	Basic Hydrology or Mineral Economics	1	2	2	0	0	2
	IV	34	Common	*Computers for Digital Era	1	2	2	0	0	2
	V	35	Extension Activity	Extension activity NCC, NSS, YRC, YWF,PE						1
			Total		9	32	28	0	4	28
		* Computers for Digital Era -*Preparatory work for two hours (Extra hour)*								

Semester V	III	36	Core-Theory	Igneous Petrology	1	5	5	0	0	4
	III	37	Core-Theory	Sedimentary and Metamorphic Petrology	1	6	6	0	0	4
	III	38	Core-Theory	Marine Geology	1	5	5	0	0	4
	III	39	Elective	Geostatistics and Computer Application in Geology / Environmental Geology	1	4	4	0	0	4
	III	40	Major Practical-V	Based on Igneous Petrology	1	2	0	0	2	2
	III	41	Major Practical-VI	Based on Sedimentary and Metamorphic Petrology	1	4	0	0	4	2
	III	42	Major Practical-VII	Based on Marine Geology	1	2	0	0	2	2
	IV	43	Skill based Common	Personality Development	1	2	2	0	0	2
			Total		8	30	22		8	24

Semester VI	III	44	Core-Theory	Economic Geology	1	6	6	0	0	4
	III	45	Core-Theory	Applied Geology – I (Geophysics, Geochemistry, Engineering Geology, Mining Geology, Ore dressing)	1	6	6	0	0	4
	III	46	Core-Theory	Hydrogeology	1	6	6	0	0	4
	III	47	Elective	Geology of Tamil Nadu/ or Applied Geology – II (Natural Hazards, Remote Sensing and Geographic Information System)/ or Medical Geology	1	4	4	0	0	4
	III	48	Major Practical-VIII	Based on Economic Geology and Hydrogeology	1	4	0	0	4	2
	III	49	Major Practical-IX	Based on Applied Geology – I and Elective- Geology of Tamil Nadu	1	2	0	0	2	2
	III	50	Major Practical-X	Geological mapping (in Second year) – One week - Geological tour (more than two weeks in third year) Specimen collection during Geological tour, Periodical short field trips/ Viva Voce on Geological mapping, Geological tour and Reports Submission	1	2	0	0	2	2
			Total		8	30	22		8	22
	Total No. of Courses				50					
	Total No. of Hours					184				
	Total No. of Lectures						152			
	Total No. of Practical's								32	
	Total No. of Credits									151

*L- Lecture *T- Tutorial *P- Practical *C- Credit

Mandatory Requirements of the B.Sc., Geology Course

Students should have to complete two days short field trips, as determined by Professor in-charge during I, II, III year B.Sc. Geology. A report on the III year two days short field trips are to be submitted by individuals at the end of the III year course during practical examination and there will be a viva-voce on it.

Geological mapping of an area determined by professor-in-charge should be held during II year, not more than one week. The reports of the geological mapping will be submitted at the end of III year course, during practical examination and there will be a viva-voce on it.

A Geological, long field trip not more than two weeks in III years will be conducted. The geological field report and specimen collection would be submitted at the end of the course during practical examination and there will be viva-voce on it.

Notes:

1. Each paper carries an internal component.
2. There is a pass minimum of 40% for external and overall components.
3. Theory : Internal Assessment – 75:25
4. Practical, External : Internal Assessment =50:50
5. Internal marks for practical's should be allotted in the following manner

Experiments – Lab observation	= 20
Record	= 10
Model Test	= 20
Total	**= 50 Marks**

6. For U.G courses the total credits will be 151.
7. The respective Board of Studies shall decide the Course Structure without affecting the Common Course Structure.

8. Hours for non-practical subjects and practicals shall be replaced by Core/Elective Courses without affecting the Common Course Structure.

Other Recommendations of the Core Committee

I. Internal assessment:

Regarding the Internal assessment, the 25 marks is allocated in the following manner.

Components	Marks
The average of the best two tests from three compulsory Tests.	20
Assignment / Seminar	05
Total	**25**

Note :

Each test is of one hour duration.

2. Allied Subjects:

i) Allied Subjects may be either from the same Department or from the other Departments.

ii) Regarding the Allied Subjects the existing system may be continued.

A & B for Arts stream

C & D for Science stream

iii) Skill based Courses may be either from the major Department or from the allied related department

iv) Choice based Credit System is introduced in this University based on the Principle of no retrenchment of existing staff. Therefore the existing teaching staff in the Allied Subject is protected.

2. For Rank purpose marks scored in Part III (Major and allied) alone will be taken.
3. In the part III there could be three Elective Courses (No Project for UG courses).
4. In the case of Environmental studies, out of two hours, one hour may be teaching and one hour may be Field work such as Environmental affected areas etc.

5. In case of value based Education, Out of the two hours, one hour may be teaching and one hour may be Field work such as Adult/ Women literacy etc.
6. In Part V, Extension activities, National Service Scheme, Youth Red Cross, Youth Welfare will be taken into account for one credit. This shall not be included for the percentage of marks. The name of the activity should be mentioned in the Mark Sheet at the end of IV semester. Attendance is compulsory for each activity and separate certificate will be issued from the University.
7. The Aided courses and unaided courses shall not be clubbed.
8. The Board of Studies shall suggest the Infrastructure requirements for each course
9. A three-tier grievance redressal mechanism should evolve for involving the Department, the College and the University. Revolution provision shall be give to all students.
10. The Subjects other than Major and Allied shall be opted as Non-Major Electives.
11. Shortage of work load in Allied Subjects shall be compensated with Non-major electives, Environmental studies, Value based Education, PD and Yoga, Computers for Digital Era and Skill based Education subjects.
12. A common Academic calendar informing the reopening day, the closing day and the Examination Time table etc. has to be provided on the reopening day itself.
13. The College shall make available to each student a Bulletin, listing all the courses offered in that semester well in advance.
14. The Performance of the Students is indicated by the **seven point scale grading system** as per the UGC norms given below:

For UG course

Grade	Grade Point	Percentage of Marks	Performance
O	9.5 and Above	95-100	Outstanding
E	8.5 and Above	85-94	Excellent
D	7.5 and Above	75-84	Distinction
A	6.0 and Above	60-74	Very good
B	5.0 and Above	50-59	Good
C	4.0 and Above	60-49	Average
RA	0	Up to 39	Re-Appear

15. The overall performance level of the candidates will be assessed by the following formulae:

$$\text{Cumulative Weighted Average of Marks} = \frac{\sum (\text{Marks} \times \text{Credits})}{\sum \text{Credits}}$$

$$\text{Cumulative Weighted Average Grade Points} = \frac{\sum (\text{Grade point} \times \text{Credits})}{\sum \text{Credits}}$$

16. Percentage of marks for Part I, Part II, Part III and Part IV should be printed on the Mark sheet.

17. There is a separate passing minimum for the external and the overall components.

18. For Non-Major Electives and for Skill based Education Subjects; Orientation Courses shall be conducted for the Teachers at various centers with minimum 7 days duration.

