ALAGAPPA UNIVERSITY

(A State University Established in 1985)
Karaikudi - 630003, Tamil Nadu, India

2017 — Accredited with A+ Grade by NAAC (CGPA : 3.64)

2018 — MHRD Govt. of India, UGC — Graded as Category - 1 & Granted Autonomy

2018 — MHRD — Swachh Campus Rank : 4

2019 — NIRF National Institutional Ranking Framework — Rank : 28

2019 — QS — India Rank : 20, BRICS Rank : 104, Asia Rank : 216

DEPARTMENT OF GEOLOGY

M.Sc., APPLIED GEOLOGY

[Choice Based Credit System (CBCS)]

[For the candidates admitted from the academic year 2019-2020]

PROGRAMME: M.Sc. APPLIED GEOLOGY

I.a. Programme General Objectives

Geology is the core discipline of the Earth Science and encompasses many different phenomena, including Plate Tectonics, Mountain building, Volcanoes, Earthquakes, and the long-term evolution of Earth's surface features, Atmosphere, Hydrosphere and interior of the Earth. Because of the ever-increasing demand for resources, the growing exposure to Natural Hazards, and the climate change. Geology is considerable societal relevance. This course introduces the importance of applications in Geology to the students. Through a combination of Lectures, Laboratory and Field studies. The topics were ranging from Minerals, Rock identifications, Origin of Continents, Geological mapping, Plate Tectonics and Natural Geo Hazards for the advanced study of Geological history of the Earth.

b. Programme Specific Objectives

1. To study the nature of the Earth and the role of the Geologists and the scientific interpretation of Earth history.
2. Comprehend that planetary descriptions contain valuable information in the Solar System & origin of Earth system. Earth processes nature and formation of the Sea floor, the Continents, and Mountain belts of the World. Explain the theory of Plate Tectonics and describe how the inner part of the Earth is broken into large fragments (Plates) that are constantly in motion relative to each other.
3. Distinguish that minerals are the fundamental building blocks of the Earth. Describe Igneous rocks and their associated landforms, Sedimentary rocks and their depositional environments, and Metamorphic rocks and their origins. Identify common rocks and minerals also illustrate major scientific ideas and theories about the processes and development of the landscape.
4. Express the necessity of Mineral & Hydrocarbon provinces of India and exploration strategies and also natural resources such as water resources, soil, forest, biomass, marine resources and its importance.
5. Understand the Geodynamic processes and expose a terrestrial system approach to study natural disasters in order to Earthquake, Landslides, Floods, Tsunami and other Hazards.

Programme Outcome

On Successful Completion of the Programme

1. Gain a greater insight into the enormous knowledge of Geologic time and the evidences that support this claim and familiarize the scope and importance of Geology.
2. Learn to implement the knowledge in the basic evidences and ideas those support the theory of Plate Tectonics. Understand how the plate tectonic system works, including the role of the different types of plate boundaries and the forces that help to drive the system and also realize how the plate tectonic system has helped to shape the Earth's surface.
3. Understand the minerals, rocks and Sediment nature can able to identify the common Rocks and Minerals.
4. Recognize the Mineral and Hydrocarbon provinces of India. Student's exploration strategies, the natural resources in the major areas of study within the discipline of Water, Soil, Forest, Biomass and Marine resources. Analyze, explain, locate, and manage the Disaster Events.

II. Eligibility for Admission

A candidate who has passed **BACHELOR'S DEGREE in GEOLOGY** with minimum 50% of marks and 45% marks for SC/ST candidates as main course of study of any University accepted by the syndicate as equivalent thereto, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc.., Degree in Applied Geology of this University after a course of study of two academic years.

III. Duration of the Course

The course for the degree of Master of Science in Applied Geology shall consist of two academic years divided into four semesters. Each Semester consists of 90 working days.

IV. Course of Study: M.Sc. APPLIED GEOLOGY

V. Teaching Methodologies

- Participation of students is essential; they are informed previously about the topic of the lecture.
- In the beginning of the Lecture, the Teacher inquiries about Students' expectation and sets objectives of the lecture.
- Some important points of the previous lecture are asked about.
- Students ask about non-clear points and the teacher joins the previous with the new lecture.
- Teacher proposes some simple problems to be solved by students currently during the lecture.
- At the end, a summary of the content is presented by 2 or 3 students followed by organized summary by the teacher.

VI. Attendance:

Educators and students have recognized for a long-time attendance is of critical importance to student achievement. Generally minimum attendance to be eligible to take end-semester-examination is 80%.

VII. Punctuality:

Punctuality is an essential element in achieving success. Therefore, anyone arriving after daily roll-call (about 5 minutes after the class begins) will be marked absent. A valid excuse for being absent from class shall be a medical or a personal emergency acceptable at the discretion of the Dean/Chairman/Head of the Dept.