19. Question pattern should be given to the students as follows for Major and Non-Major subjects

Section	**Type of question**	**Marks**
Part A	Multiple Choice Questions (Two questions from each Unit) 5x2	1 x 10 = 10 marks
Part B	Internal Choice Questions (One Question from each Unit) 5x1	5 x 5 = 25 marks
Part C	Internal Choice Questions (One Question from each Unit) 5x1	8 x 5 = 40 marks
	Total	**75 Marks**

20. The question pattern for Non-Major Elective shall be as follows

Section	**Type of question**	**Marks**
Part A	Multiple Choice Questions (Two questions from each Unit) 5x2	1 x 10 = 10 marks
Part B	Internal Choice Questions (One Question from each Unit) 5x1	5 x 5 = 25 marks
Part C	Internal Choice Questions (One Question from each Unit) 5x1	8 x 5 = 40 marks
	Total	**75 Marks**

III SEMESTER **STRUCTURAL GEOLOGY**

L	T	P	C
4	0	0	4

Objective:

To learn about the fundamentals of structural geology, including the methods of mapping, mechanical properties and deformation structures in rocks.

Prerequisites:

- **Any person with a good grasp of the basic science or equivalent should be able to undertake the subject.**

Outcome:

- **After completing this course, students can identify important structures and will have better understanding on various structural signatures, and tectonic setups.**

UNIT-I Topography representation and attitude of beds **15 Hours**

Definition and scope of structural geology – topographic features - topographic map - geological map - contour lines-stratum contours – outcrops and exposures. Attitude of beds - strike and dip of the formation – trends of outcrops and v-rules. True and vertical thickness of the formations. Types of forces, stress and strain.

UNIT II Folds **10 Hours**

Clinometer and Brunton compass and its parts, method of using the instruments. Folds – Definition, parts of fold and classification of folds - criteria of recognition of folds in the field and from map. Mechanics of folding.

UNIT III Structures due to erosional and depositional process **10 Hours**

Joints: Definition, geometric and genetic classification of joints. Erosional structures: Inlier and Outlier, Klippe and Fenster, Synclinal hill and Anticlinal valley. Unconformities: kinds, geological significance and their recognition. Overlap (Offlap and Onlap).

UNIT IV Faults **10 Hours**

Faults: definition, parts of fault, geometric and genetic classification of faults, effects of faulting on outcrops and mechanics of faulting – Horst and Graben. Recognition of faults in the field.

UNIT V Structures and preparation of geological report **15 Hours**

Foliation: descriptive terminology, kinds, origin and relation to major structures. Lineation: descriptive terminology, kinds, origin and relation to major structures. Shear zones: ductile and brittle shear zones. Elementary knowledge in the methods of sampling and preparation of geological report.

Total Hours: 60Hours

Text Book:-

1. Billings M. P 1974, Structural geology ,Prentice hall New Delhi.
2. Ragan ,D.M. 1985. Structural Geology.
3. Hobbs,B.E, Means, W.D 1976 & William ,P.F– an outline of structural geology, John Wiley,Newyork.

References:-

4. De Sitter,L.U.1956 – Structural geology ,McGraw Hill,New York
5. Gosh,S.K.1993 - Structural Geology fundamentals and modern developments.
6. Lahee -1917. Field Geology.

III SEMESTER SKILL –BASED CORE- EXPLORATION GEOPHYSICS

L	T	P	C
4	0	0	4

UNIT-I Electrical Methods 12 Hours

Electrical Methods: Electrical properties of rocks, Flow of current through ground surface, apparent resistivity, Electrode arrangements (Wenner, schlumberger method) VES (Vertical Electrical Sounding) - qualitative interpretation and quantitative interpretation of VES curves for groundwater exploration.

UNIT – II Magnetic method 10 Hours

Magnetic method: Geomagnetic field, Induced magnetism, Remanent magnetism, Susceptibility, Field survey method, Equipment, Data processing, Qualitative and quantitative interpretation of magnetic data.

UNIT – III Gravity method 15 Hours

Gravity method: Gravitational force; Gravitational acceleration; Gravitational potential, Earth's gravitational field, Collections; corrections and presentation of Gravity data, Regional and residual anomalies. Induced Polarization Methods: Earth's polarization, IP measures, Time and frequency domain techniques, Field surveys, Equipments, Data acquisition and interpretation.

UNIT – IV Seismic Methods and Radiometric Methods 12 Hours

Seismic Methods: Basic principles, Types of seismic waves and their propagation characteristic, Seismic velocities in Earth's materials, Refraction and reflection seismic methods: Basic principal, field procedure, data acquisition and interpretation, Siesmic startigraphy, Radiometric Methods: Basic principles, radioactive elements in rocks, Data collection and interpretation.

UNIT – V Logging Methods 11 Hours

Borehole geophysics- well logging, electric logging, radioactive logging, induction logging, Sonic logging - Airborne survey, Data acquisition, Equipment, Measurement, Data processing and interpretation.

Total Hours: 60Hours

Text Book:-

1. Ramachandra Rao, M.B., Prasaranga, 1975. Outlines of Geophysical Prospecting - A manual for geologists by University of Mysore, Mysore,.
2. Bhimasarikaram V.L.S. 1990. Exploration Geophysics - An Outline by., Association of Exploration Geophysicists, Osmania University, Hyderabad,.
3. Dobrin , 1984. An introduction to Geophysical Prospecting by, M.B. McGraw Hill, New Delhi.

References:-

4. Telford W.M. Geldart L.P., Sheriff, R.E. and Keys D.A. 1976, Applied Geophysics. Oxford and IBH Publishing Co. Pvt., Ltd. New Delhi,
5. Parasnis, D.S 1975.Principles of applied Geophysics, Chapman and Hall.

III SEMESTER SKILL –BASED CORE- GEMMOLOGY

L	T	P	C
4	0	0	4

UNIT-I Crystal Systems **10 Hours**

The nature of crystals – crystal systems – Introduction to Gems and precious stones – kinds of Gemstones.

UNIT – II Characteristics of Gemstones **15 Hours**

Physical and Chemical properties of various Gemstones – Form, colour, density, cleavage, fracture, lustre, Hardness, Specific gravity, isotropism, Anisotropism, Birefringence, simple and double refraction, colour and dispersion .

UNIT – III Characteristics of Precious stones **12 Hours**

Precious stones – Diamond ,Chrysoberyl, Topaz ,Zircon, Emerald Ruby,Sapphire,Coral and pearl – semi precious stones – varieties of quartz, Garnets, Pyroxenes, Amphiboles, Epidotes-Feldspathoids.

UNIT – IV Identification of Gem **12 Hours**

Gem Identification – Megascopic and Microscopic identification, Gemmological refractometer, Spectroscopy, Examination of Fluorescence – Cutting of Gemstones.