VIII. Class Participation:

Class participation and interaction helps to form a complete educational experience. However, class participation and interaction is to be relevant to course content and context. Deviant behavior may lead to Dismissal or Suspension.

IX. Submission of Assignments:

When submitting any assignments, **Your Name, Your Student Register Number, Course Number and Date of Submission** should be clearly written on every page and all pages should be stapled together. The timely submission of assignments is an essence of personal discipline and will contribute towards forming a person's professional responsibility.

X. Preparedness:

Students are expected to have read and be able to discuss the assigned chapter before attending the lecture. In addition, students should be prepared to discuss homework problems.

XI. Academic Dishonesty:

Academic work produced using dishonest methods has no value. Academic dishonesty also includes copying - verbatim or otherwise, and plagiarism i.e., the use of an author's ideas, statements, or approaches without crediting the source. A clear indication of academic dishonesty will result in a grade of "F" being assigned to that particular piece of work.

Seminar	Assignment	CIA Test I	CIA Test II
During specific semester of the subject deliberated	During specific semester of the subject deliberated	During specific semester of the subject deliberated	During specific semester of the subject deliberated

XII. Examinations:

Assessment & Evaluation: "Assessment and Evaluation are essential components of teaching and learning systems. Student evaluation is takes place based on Exams, Assignments, Seminars and Class participation.

The examination shall be Three hours duration to each course at the end of each semester. The Candidate failing in any course(s) will be permitted to appear for each failed course(s) in the subsequent examination.

Practical examinations for M.Sc. course in Applied Geology will be conducted in first three semesters.

(a) Distribution of marks for examinations:

Theory:

Components of Internal Assessment (Max. Marks 25)

Written Test	: 15 marks
Assignment	: 05 marks
Seminar	: 05 marks
Internal Minimum	: 10
External Minimum	: 30
(Max. 75 marks)	
Internal + External pass Minimum	: 50

Practical:

Internal 25; External -75	
Internal Minimum	10
External Minimum	30
Internal + External Minimum	50

(b) Question Paper Pattern – Theory

M.Sc. Applied Geology

(c) Sub Code: Course Title

(2019-20 Onwards)

Time: 3 Hours **Max. Marks - 75**

PART A **(10 x 2 = 20 marks)**

Answer all questions. All questions carry equal marks.

1. from UNIT I
2. from UNIT I
3. from UNIT II
4. from UNIT II
5. from UNIT III
6. from UNIT III
7. from UNIT IV

8. from UNIT IV
9. from UNIT V
10. from UNIT V

PART B **(5 x 5 = 25 marks)**

Answer all questions either (a) or (b)

11. (a) or (b) from UNIT I
12. (a) or (b) from UNIT II
13. (a) or (b) from UNIT III
14. (a) or (b) from UNIT IV
15. (a) or (b) from UNIT V

PART C **(3 X 10 = 30 marks)**

Answer any three questions.

16. from UNIT I
17. from UNIT II
18. from UNIT III
19. from UNIT IV
20. from UNIT V

(d) Question Paper Pattern – Practical - Time: 6 Hours

S. No	**Questions**	**Marks**
1	Major Experiment I. Interpretation of Satellite Image II. Preparation of Maps using GIS Software III. Variation diagrams calculation IV. Rocks Geochemical interpretation	20
2	Minor Experiment I. Scale problem in Aerial photograph II. Grain size analysis III. Ore reserve estimation	20
3	Identification Megascopic, Microscopic Rocks, Minerals, Crystal model and Mega & Micro Fossils. Digital Image Processing Experiment	30
4	Record	10
	Total	**75**

XIII. Project Work

Project work Internal	–	75 Marks	
Project work External	–	75 Marks-	**Average of 75**
Viva-Voce	–	25 Marks	
Total	–	100 Marks	

(a) Plan of Work:

The student should prepare plan of work under the supervision of guide for the dissertation,

get the approval of the guide and should be submitted to the university during the fourth semester of their study. The duration of the dissertation research shall be a minimum of three months in the fourth semester.

(b) Project Work outside the Department:

In case the student stays away for work from the Department for more than one month, Specific approval of the university should be obtained.

(c) No. of copies/distribution of project work:

The students should prepare three copies of dissertation and submit the same for the evaluation by Examiners. After evaluation one copy is to be retained in the Department library and one copy is to be submitted to the guide and one copy can be held by the student.

(d) Format to be followed:

The format/certificate for dissertation to be submitted by the students is given below:

Format for the preparation of project work:

(a) Title page
(b) Bonafide Certificate
(c) Acknowledgement
(d) Table of contents

CONTENTS

NEC - Non Exam Course

464601 – GEOLOGICAL FIELD TOUR	
Field Collections and Display	20Marks
PPT Presentation	20 Marks
Report Submission	40 marks
Viva - Voce	20 Marks
Total	100 marks

Format of the Title Page:

TITLE OF THE PROJECT

A Dissertation Submitted to the Alagappa University, Karaikudi -630 003 in Partial Fulfillment of the Requirement for the Award of Degree of

MASTER OF SCIENCE IN APPLIED GEOLOGY

By
Students Name
Register Number
Supervisor:

University Emblem
Department ofGeology
Alagappa University
Karaikudi – 630 003
Month and Year

Format of Declaration of the Candidate:

Name and class of the student:

DECLARATION

I hereby declare that the Project entitled_____submitted to Alagappa University for the award of the degree of Master of Science in Applied Geology is my original work and that it has not been previously formed the basis for the award of any degree, diploma/associate ship or any other similar title of any other University or Institution.

Signature of the Student

Format of the Certificate:

CERTIFICATE

This is to certify that the project entitled ----------Submitted in partial fulfillment of the requirement of the degree of Master of Science in Applied Geology to the Alagappa University, Karaikudi is a record of bonafide research work carried out by ----------under my supervision and guidance and that no part of the project has been submitted for the award of any degree or diploma.

Signature of HOD
Place:
Date: Signature of Guide

XIV. Village Extension Programme (VEP)

The Sivagangai and Ramnad districts are very backward districts, where a majority of the people lives in poverty. The rural mass is economically and educationally backward. Thus, the aim of introducing Village Extension Programme (VEP) is to extend outreach programs in environmental awareness, hygiene and health to the rural masses of this region.

The students in their third semester have to visit our department adopted village and can arrange various programme to educate the rural masses in the following areas for three days. A minimum of two faculty members can accompany the students and guide them.

1. Plastics Waste free village
2. Harmful effects of single use plastics
3. Environmental awareness
4. Hygiene and Health
5. Rainwater Harvesting
6. Water Conservation
7. Renovation water bodies
8. Tree plantation
9. Watershed Development

This course is a compulsory one for all the M.Sc. Applied Geology students of Department of Geology, Alagappa University. Students will be awarded TWO credits apart from the minimum credits of 90 to be earned for the M.Sc. programme.

Classification of Successful Candidates

P.G. Programme

MARKS	GRADE POINT	CGPA	LETTER GRADE	Description
96 and above	10	9.51 and above	S+	First Class - Exemplary
91 – 95	9.5	9.01 – 9.50	S	
86 – 90	9.0	8.51 – 9.00	D++	First Class – Distinction
81 – 85	8.5	8.01 – 8.50	D+	
76 – 80	8.0	7.51 – 8.00	D	
71 – 75	7.5	7.01 – 7.50	A++	First Class
66 – 70	7.0	6.51 – 7.00	A+	
61 – 65	6.5	6.01 – 6.50	A	
56 – 60	6.0	5.51 – 6.00	B	Second Class
50 – 55	5.5	5.00 – 5.50	C	
Below 50	-	Below 5.00	F	Fail
			AA	Absent

Passing Minimum: 50%, P: Pass, ESE: End Semester Examination, CIA: Continuous Internal Assessment

$$\text{GPA} = \frac{\Sigma\,(\text{CDT} * \text{GPT})}{\Sigma\text{CDT}}$$

Where: CDT = No. of credits of major allied and elective courses

GPT = Grade Point (obtained by dividing the percentage of marks scored by 10)

Note: Extra Grade Points and Marks are not considered for GPA and Total Marks Calculations.

CGY – Category CDT – Credit GRD – Grade GPT – Grade Point GPA – Grade Point Average CGPA – Cumulative Grade Point Average	**Category (CGY)** 1. Theory (Core) 2. Practical (Core) 3. Inter-disciplinary – Theory 4. Inter-disciplinary – Practical 5. Elective / Optional 6. Comprehensive Viva / Seminar 7. Extension Programmes 8. Project and Viva – Voce

XVI Maximum Duration for the Completion of the Course

The maximum duration for completion of M.Sc. Degree in Applied Geology Programme shall not exceed ten semesters.