UNIT – V Gems and Health **11 Hours**

Gems and Health, Gem Therapy, Origin and mode of occurrences of Gemstones, Gems and Global Tectonics.

Total Hours: 60Hours

Text Book:-

1. Kennie Lymen,1984. Guide to Gems and precious stones,Simon and Schusterinc,Newyork, 604p.

2. E.S.Data,1935,A Text Book of Minerlogy,John Wiley & sons.

3. Deer,W.A.,Howie,R.A and Zussman,J.1966,An Introdution to the Rock forming Minerals,Longmans.

References:-

4. Berry Mason, L.G.1961 Minerology W.H.Freeman and Co.

III SEMESTER (Non – Major Elective) Offered by Geology to students of other Department

CLIMATOLOGY

L	T	P	C
2	0	0	2

UNIT-I Principles of climatology **5 Hours**

Atmosphere- Fundamental principles of climatology – Earth's radiation balance – longitudinal and seasonal variation of insolation.

Unit – II Characteristics of weather elements **8 Hours**

Weather elements– Temperature, pressure, humidity, clouds, wind, sunshine and rainfall – monsoon patterns.

Unit – III Cyclones **4 Hours**

Cyclones – Definition, types and their effects and geographic distribution.

Unit – IV Classification of Climates **6 Hours**

Classification of climates –Koppen's and Thornthwaite's scheme of classification –climate change.

Unit – V Global warming **7 Hours**

Global warming: Definition, greenhouse effect, greenhouse gases, Impact of climate change, prevent to global warming

Acid rain: Definition, causes, formation, affected area, effects and preventive measures. Ozone depletion: Definition, effects and preventive measures

Total Hours: 30 Hours

Text Book:-

1. Spencer, E.W .2003. Earth science, McGraw Hill,518p

2. Abbott, L.P . 2002. Natural Disasters, McGraw Hill 422p

3. Beer, T. 1997. Environmental Oceanography, VRC Press, Florida, 367p.

References:-

4. Valdiya K.S. 1987. Environmental Geology, Indian context, Tata Mc-Graw Hill,NewDelhi,581p.

III SEMESTER (Non – Major Elective) Offered by Geology to students of other Department

FUNDAMENTALS OF GEOLOGY

L	T	P	C
2	0	0	2

UNIT-I Geology and its perspectives **6hours**

Geology and its perspectives – Geology as a science and its relationship with other sciences – subdivisions of Geology.

UNIT –III **Origin , Age and Interior of the Earth** **5hours**

A brief review of the various theories regarding the origin and age of the earth .Interior of the Earth – study of internal constitution of the earth with the help of seismic waves.

UNIT – III Solar system **6hours**

Solar system – its size, shape, density and movements of the Earth .Atmosphere, Lithosphere and Hydrosphere.

UNIT – IV Exodynamic Process **7hours**

Exodynamic Process – Weathering and its types and effect on geological formations – Brief outlines of the geological work of wind, rivers and underground water – Mechanism of erosion, transportation and deposition.

UNIT – V Dynamics of Earth **6hours**

Geological work of lakes, Glaciers, Seas and Oceans - Brief outlines of earthquakes, its nature and origin – Volcanoes – Types and causes of volcanism.

Total Hours: 30 Hours

Text Book:-

1. Homer, A., 1992, Principles of Physical Geology, chapman & Hall, London.

2. Radhakrishnan, V., 1987, General Geology, V.V.P publishers, Tuticorin.

3.Jacobs, J.A.,Russel,R.D,&Wilson,J.T., 1974. Understanding the Earth Edition .,London

References:-

4. Wyllie, P.J., 1971, The Dynamic Earth, John Wiley &sons

5. Spencer, E.V, 1962, Basic Concepts of Physical Geology, oxford&IBH.

III SEMESTER **PRACTICAL-III- STRUCTURAL GEOLOGY**

L	T	P	C
0	0	2	2

Basic idea of topographic contours, Topographic sheets of various scales. Introduction to Geological maps: Lithological and Structural maps Structural contouring and 3-point problems of dip and strike Drawing profile sections and interpretation of geological maps of different complexities

Total Hours: 30 Hours

IV SEMESTER **MINERALOGY**

L	T	P	C
4	0	0	4

Objectives:

To learn about the physical and optical properties of rock forming minerals. It deals in detail about the structure, physical and chemical properties of Ortho, ring, sheet, and chain and framework silicates.

Prerequisites:

- **Any person with a good grasp of the basic science or equivalent should be able to undertake the subject.**

Outcome:

- **Student will be prepared to address the geological resources for economic resources evaluation and exploitation programme.**

UNIT-I PHYSICAL PROPERTIES OF MINERAL: **10hours**

Mineral–Definition and Classification –Physical properties of minerals: Color, Luster, Transparency or diaphaneity, Crystal Habits, Cleavage, Fracture, Hardness, Specific gravity, Streak, tenacity, feel, taste, odour, electrical, magnetic and thermal Properties - chemistry of minerals: general principals of chemistry as applied to minerals: atom, ions, molecules, atomic number, mass number, valence, ionic radii – bonding in minerals –atomic substitution and solid solution - Isomorphism, polymorphism and pseudomorphism. A brief outline of silicate structure.

UNIT-II - ORTHO AND RING SILICATES: **12hours**

Physical properties, chemical composition, Classification, diagnostic properties and mode of occurrence of Ortho and Ring silicates:Garnet group, Alumino silicates-Epidote group, Zircon, Staurolite, Beryl, Cordierite and Tourmaline.

UNIT-III -SHEET SILICATES AND CHAIN SILICATES: **10hours**

Physical properties, chemical composition, Classification, diagnostic properties and mode of occurrence of Sheet silicates and Chain silicates: Mica group, Chlorite group and clay minerals. Pyroxene group, Amphibole group.

UNIT-IV-FRAME WORK SILICATES: **15hours**

Physical properties, chemical composition, Classification, diagnostic properties and mode of occurrence of Frame work silicates: Quartz group, Feldspar group, Feldspathoid group and Zeolite group.

UNIT–V-Optical Mineralogy: **13hours**

Nature of light - Ordinary light and Plane polarized light – Reflection and Refraction – Refractive Index – Critical angle – Total internal reflection – Single refraction. Polarising / Petrological microscope and its parts - Behaviour of light in its passage through petrological microscope – Optical properties of minerals: Colour, Form, Cleavage, Refractive Index, Relief, Alteration, inclusions, Zoning, Pleochroism, Pleochroic haloes, Twinkling, Isotropism and anisotropism, Extinction, Polarisation colors, Birefringence, Twinning - Optical accessories and their uses: Gypsum plate – Mica plate – Quartz wedge. Optical properties of Uniaxial and biaxial minerals.