DEPARTMENT OF GEOLOGY

ALAGAPPA UNIVERSITY

(A State University Established 1985)

KARAIKUDI-630003, TAMIL NADU, INDIA

M.Sc - APPLIED GEOLOGY

(CBCS-Choice Based Credit System-2019 onwards)

SYLLABUS CREDIT STRUCTURE FOR M.Sc PROGRAMME

Semester	Course / Title	Course Code	Credit	Hours/ Week	Marks		Total
					Internal	Ext	
I	General Geology (C)	464101	4	4	25	75	100
	Advanced Crystallography and Mineralogy (CC)	464102	4	4	25	75	100
	Stratigraphy and Palaeontology (C)	464103	4	4	25	75	100
	Remote Sensing and GIS (CC)	464104	4	4	25	75	100
	Structural Geology and Geotectonics (CC)	464105	4	4	25	75	100
	Practical - Advanced Crystallography, Mineralogy and Palaeontology	464106	2	4	25	75	100
	Practical - Remote Sensing & GIS and Structural Geology	464107	2	4	25	75	100
	Library			2	-	-	-
	Total		**24**	**30**	**-**	**-**	**700**
Semester II							
II	Igneous And Metamorphic Petrology (CC)	464201	5	5	25	75	100
	Sedimentary Petrology (CC)	464202	5	5	25	75	100
	Geomorphology (CC)	464203	5	5	25	75	100
	Natural Hazards and Management (EC)	464501	5	5	25	75	100
	Practical - Igneous, Metamorphic and Sedimentary Petrology	464204	2	4	25	75	100
	Geological Field Tour (NEC)	464601	3	-	25	75	100
	Non Major Elective I (NME)		2	3	25	75	100
	Self Learning Course (*SLC-I)	Moocs	Extra Credit				
	Library, Yoga And Career Guidance			3	-	-	-
	Total		**27**	**30**	**-**	**-**	**700**

III	Economic Geology (Cc)	464301	5	5	25	75	100
	Hydrogeology (Cc)	464302	5	5	25	75	100
	Geochemistry (Ec)	464502	5	5	25	75	100
	Practical - Economic Geology	464303	2	4	25	75	100
	Practical - Hydrogeology	464304	2	4	25	75	100
	Non Major Elective II(Nme)		2	3	25	75	100
	Self Learning Course (*Slc-Ii)	Moocs	Extra Credit				
	Library, Yoga And Career Guidance			4	-	-	-
	Total		**21**	**30**	-	-	**600**
IV	Engineering Geology, Mining Geology, Ore Processing and Environmental Geology (Ec)	464503	5	5	25	75	100
	Petroleum Geology (Ec)	464504	5	5	25	75	100
	Project Work	464999	8	16	25	75	100
	Library and Tutorial			4			
	Total	**18**		**30**	**-**	-	**300**
Grand Total		**90**		**120**	**-**	**-**	**2300**

XVII. **CC**: Core Course, **EC**: Elective Course, **NME**: Non Major Elective Course, **SLC**: Self Learning Course (MOOCs) and **NEC**: Non Exam Course.*Credits earned through Self Learning Courses (MOOCs) shall be transferred in the credit plan of the program as extra credits

Consolidation of Contact Hours and Credits: PG

Semester	Contact Hrs / Week	Credits
I	30	23
II	30	25 + Extra credits
III	30	25+ Extra credits
IV	30	17
Total		90+ Extra credits

A) Curriculum Credits

Core	--	74 Credits
Elective	--	12 Credits
NME	--	4 Credits
Total	--	**90 Credits**

Semester - I			
Course code: 464101	**General Geology**	**Credits : 4**	**Hours : 4**
Objectives	➢ Origin of Earth system. Earth processes nature and formation of the Sea floor, the Continents and Mountain belts of the World. Explain the theory of Plate tectonics and describe how the outer part of the earth is broken into large fragments (plates) that are constantly in motion relative to each other. ➢ Understand the Geodynamic processes and expose a terrestrial system approach to study Natural disasters in order to Earthquake, Landslides, Floods, Tsunami and other Natural disasters.		
Unit : I	Evaluation of Earth, Earth Structure and composition. Plate tectonics, Plate boundaries, Plate movement –Causes and Mechanism of Plate movements, Palaeomagnetism, Seismicity, Palaeoposition of India and Geodynamics of the Indian Plate.		
Unit : II	Sea Floor Spreading – Theory, Evidence and Mechanism, Submarine canyons, Island arc system, Mid oceanic ridges, Evolution of Arc – Trench gap.– Magmatism, Intensity and Petrology, Different Island arc systems.		
Unit : III	Isostasy – Airy and Pratt Hypothesis, Marine Transgression and Regression - Effects of Sea level changes – Definition and Sea level trends during Geologic time causes, Geological evidences of continental boundaries.		
Unit : IV	Volcanoes – description, Origin of volcanoes, Structure and types of Volcano, Plate Tectonics and Volcanic activity. Mountain building movements – Orogeny and Epiorogeny, Types of mountains.		
Unit : V	Natural hazards and Disasters - Landslides, Floods, Earthquake, History of Earthquake in India. Tsunami – scale of intensity and magnitude of Tsunami, warning prediction and mitigations.		

Reference and Textbooks:

Chernicoff, S., & Whitney, D. L. (2007). *Geology: An introduction to physical geology*. Upper Saddle River, NJ: Pearson Prentice Hall.

Fletcher, C. H. (2017). *Physical geology: The science of Earth*. Hoboken, NJ: John Wiley & Sons.

Gokhale, N. W. (2014). *Geological features and mysteries of the planet Earth*. Delhi: CBS Publication.

Guhey, R. (2018). *Geology: Principles and practical manual*. New Delhi: New India Publishing Agency.

Jain, S. (2018). *Fundamentals of Physical Geology*. New Delhi: Springer Publication.

Mahapatra, G. B. (2016). *A text book of Geology*. New Delhi: CBS

Publication. Mathur, S. M. (2010). *Elements of Geology*. New Delhi: PHI

Learning Pvt.

McConnell, D. (2018). *The good Earth: Introduction to Earth science*. New York: McGraw-Hill Education.

Norton, W. H. (2017). *Textbook of Geology: Elements and theories*. New Delhi: Dominant &

Dis. OHara, K. D. (2018). *A brief history of Geology*. Cambridge: Cambridge University Press.

Petersen, J. F., Gabler, R. E., & Sack, D. (2015). *Fundamentals of Physical Geography*. Stamford: Cengage Learning.

Sawant, P. T. (2011). *Engineering General Geology*. New Delhi: New India Publishing Agency.

Sunil Kumar. (2016). *Text Book of Geology*. New Delhi: Sonali Publication.

Tarbuck, E. J., Lutgens, F. K., Linneman, S., & Tasa, D. (2016). *Earth: An introduction to physical Geology*. Noida: Pearson India Education.

Tejankar, A. V. (2018). *Physical Geology*. Jaipur: Oxford Company.

Tyrrell, G. W. (1958). *The Earth and its mysteries*. London: G. Bell.

Wicander, R., & Monroe, J. S. (2009). *Essentials of Physical Geology*. Belmont, CA: Brooks/Cole, Cengage Learning.	
Outcomes	➢ Theory of plate tectonics. Understand how the plate tectonic system works, including the role of different types of plate boundaries and the forces that help to drive the system. ➢ Realized how the plate tectonic system has change the shape of the Earth's surface

Name of the Course Teacher: Dr. R. Karikalan

Semester - I			
Course code: 464102	**Advanced Crystallography and Mineralogy**	**Credits : 4**	**Hours : 4**
Objectives	➢ To learn the Physical, Chemical, and Optical properties of common rock-forming Minerals; Mineral reactions, stability, and Paragenesis of crystal systems. ➢ Qualitative and Quantitative analytical methods (Optical, X-ray diffraction and electron microscopy) in mineral and material science.		
Unit : I	Crystal systems and symmetry for 32 classes – Schoenflies notation and Hermann Mauguin symbols. Projection of crystals belonging to Normal class – Spherical, Stereographic and Gnomonic projections. Cotangent and Tangent Relations. Equation of Normal Zone symbols. Napier's Theorem. Interfacial angle.		
Unit : II	Elements of Crystal- Irregularities of crystal. Twinning and Zoning; Polymorphism, Pseudomorphism, Isomorphism and Soild solution; physical properties of minerals; Space Lattice – 14 Bravais lattices. Principles of X-ray diffraction –Braggs law and powder method. Electron microscopy and its mineralogical applications. Thermal analytical techniques.		
Unit : III	Optical properties of Minerals under Polarisation and cross nicols. Optical accessories – Quartz wedge, Mica plate and Gypsum plate. Berek compensator – Micrometer ocular. Pleochroic scheme – Birefringence – Optic anomalies – Dispersion. Optic axial angle. Determination of Sign of elongation. Determination of Extinction angle. Determination of Sign of Uniaxial and Biaxial minerals by using optical accessory plates.		
Unit : IV	Classification of Minerals – Description of physical, optical and chemical properties and Paragenesis of the following; Ortho & Ring Silicate – Olivine group, Garnet group. Alumino silicates – Epidote group, Zircon, Sphene, Topaz, Staurolite, Beryl, Cordierite, Tourmaline.		
Unit : V	Sheet silicate – Mica group, Chlorite group and clay minerals. Chain silicate – Pyroxene and Amphibole group and pyroxenites – Wollastonite, Frame work silicates – Quartz, Feldspar, Feldspathoid groups, Zeolite and Scapolite groups. Non Silicate groups – Spinel group, Carbonates and Phosphates.		