Text Book:-

1. Dana, E.S.1935. A text book of mineralogy, John Wiley and Sons, New York.
2. Read,H.H. 1916. Rutleys elements of mineralogy, Thomas Murphy & co,. London.
3. Kerr, Paul. 1977. Optical mineralogy, McGraw hill, New York.

REFERENCES

4. Deer, Howie and Zussman . 1964. an introduction to rock-forming minerals orient , Longman, London.
5. Naidu,P.R.J. 1967. Optical Mineralogy.

Total Hours: 60 Hours

IV SEMESTER SKILL –BASED CORE- DISASTER MANAGEMENT

L	T	P	C
4	0	0	4

UNIT I Disaster **6hours**

Disaster: Meaning, Factors and significance, causes and effects of disaster, Disasters: A global view. Disaster profile of India – Regional and seasonal.

UNIT II Earthquakes **8hours**

Earthquakes: General characteristics, Pre-Casers: Instrumental and non-instrumental vulnerability, impact and effects, Nature of damage, earthquakes prone areas in India.

UNIT III Floods **7hours**

Floods: Causal phenomena and characters of floods, vulnerability, predictability, forecasting and warning, preparedness mitigation with special reference to flood plain zoning adverse effects of flood.

UNIT IV Cyclones **4hours**

Cyclones: Characteristics, forecasting and warning systems, preparedness, such reduction measures, effects, cyclones prone areas in India.

UNIT V Land slide **5hours**

Land slide and snow avalanches: Characteristics and causes of land slide and snow avalanche. Characteristics and causes, vulnerability, Risk reduction measures, preparedness, effects and impacts.

Total Hours: 60 Hours

Text Book:-

1. Aravind Kumar Anmal, 2006. Disaster Management – Recent Approaches 2.

Ghorh. G.K Disaster Managemen. 2006. A.P.H Publishy Corporation.

3. Singh,2006. Disaster Management . Rawat Publication.

REFERENCES:-

4. Narayan, B.2006. Disaster Management. A.P.H Publishy Corporation.

5. Nikij Kumar. 2006. Disaster Management . Alfa Publication, 2006.

IV SEMESTER (Non – Major Elective) Offered by Geology to students of other Department

BASIC HYDROLOGY

L	T	P	C
2	0	0	2

UNIT-I Origin of Water **5hours**

Origin of Water- Water resources – Categorization of water resources - Surface water resources from Dams and Lakes.

Unit – II Hydrologic cycle **6hours**

Hydrologic cycle – Various components of hydrological cycle – Precipitation, Run-off, Infiltration, Evaporation and transportation - Rain gauges and their distribution.

Unit – III Aquifers **8hours**

Groundwater occurrence and movement – Aquifers – Definition and types – Hydrogeological Properties of rocks .Basic Principles of groundwater exploration.

Unit – IV process and its features of water **7hours**

Running water – source – weathering, erosion, transportation and deposition – process and its features – Water Shed Management.

Unit – V Rainwater harvesting **4hours**

Rainwater harvesting – Definition, method and their importance.

Text Book:-

1. Alley.W.M. 1993. Regional groundwater quality – VNR- New York.
2. Arul P. 2000 A text book of Ground water, 1st Edition, 105 – 122
3. Bouwer, H., 1978, Groundwater Hydrology,McGraw-Hill Book co.,NY

REFERENCES:-

4. Davies, S.N., & Dewilest, R.J.M., 1966, Hydrogeology, John Wiley & Sons Inc., N
5. Fetter.C.W. 1990. Applied Hydrology. Merill Publishing.
6. Karanth.K.R. 1987. Groundwater assessments and management – Tata Mc-graw Hall
7. H. M. Raghunath 2007 Ground Water, New Age International , 520p

Total Hours: 30 Hours

IV SEMESTER (Non – Major Elective) Offered by Geology to students of other Department

MINERAL ECONOMICS

L	T	P	C
2	0	0	2

UNIT-I Concept of Mineral **6hours**

Mineral Economics and its concept - A brief outline of world's mineral resources.

Unit – II Mineral Policy and Regulation **7hours**

National Mineral Policy and conservation of minerals – an overview of the mines and minerals (regulation and development) act.

Unit – III Grades of Ores **8hours**

Tenor – grade and specification of ores – classification and gradation of coal – Gradation of important minerals and ores.

Unit – IV classification of minerals **5hours**

Strategic - critical and essential minerals – classification of minerals from military point of view.

Unit –V Mineral Resources **4hours**

Marine mineral resources – Laws of seabed, marine mineral resources – Mineral taxation.

Text Book:-

1. Evans, A.M, 1993, Ore Geology and industrial minerals, Blackwell.
2. Sinha,R.K, & Sharma, N.L, 1973, Mineral Economics ,Oxford & IBH publishing co.
3. Krishnaswamy, S., 1972, India's Mineral Resources, Oxford & IBH publishing co.

Total Hours: 30 Hours

IV SEMESTER **PRACTICAL-IV- MINERALOGY**

L	T	P	C
0	0	2	2

MEGASCOPIC MINERALOGY:

Megascopic identification and description of the following: Quartz, Rosy quartz, Amethyst, Chalcedony, Agate, Flint, Jasper, Chert, Opal, Orthoclase, Microcline, Albite, Oligoclase, Labradorite, Nepheline, Leucite, Sodalite, Enstatite, Bronzite, Hypersthene, Diopside, Augite, Spodumene, Acmite, Rhodonite, Wollastonite, Anthophillite, Tremolite, Actinolite, Hornblende, Glaucophane, Olivine, Serpentine, Muscovite, Biotite, Vermiculite, Chlorite, Epidote, Garnet, Olivine, Natrolite, Stilbite, Apophyllite, Talc, Steatite, Andalusite, Kyanite, Sillimanite, Staurolite, Cordierite, Apatite, Beryl, Topaz, Calcite, Dolomite, Tourmaline, Zircon, Fluorite.

Identification and description of the following silicate minerals. Quartz and its varieties, Feldspar group, Feldspathoids, Pyroxene group, Amphibole group, Epidote, Mica, Garnet, Aluminum Silicate group.

MICROSCOPIC MINERALOGY:

Microscopic identification and Description of the following:- Quartz, Orthoclase, Microcline, Albite, Oligoclase, Labradorite, Nepheline, Leucite, Enstatite, Hypersthene, Glaucophane, Biotite, Muscovite, Olivine, Epidote, Garnet, Apatite, Zircon, Sphene, Tourmaline, Calcite, Andalusite, Kyanite, Sillimanite, Staurolite, and Cordierite.

Text Book:-

1. Earth Materials- Introduction to Mineralogy and Petrology, Cornelis Klein and Anthony Philpotts, Cambridge University Press, 2013.