Reference and Textbooks:

Akhtar, A. (2016). *The DBS handbook of Mineralogy and Petrology*. New Delhi: DBS Imprints.

Alexander, P. O. (2009). *A handbook of Minerals, Crystals, Rocks and Ores*. New Delhi: New India Pub. Agency.

Berry, L. G., Mason, B., & Dietrich, R. V. (2004). *Mineralogy: Concepts, descriptions, determination*(2nd ed.). New Delhi: CBS Publication.

Dexter Perkins. (2013). *Minerology*(3rd ed.). New Delhi: PHI Learning Pvt.

Dexter Perkins. (2017). *Minerology*(3rd ed.). Noida: Pearson India Education Services Pvt.

Ford, W. E. (2006). *Danas textbook of Mineralogy* (4th ed.). New Delhi: CBS Publication.

Gribble, C. D. (2005). *Rutley's elements of Mineralogy* (27th ed.). New Delhi: CBS

Publication. Johan, J. M. (2017). *Text book of Mineralogy*. New Delhi: Rajat publications.

Kerr, P. F. (2014). *Optical Mineralogy* (4th ed.). New Delhi: McGraw-Hill Education.

Klein, C., & Dutrow, B. (2008). *Mineral Science: (after James D. Dana)*(23rd ed.). New Delhi: John Wiley & Sons.

Rabindra, H. N. (2017). *Practical approach to Crystallography and Mineralogy* (2nd ed.). New Delhi: Cbs & Distribu.

Read, H. H. (2012). *Rutley's Elements of Mineralogy* (25th ed.). New Delhi: Surjeet Publication.

<table>
<tr><td colspan="2">Revell Philips, W. M., & Griffen, T. D. (2004). Optical Minerology of The Nonopaque Minerals. New Delhi: CBS Publication.
Tejankar, A. V. (2017). Crystallography. Jaipur: Oxford Book Company.
Tejankar, A. V. (2017). Mineralogy. Jaipur: Oxford Book Company.
Wenk, H., & Bulakh, A. (2016). Minerals: Their constitution and origin (2nd ed.). Cambridge: Cambridge Univ. Press.</td></tr>
<tr><td>Outcomes</td><td>➢ Understand the basic crystal-chemical properties of minerals and how variability in these properties relates to physical and optical characteristics as well as the formation and stability of minerals in igneous, metamorphic, and sedimentary environments.
➢ Microscopic thin section study and identity characterize common rock-forming minerals.</td></tr>
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Name of the Course Teacher: Dr. R. Karikalan

Semester - I			
Course code: 464103	**Stratigraphy and Palaeontology**	**Credits : 4**	**Hours : 4**
Objectives	➢ Students should be able to collect Stratigraphic and Paleontologic data in the field, construct and interpret Stratigraphic sections, and correlate their sections. ➢ Students should able to synthesize Geological and Biological information to interpret local and regional Geologic history to realize the different Geological epoch formation.		
Unit : I	Principles of Stratigraphy and its concepts – Lithostratigraphy, Biostratigraphy, Chronostratigraphy, Magnetostratigraphy, Chemostratigraphy and Evenstratigraphy. Nomenclature and the modern Stratigraphic code. Geological Time Scale. Imperfections in Geological Records.		
Unit : II	Precambrian formation of India - (Dharwar, Singhbum, Aravalli, Bundelkhand, Meghalaya, Nagpur, Sausar and Sakoli series). Proterozoic –Vindhyan, Cuddapah and Kurnool, Bhima, Kaladgi and Badami, Delhi System, Cambrian Salt range, Gondwana formation.		
Unit : III	Triassic of Spiti, Jurassic of Kutch, Cretaceous of Trichinopoly. Deccan Traps, Siwalik formations Tertiary and Quaternary deposits of India. Palaeozoic formation of India.		
Unit : IV	Evolution of Trilobite, Ammonite and Graptolite. Vertebrate Evolution – Equus, Elephas, Man, Bird (Archaeopteryx). Life through various ages. Gondwana and Tertiary Flora of India. Devonian fishes, Mesozoic reptiles and Dinosaurs.		
Unit : V	Morphology, Classification of Ecology and Palaeontology - Foraminifera, Ostracoda, Bryozoa –Diatoms. Brief introduction of Morphology - Radiolarian, Conodonts, Stromatolites and Pteropods. Morphology of Spores and Pollen and significance in petroleum exploration, environmental importance of microfossils. Determination of age and correlation of Paleontology and Tectonics in Microfaunal evidences. Micropalaeontological techniques. Maceration techniques.		

Reference and Textbooks:

Bilwa, L. M. (2017). *Paleontology: A practical manual*. New Delhi: Studera Press.