2. Understanding Earth (Sixth Edition), John Grotzinger and Thomas H. Jordan, 2010, W.H. Freeman and company, New York.

3. Dana, E.S.1935. A text book of mineralogy, John Wiley and Sons, New York

Total Hours: 30 Hours

V SEMESTER **IGNEOUS PETROLOGY**

L	T	P	C
5	0	0	4

Objectives:

To understand the forms, structures and textures of the intrusive nature of the igneous rocks, Crystallization, classification and petrogenesis of igneous rocks.

Prerequisites:

- **Any person with a good grasp of the basic science or equivalent should be able to undertake the subject.**

Outcome:

- **Student will be able to understand the Igneous processes and evolution of earth resources and rock types.**

Unit – I Scope, Textures and Structures **12 hours**

Nature and scope of petrology, Rock cycle, intrusive and extrusive forms of igneous rocks – textures and structures of igneous rocks.

Unit – II classification of igneous rocks **15 hours**

Principles of classification of igneous rocks, outlines of the C.I.P.W., Tyrrell's tabular classifications and Rosenbusch classification.

Unit – III Petrography elements **17 hours**

Megascopic and microscopic petrography of the Granite clan, Granodiorite clan, Diorite clan, Syenite clan, the Gabbro clan and the Ultrabasic clan. Aplite, Pegmatite and Lamprophyres.

Unit – IV constitution of magmas and Systems **18 hours**

Composition and constitution of magmas, Cystallisation of unicomponent magma, Binary magmas with simple eutectic (Diopside-Anorthite system) and with solid solution (Albite – Anorthite system) and with incongruent melting (Leucite – Silica system).

Unit – V Petrogenesis, Provinces and Principles of Bowen's Reaction **13 hours**

Bowen's Reaction principle and its bearing on igneous petrogenesis. Theories of differentiation, assimilation, petrographic provinces.

Text Book:-

1. Tyrrell, G.W. 1963.Principles of petrology, Methunn & Co.,.
2. Turner, F.J. and Verhoogen, J., 1960. Igneous and Metamorphic petrology, McGraw-Hill Book co.
3. Bowen, N.I., 1966. Evolution of Igneous Rocks, Dover publication,
4. Huang, Walter, T. 1962. Petrology, McGraw Hill book Co.

References:-

5. Hatch, F.H., Wells, A.K. and Wells, M.K. 1949. Petrology of Igneous Rocks. Thomas Murby & Co.
6. Hyndmann, Donald, W. 1972. Petrology of Igneous and Metamorphic rocks, McGraw – Book Co.
7. Albert Johannsen, 1962, Allied pacific private limited, Bombay.

Total Hours: 75 Hours

V SEMESTER SEDIMENTARY AND METAMORPHIC PETROLOGY

	L	T	P	C
Objectives:	**6**	**0**	**0**	**4**

To become familiar with the petrographic nomenclature of sedimentary rocks. To learn about the occurrence, origin, classification and environments of sedimentarary and metamorphic rocks.

Prerequisites:

- **Any person with a good grasp of the basic science or equivalent should be able to undertake the subject.**

Outcome:

- **Student will be prepared to address the sedimentary and metamorphic basins to look for economic resources evaluation and exploitation programme.**

Unit – I Sedimentary - Weathering , Environments and Classification 22hours

Weathering – decomposition and disintegration of rocks – Erosion – Transportation – Deposition – A brief idea of diagenesis and lithification. Size and shape of sediments. Relative abundance, composition and textures of sedimentary rocks. Classification of sedimentary rocks into clastic, residual, chemical and organic.

Unit – II Processes of Rock and provenance studies 20hours

Descriptive study of the rocks formed by the residual, mechanical, chemical and organic processes. An outline of heavy mineral analysis and its utility in the provenance studies.

Unit – III Metamorphism, textures and structures 18hours

Definition and types of metamorphism – Factors of metamorphism – Zones, grades and facies of metamorphism – Stress and antistress minerals – Metamorphic textures and structures.

Unit – IV Effects and elements of rocks 15hours

Effects of Dynamic, Contact and Regional (Dynamothermal and burial) Metamorphism on the following rocks. Carbonates, pelites, psammites, ferruginous and acid, intermediate, basic and ultrabasic igneous rocks.

Unit – V Metamorphic differentiation and Metasomatism 15hours

Metamorphic differentiation – Metasomatism – Anatexis – Palingenesis – Diaphthoresis – An outline of granitisation. A brief discussion on the origin of amphibolite, charnockite, migmatite and eclogite.

Text Book:-

1.Tyrrell, G.W. 1963. Principles of Petrology, Methunn, Co.,.
2.Winkler H.G.F. 1974. Petrogenesis of Metamorphic rocks, Third Edn. Springer Verlag.
3.Turner F.J. 1968. Metamorphic Petrology, McGraw Hill.
4.Miyashiro, A. 1973. Metamorphism and metamorphic belts Allan and Unwin.

References:-

5.Hyndman, F.D. 1972. Petrology of Igneous & Metamorphic rocks McGraw Hill.
6.Blatt H. Middleton, G and Murray R. 1972. Origin of Sedimentary Rocks, Prentice Hall.
7.Folk F.L. 1968.Petrology of Sedimentary Rocks Hempill's University Station Texas,.
8.Krumbein W.C. and Pettijohn F.J. 1960. Manual of Sedimentary Petrology, Appleton Century Co.,.
9.Pettijohn F.J. Potter, P.E. Silver, R., 1972. Sand and Sand Stones, Springer Verlag.
10.Pettijohn F.J. 1957. Sedimentary Rocks, Harper & Row.

Total Hours: 90 Hours

V SEMESTER **MARINE GEOLOGY**

	L	T	P	C
Objectives:	**5**	**0**	**0**	**4**

To understand the waves, tides, currents and bottom of the sea. It deals in detail about the law of the sea, marine deposits, beach minerals and instruments applications in sea.

Prerequisites:

- **Any person with a good grasp of the basic science or equivalent should be able to undertake the subject.**

Outcome:

- **Preparation of man power to address the ocean resources and environment.**

Unit – I History of Marine Geology and sampling techniques **18hours**

History of Marine Geology. Principles and application of Echo sounder, Side scan sonar, Position fixing at Sea. Bottom sediment samplers.

Unit – II **Waves and Tides** **22hours**

Waves: Definition, Parts of waves, Types of waves, Classification of waves and wave interactions with the shore.

Tides: Definition, Classification and types.

Unit – III Ocean Currents **15hours**

Tsunamis: Definition, causes, generation, propagation and effects.

Ocean Currents: Definition and causes. Littoral processes.

Unit – IV Ocean Floor and Coastline classification **12hours**

Geomorphology of the ocean floor – Sea floor spreading – Coastline classification – Beach materials.

Unit – V **Marine deposits and Coastal zone regulation** **8hours**

Eustatic Sea level changes, Marine deposits, Laws of the sea and Coastal zone regulation.