Clarkson, E. K. (2012). *Invertebrate Palaeontology and Evolution* (4th ed.). New Delhi: Wiley India Pvt.

Devesh, K. S. (2007). *Micro Paleontology; Application In Stratigraphy and Paleooceanography*. New Delhi: Narosa Publishing House.

Jain, P. C., & Anantharaman, M. S. (2015). *Palaeontology (Palaeobiology) Evolution and Animal Distribution*. Jalandhar: Vishal publishing.

Kavitha. (2007). *Fossils*. New Delhi: AITBS.

Krishnan, M. S. (2010). *Geology of India and Burma*(6th ed.). New Delhi: CBS Publication.

Kumar, R. (2015). *Fundamentals of historical Geology and Stratigraphy of India*. New Delhi: New Age International.

Moore, R. C., Lalicker, G. C., & Fischer, G. A. (2004). *Invertebrate Fossils*. New Delhi: CBS Publication.

Nichols, G. (2013). *Sedimentology and Stratigraphy*(2nd ed.). Somerset: Wiley.

Raup, D. M., & Stanley, M. S. (2004). *Principles of Palaeontology*(2nd ed.). New Delhi: CBS Publication.

Sam Boggs, J. R. (2016). *Principles of sedimentology and Stratigraphy*(5th ed.). Noida: Pearson India Education Services Pvt.

Shrock, R. R., & Twenhofel, H. W. (2005). *Principles of invertebrate Palaeontology*(2nd ed.). New Delhi: CBS Publication.

Subramani, K., & Manivannan, V. (n.d.). *Palaeontology Practical Manual*. Jalandhar: Vishal publishing. Woods, H. (2004). *Palaeontology Invertebrate* (8th ed.). New Delhi: CBS Publication.	
Outcomes	➢ It focus specifically on settings and time periods that the students will encounter on our field trips, emphasizing the combined use of Sedimentological characteristics and fossil content for interpreting Paleoenvironments and facies changes. ➢ In the field, students describe and measure sections, and record data on fossil assemblages.

Name of the Course Teacher: Dr. K. Prabakaran

Semester - I			
Course code: 464104	**Remote Sensing and GIS**	**Credits : 4**	**Hours : 4**
Objectives	➢ Attain a foundational knowledge and comprehension of the principles of remote sensing. ➢ Gain basic experience in the hands-on application of Remote Sensing data through Visual interpretation and Digital Image Processing (ENVI, ERDAS imagine) using GIS exercises.		
Unit : I	Principles of Photogrammetric, types of Aerial photographs, Properties of Aerial Photos, Photographic scale. Flight planning, Parallax relief displacement and vertical exaggeration. Stereoscopy and stereoscopes. Aerial photo stereoscopes mosaics.		
Unit : II	Introduction to Remote Sensing - Electro Magnetic Radiation and spectrum; Electromagnetic bands in remote sensing; Spectral signatures of soil, rock, water and vegetation; EMR interaction with Atmospheric window. Spectral reflectance of earth Objects and land covers. Interpretation keys and elements.		
Unit : III	Satellite data acquisition, Resolution (Spectral, Spatial, Temporal and Radiometric). Platforms – Sensors – scanning and orbiting mechanics of satellite data – LANDSAT, IRS and SPOT series of satellites – Thermal, near infra red and Microwave Remote Sensing – digital image processing; High resolution satellites (IKONOS, Quick Bird) – Remote Sensing development in India - Image Classification (Supervised and Unsupervised).		
Unit : IV	Basic of GIS – definition, components of GIS, Data structure – Point, Line Polygon. Data basic structures - Raster and vector data structure. Data conversion (Vector to raster; raster to vector). Sources of data, Different types of data entry methods. Linking of spatial and non spatial data. Data outputs (Types of output).		
Unit : V	Data analysis – DEM and DTM (Contour, shaded relief map, slope, line of sight, drainage analysis, volume estimation, usefulness of DEM). GPS- Basic, control and user segments. Signal components – error in GPS observation. GPS positioning, Differential GPS, Real Time Kinematic (RTK) Navigation System and GPS Mapping.		

Reference and Textbooks:

Burrough, P. A., McDonnell, R., & Lloyd, C. D. (2015). Principles of geographical information systems(3rd ed.). Newyork: Oxford University Press.

Chandra, A. M., & Ghosh, S. K. (2015). *Remote sensing and geographic information system*(2nd ed.). New Delhi: Narosa Publishing House.

Chauhan, A., & Kumar, P. (2017). *Geospatial Technology and Water Management*. New Delhi: Discovery Publishing house Pvt.

Chun, Y., & Griffith, D. A. (2013). Spatial Statistics and Geostatistics: Theory and applications for geographic information science and technology. New Delhi: Publications India Pvt.