Text Book:-

1. Kuenen, Ph.H., Marine Geology. John Wiley and Sons, 1950
2. King, C.A.M. – Beaches and coasts, Edward Arnold, London 1959.
3. King, C.A.M. – Introduction to marine Geology and Geomorphology. Edward Arnold, London, 1975.
4. Manimaran,G. 2007. Indian Ocean Tsunami and Related events. Renuga publications. Tirunelveli.pp.72

References:-

5. Radhakrishnan, V. General Geology V.V.P. Publishers, Tuticorin, 1996.
6. Siddhartha, K. 2002. Oceanography: A Brief Introduction, Kisalaya Publications Pvt Ltd, 347p.
7. Shepard, F.P. Geological Oceanography, Heinmann, London, 1978.
8. The Ocean, A Scientific American book, W.H. Freeman and company, SanFrancisco, 1969.

Total Hours: 75 Hours

V SEMESTER **GEOSTATISTICS AND COMPUTER APPLICATIONS IN GEOLOGY**

L	T	P	C
4	0	0	4

Unit I Statistics of Sampling, population, Scores, data , Curves, and Testing 22hours

Definition of Statistics - Sampling and population. Measures of central tendency –- mean, median, mode, standard deviation, skewness and kurtosis. Nominal, Ordinal, Interval and Ratio scales. Discontinuous and continuous data. Ungrouped and grouped scores. Graphical representation of data; bar charts, histograms, line graph, XY graph, frequency and cumulative frequency curves. Hypothesis testing, x^2 student's 't' and Snedecor's 'F' tests.

Unit II Statistics of Geological Data types, correlation, Scales of measurements 13hours

Geological Data types - Parametric Statistics and Nonparametric Statistics. Karl Pearson's correlation, Spearman's rank correlation - Probability and normal distribution - - Simple Linear Regression - Goodness of fit tests: Chi-square test. Scales of measurements:

UNIT - III Data Analyses 10hours

Geological Data Analyses - Principal component analysis – Discriminant analysis - Time series analyses - map analysis – Cluster analysis – Factor analysis.

Unit IV 1 Capabilities of Computer 5hours

Computer capabilities – General structure of a computer – Hardware components. Input devices (keyboard and mouse) output devices (dot matrix printers and Inkjet Printers) and storage devices (Disk organization, Floppy Disks, Hard disks and Compact discs) Computer applications in geology – Structured programming, algorithm and flowchart.

Unit V Windows 2013 and Microsoft office 2013 10hours

Windows 2013:- Introduction – Graphical user interface objects:- windows, icons, menus, pointers. desktop features: - short cut, task Bar, start, time and status. MS – WORD 2000: Introduction – menu bar – tool bar – drawing tools bar – Document creation and formatting. MS – EXCEL 2013: Worksheet concept – menu Bar, tool Bar, building formulas. Data Analysis using MS – Excel 2013: Data file creation – calculation of summary statistics.

Text Book:-

1. Krishna, N. 2001. Computer Fundamentals and windows with Internet Technology, SCITECH, Tirunelveli.
2. Davies, J.C. 1973. Statistics and data analysis in Geology, Wiley.
3. Harbaugh, J.W. & Merriam, D.F.1965. Computer application in Stratigraphic analysis, Wiley.

References:-

4. Krumbein W.C. and Gray bill F.A. 1965. An introduction to statistical models in Geology, McGraw Hill.
5. Miller R.L. Kahn, J.S. 1962. Statistical analysis in the Geological Sciences, Wiley.

Total Hours: 60

V SEMESTER **ENVIRONMENTAL GEOLOGY**

L	T	P	C
4	0	0	4

Unit – I **Geological Agents, Resources and Mineral Mining** **10hours**

Geological agents and their impact on environment, renewable and non-renewable earth resources, Environmental impact of mineral extraction and mining.

Unit – II Global Warming and Green House Effect **18hours**

Carbon-di-oxide in atmosphere, limestone deposits in the geological sequences. Global Warming and Green House Effect.

Unit – III **Degradation, contamination, and Urbanisation** **17hours**

Impact assessment of degradation and contamination of surface water and ground water quality due to industrialization and Urbanisation.

Unit – IV problems in Environment **5hours**

Environmental problems related to natural disasters and their mitigation – earthquakes, Valcanoes, Tsunami, Floods, droughts and storms.

Unit –V Medical Geology **10hours**

Medical Geology – Introduction to Geomedicines, Heavy metals and health hazards – Mineral induced diseases: Minameta, Fluorosis, Silicosis, Itai-itai, Goitre and cretin, Keshan, Enviro Scar, Mesothelioma, Anaemia, Lung Cancer, Wilson's diseases. Mineral remedies to diseases including Gem Therapy. Drugs from ocean.

Text Book:-

1. Strahler and Strahler .1973. Environmental Geosciences.
2. Valdiya, K.S. 1987. Environmental Geology, Indian Context. Tata McGraw Hill publishing Co. New Delhi,
3. Davis, S.N. 1992. Physical environment.
4. Balasubramanian, A.1995. Ecology, Environment and pollution, Indira publishers, Mysore.

References:-

5. Cannon, H.L. and Hopps, H.C., 1972. Geochemical environment in relation to health and diseases,Newyork Academy of science.
6. Keller, E.A., 1985. Environmental Geology, CBS publishers, NewDelhi,.
7. Libes, S.M. 1992. An introduction to marine biogeochemistry John wiley & Sons, Newyork,.
8. Trace elements in Human Nutrition and Health, 1996. world Health Organisation,.
9. Varley, H., 1988. Practical clinical biochemistry. IV Ed. CBS publishers, NewDelhi,.

Saha N.N. 1984. Healing through Gems, Sterling Publ. Pvt. Ltd., New Delhi

Total Hours: 60

V SEMESTER **PRACTICAL-IGNEOUS PETROLOGY**

L	T	P	C
0	0	2	2

To develop skill and abilities in the identification of rocks with their texture, mineralogy and genesis both in hand specimen and thin sections.

a. Megascopic identification of important igneous rocks.

b. Microscopic identification of rock fabrics, mineral assemblages of igneous rocks.

V - SEMESTER **PRACTICAL-SEDIMENTARY AND METAMORPHIC PETROLOGY**

L	T	P	C
0	0	4	2

To develop skill and abilities in the identification of rocks with their texture, mineralogy and genesis both in hand specimen and thin sections.

a. Megascopic identification of important metamorphic and sedimentary rocks.

b. Microscopic identification of rock fabrics, mineral assemblages of metamorphic and sedimentary rocks.

V- SEMESTER PRACTICAL - MARINE GEOLOGY AND GEOSTATISTICS AND COMPUTER APPLICATIONS IN GEOLOGY

	L	T	P	C
MARINE GEOLOGY:	**0**	**0**	**2**	**2**

- Beach profile survey and sediment sample collection.
- Estimation of salinity of seawater by Mohr-Knudsen's method – Determination of dissolved oxygen of seawater – Determination of pH of seawater – Determination of total alkalinity of seawater – Verification of Beer's Law.
- Graphical representation and interpretation of bathymetry data set- Study of bathymetry maps - Study of seismic profiles.

GEOSTATISTICS:

- Manual determination of summary statistics (Measures of Central Tendency, Standard Deviation, Skewness and Kurtosis) – Hypothesis testing by Chi-square, Student's 't' and 'F' tests – Linear Regression and Linear correlation.

COMPUTER APPLICATIONS IN GEOLOGY

- Data file creation – Statistical solution of geological problems using MS-EXCEL 2000 – Construction of Histograms, Pie charts and Bivariate Plots using Excel 2000.

VI SEMESTER **ECONOMIC GEOLOGY**

L	T	P	C
5	0	0	4

Objectives :

To learn about geology of the non metallic minerals and their in ions, distribution and mode of occurrences. To gain knowledge about the mines legislation of India, National mineral policy, and their role in National economy.

Prerequisites:

- **Any person with a good grasp of the basic science or equivalent should be able to undertake the subject.**

Outcome:

- **Preparing students for professional employment in mineral mining and beneficiation industries. To train in the concepts of mineral exploration methods and address the techniques in exploration of economical deposits.**

Unit – I **Ore minerals, Gangue minerals Metallogenic and Classification 15hours**

Ore, Protore, Ore minerals, gangue minerals, Tenor of ores, Geologic thermometers, Metallogenic epochs and provinces – Lindgren's and Bateman's classification.

Unit – II Mineral Deposits and its processes 18hours

An outline of the processes of formation of mineral deposits. Magmatic, hydrothermal, mechanical concentration mineral deposits (Placers), Oxidation and supergene sulphide enrichment and residual concentration deposits. Contact metamorphism / metasomatism – structural control on ore localization.

Unit – III Mode of occurrence and Distribution of important ores 17hours

Mineralogical characters, Mode of occurrence and Distribution of important ores – Iron, Copper, Lead, Zinc, Manganese, Gold, chromium and Aluminium.

Unit – IV Precious and semi-precious minerals 13hours

Radioactive minerals, Precious and semi-precious minerals, Minerals required for refractory, cement, ceramic, paint and pigments, Insulators and fertilizers.

Unit –V **Coal & Petroleum in India and Mineral wealth of Tamil Nadu 12hours**

Classification, origin, occurrence and distribution of coal in India. Origin, occurrence and distribution of petroleum in India. Mineral wealth of Tamil Nadu.

Text Book:-

1. Bateman. A.M. 1961. Economic mineral deposits, John Wiley & Sons.
2. Krishnaswamy. S. 1972. India's Mineral Resources, Oxford and IBH Publishers, New Delhi.
3. Gokhale.K.V.K. and Rao. T.K. 1972. Oredeposits of India, Thomson press, New Delhi.

References:-

4. Umeshwar Prasad, 1996, Economic geology, CBS Publishers and distributors, New Delhi-110 002.
5. Edward R. and Atkinsan K. 1986. Ore deposit Geology, Chapmon and Hall, 1.
6. Deb. S. 1980. Industrial minerals and rocks of India. Allied publisher. Pvt.Ltd.

Total Hours: 75

VI SEMESTER **APPLIED GEOLOGY PAPER I**

(GEOPHYSICS, GEOCHEMISTRY, ENGINEERING GEOLOGY, MINING GEOLOGY AND ORE DRESSING)

	L	T	P	C
Objectives:	**5**	**0**	**0**	**4**

- **To study the chemical properties of earth and application of chemistry in geology, to understand rock chemistry and evolution of various rock types through geochemical differentiation. Also to understand various surface guides for exploration of economical ores and minerals.**

Prerequisites:

- **Any person with a good grasp of the basic science or equivalent should be able to undertake the subject.**

Outcome:

- **Better understanding on geochemistry of rocks and minerals and interpretation of geochemical path finders for economical minerals and ores.**

Unit- I Fundamental and principles of Geophysical methods 13hours

Fundamental principles of Electrical Resistivity method, Gravity method, Magnetic method , Seismic Methods, Instrumentation and field procedures.

Unit-II Fundamental and principles of Geochemical elements 12hours

Definition, aims and scope of Geochemical structure and composition of the earth. Distribution of elements in the geosphere. Geochemical affinity. Geochemical classification of elements.

Unit-III Engineering Geology 20hours

The role of Geology in civil engineering. Properties of rocks – Strength and elastic properties. Properties of building stones concrete aggregates, rail and road material. Types of earth movements and their classification and preventive measures. Geological investigations pertaining to the foundations of dams, reservoirs and tunnels.

Unit-IV Geological Mining Methods 15hours

Prospecting sampling and evaluation of ore resources. Outline of the method of metal mining. Opencast and underground mining, Methods of coal mining.

Unit – V Ore Dressing/Beneficiation 15hours

Principles and scope of ore dressing, Physical and chemical properties as applied to ore dressing. A brief study of common crushers, grinders, and classifiers, Concentration of ore minerals by magneto – electrostatic and floatation processes.

Text Book:-

1. Dobrin M.B., and Savit C.H.,1988. Introduction to Geophysical Prospecting (4th ed.,) McGraw – Hill, New York.

2. Parasnis D. S .1997, Principles of applied geophysics, Chapman & Hall, 2-6 Boundary Row, London SE1 8HN, UK.

3. Ramachandra Rao, M.B., Prasaranga, 1975. Outlines of Geophysical Prospecting - A manual for geologists by University of Mysore, Mysore.

4. Brain Mason, 1966. Principles of Geochemistry.Willey 1966.

5. Arogyasamay, R.N.P. Course in Mining Geology. Oxford & I.B.H.Publishing Co.

References:-

6. Kruskopt E.B. 1967. Introduction to Geochemistry. Mc. Graw Hill 1967

7. Rankama, K. and Sahama, 1950, Geochemistry, University of Chicago Press

8. Krynine and Judd. 1957. Principles of Engineering Geology and Geo-techniques. Mc. Graw Hill.

9. Sinha R.K.., & Sharma, N.L, Mineral Economics , Oxford & I.B.H.Publishers.

10. Sathya Narayanswami, B.S., Engineering geology. Chaparral & co. Delhi,2000.

Total Hours: 75

VI SEMESTER **HYDROGEOLOGY**

	L	T	P	C
Objectives:	**5**	**0**	**0**	**4**

- **This course is an introduction to the hydrological process in the earth system, estimation of aquifer parameters and potential for groundwater development using geophysical approach and assessment of groundwater quality through hydro geochemical techniques.**

Prerequisites:

- **Any person with a good grasp of the basic science or equivalent should be able to undertake the subject.**

Outcome:

- **Student will gain knowledge on groundwater flow through earth system and skill to interpret potential for exploration of groundwater.**

Unit – I Origin of groundwater **15 Hours**

Hydrologic cycle, Origin of groundwater, Vertical distribution of ground water, Hydrological parameters, Types of aquifers, Springs.

Unit – II Groundwater movements **20 Hours**

Ground water flow - Darcy's law, experimental verification, permeability- intrinsic permeability - Hydraulic conductivity- Determination of aquifer constants.

Unit – III Occurrence of groundwater **15 Hours**

Occurrence of groundwater in Igneous, Sedimentary and Metamorphic rocks. Occurrence in alluvial, glacial and coastal plains.

Unit – IV Exporation of groundwater **15 Hours**

Exploration for ground water – Geological, remote sensing and geophysical methods- resistivity- Wenner method.-Schlumberger method, Seismic refraction method.

Unit – V Groundwater quality **10 Hours**

Suspended and dissolved constituents- Chemical analysis – Concentration by weight, Chemical equivalence, Total Dissolved Solid, Hardness; Graphical representation - Water quality - Water sampling –- Suitability for domestic, industrial and agricultural purposes.

Text Book:-

1. Ragunath. 1987 Ground water – Wiley Eastern,.
2. Todd. D.K. 1980. Ground water Hydrology, John Wiley,
3. Davis and Diewett. 1966. Hydrogeology, John Wiley.

References:-

4. Rao R.M. & Subrahmanyam A, 1999. Basic principles of hydrogeology, Tenali.
5. Arul, P.2000.A text book of Ground water. Dhanam Agency, Virudachalam.

Total Hours: 75

VI SEMESTER **GEOLOGY OF TAMILNADU**

L	T	P	C
4	0	0	4

UNIT-I Geomorphology and Physiography of Tamil Nadu **12 Hours**

Geological Time scale of India. General Geological setting of Tamil Nadu. Geomorphology: Physiography - Western and Eastern Ghats of Tamil Nadu and their structural aspects.

Unit-II **Structures , Tectonics and Shear zones of Tamilnadu** **15 Hours**

Structure and Tectonics of TamilNadu. Shear zones of Tamilnadu- Palghat – Cauvery, Moyar – Bhavani, Salem-Attur and Gangavalli- Achankovil shear Zones.

Unit-III **Archean systems and Proterozoic formations of Tamilnadu** **13 Hours**

Archean systems – Sathiyamangalam Greenstone Belt – Penninsular gneiss, Charnockite, Khondalites. Proterozoic formations- Charnockite-Migmatite and Granite.

Unit-IV Formations of Tamilnadu **10 Hours**

Gondwana formations – Sivaganga formations, Sriperamabalur beds, Terani formations, Creataceous of Trichinopoly marine formations.

Unit-V Mineral wealth of Tamilnadu **10 Hours**

Tertiary formations – Cuddalore formations – Neyveli Lignite formation, Kariaikal formations, Panamparai Sandstone – Recent Sub-recent – fluvio-marine coastal deposits – Manavalakuruchi, Thoothukudi. Mineral wealth of Tamilnadu.

Text Book:-

1. Subramanian. K.S. and Selvan, T.A. 2001. Geology of Tamilnadu and Pondicherry. Geological Society of India, Bangalore- 192 p.
2. Krishnan M.S.. 1968. Geology of India and Burma, Higginbothams, 1968.
3. Wadia D.N. 1953. Geology of India, Macmillian and Co.

References:-

4. Kumar. 1985. Fundamentals of Historical Geology and Stratigraphy of India.

Total Hours: 60

VI SEMESTER **APPLIED GEOLOGY - II**

(NATURAL HAZARDS, REMOTE SENSING AND GIS)

L	T	P	C
5	0	0	4

Unit-I Types of natural hazards and their classification **10 Hours**

Introduction to natural hazards – Types of natural hazards and their classification.

Unit-II Earthquakes **13 Hours**

Earthquakes – Types of elastic waves – Kinds of earthquakes – Seismograms – Ritcher's and movement scales – Causes, prediction and prevention of earthquakes.

Unit-III Landslides **12 Hours**

Landslides – Classification – Driving forces and causes – Mitigation of landslides.

Unit-IV Remote sensing and its applications in geological sciences **20 Hours**

Introduction to remote sensing – Electromagnetic spectrum – Sensors – Aerial platforms – Resolution of satellite data – Visual interpretation of satellite images – Application of satellite remote sensing in geological sciences.

Unit-V geographic Information System (GIS) **20 Hours**

Application of GIS in earth science, Basic principles of geographic information system – Basic geographic concepts – spatial awareness, spatial measurement, spatial location and reference, spatial patterns Map Basics: Nature of maps, map scale, map projections, Grid Systems for mapping. GIS data models: vector and raster data models.

Text Book:-

1. Gary L. Prost 2001. Remote Sensing for geologists Guide to Image Interpretation. Grdon and Breach Science Publishers pp. 374.
2. Michale N.DeMers , 2005. Fundamental of Geographic Information Systems. Wiley India (p) Ltd.pp.467.
3. Kang-tsung chang. 2002. Introduction to Geographic Information Systems. McGraw-Hill companies, pp 348.

References:-

4. Ian Heywood, Sarah Cornelius and steve carver. 2003. An Introduction to Geographic Information Systems, Pearson, pp 295.

Total Hours: 75

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VI SEMESTER PRACTICAL- ECONOMIC GEOLOGY AND HYDROGEOLOGY

L	T	P	C
0	0	4	2

Economic geology:

Identification and description of the following economic minerals:

Magnetite, Ilmenite, Hematite, Pyrite, Pyrolusite, Psilomelane, Chromite, Wulframite, Chalcopyrite, Malachite, Galena, Magnesite, Bauxite, Stibnite, Cinnabar, Gypsum, Barite, Monazite, Rutile, Sillimanite, Kyanite, Corundum, Calcite, Dolomite, Beryl, Asbestos, Orpiment.

Hydrogeology:

Analysis of rainfall data and resistivity data.

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VI SEMESTER PRACTICAL- APPLIED GEOLOGY-I AND GEOLOGY OF TAMILNADU

L	T	P	C
0	0	2	2

Geophysics:

Elementary analysis of seismic reflection and refraction data.

Geochemistry:

Classification of ground water and rock types based on geochemical data.

Engineering Geology:

Calculation of compressive strength, Shearing strength and Tensile strength of rocks. Select a suitable site from geological and topographical maps for dam and tunnel construction.

Mining Geology:

Estimation of ore reserves.

Geology of Tamilnadu

Problems and maps related to Geology of Tamilnadu

VI SEMESTER PRACTICAL- VIVA VOCE ON PERIODICAL SHORT FIELD TRIPS, GEOLOGICAL MAPPING GEOLOGICAL TOUR AND REPORTS

L	T	P	C
0	0	2	2

- Geological mapping (One week mapping camp)
- Geological tour more than two weeks days
- Viva voce on Geological mapping and Geological tour
- Reports submission
- Specimen collection and two days short field trips