Dhawan, B. (2015). *Trends and techniques of geomorphology*. New Delhi: Random Publications.

Dwivedi, R. S., & Roy, P. S. (2016). *Geospatial technology: For integrated natural resources management*. Chennai, Tamil Nadu, India: Yes Dee Publishing Pvt.

Elangovan, K. (2006). *GIS; Fundamentals Application and Implementations*. New Delhi: New India

Publishing Agency.

Foody, G. M., & Curran, J. P. (2013). Environmental remote sensing from regional to global scales. India Pvt Ltd: Wiley India Pvt.

Gaur, M. (2006). *Remote Sensing Applications in Dry land Natural Resources Management*. New Delhi: New India Publishing.

Gupta, R. P. (2018). Remote sensing geology(3rd ed.). Berlin: Springer-Verlag.

Jain, A. K. (2015). Fundamentals of digital image processing. Noida: Pearson India Education Services Pvt.

Jamwal, A. K., Chiranjeev, A., & Haque, A. (2010). *Land use and resource management using GIS*. New Delhi: Jnanada Prakashan in association with Confederation of Indian Universities.

Jensen, J. R. (2014). Remote sensing of the environment: An earth resource perspective(2nd ed.). Noida: Pearson India Education Services Pvt.

Joseph, G., & Jeganathan, C. (2018). *Fundamentals of remote sensing*(3rd ed.). Hyderabad, India: Universities Press.

Kumar, S. (2018). *Remote sensing geology*. Jaipur: Agrotech Press.

Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2015). *Remote sensing and image interpretation*. Hoboken: John Wiley & Sons.

Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2010). *Geographical information systems and science*. Chichester: Wiley.

Mallick, J., & Rahman, A. (2018). *Thermal and optical remote sensing: Urban environmental studies*. New Delhi: Rajat Publications.

Panda, B. C. (2005). *Remote sensing: Principles and applications*. New Delhi: Viva Books.

Pandey, S. N. (2015). *Principles and applications of photogeology*(2nd ed.). New Delhi: New Age International Publishing.

Pinder, G. F. (2013). *Groundwater modeling using Geographical information systems*. New York: J. Wiley & Sons.

Rajesh, A. (2016). *Fundamentals of Geographical Information Systems*. New Delhi: Somali Publications.

Ramasamy, S. M., & Govindarajan, T. (2017). *Geomatics in Energy and Water Resources*. New Delhi: New India Publishing Agency.

Ramasamy, S. M., & Kasturirangan, K. (2015). Remote sensing in Geomorphology. New Delhi: New India Publishing Agency.

Ramasamy, S. M., Kuamnan, C. J., Sivakumar, R., & Bhoop, S. (2006). *Geomatics in Tsunami*. New Delhi: New India Publishing.

Ramasamy, S., Saravanavel, J., & Gunasekaran, S. (2016). Geomatics in Applied Geomorphology. New Delhi: New India Publishing Agency.

Robert, A. H. (2015). Interpretation of air photos and remotely sensed imagery. New Delhi: CBS Publication.

Samual, D. K. (2017). *R statistics*. New Delhi: New India Publishing Agency.

Soam, S. K., Sreekanth, P. D., & Rao, N. H. (2013). *Geospatial technologies for natural resources*

Management. New Delhi: New India Pub. Agency.	
Outcomes	➢ Students will be able to recognize and explain fundamental principles of remote sensing. ➢ Students will be able to identify key applications of land, marine, aquatic, and atmospheric remote sensing and relate them to the properties of historical, current, and Planned remote sensing instruments, approaches, and datasets.

Name of the Course Teacher: V. Agastheeswaran

<table>
<tr><th colspan="4">Semester - I</th></tr>
<tr><td>Course code: 464105</td><td>Structural Geology and Geotectonics</td><td>Credits : 4</td><td>Hours : 4</td></tr>
<tr><td>Objectives</td><td colspan="3">➢ Students to learn the geometry and types of structures produced by complex crustal deformation histories involving contraction, extensional and wrench regimes, in addition that applying remote sensing tool to demarcate the process.
➢ To understand factors influencing the strength and mechanical behavior of the Earth's crust and underlying mantle lithosphere</td></tr>
<tr><td>Unit : I</td><td colspan="3">Basic Principles, Definition, Primary and Secondary structures. – Trends of outcrops. Relation between True dip and Apparent dip, True thickness and vertical Thickness and Their mutual relation.</td></tr>
<tr><td>Unit : II</td><td colspan="3">Mechanical properties of rock. Stress, strain – Kinematic and dynamic analysis of deformation; definition and types, Stress and Strain ellipsoid, Mohr cycle. Physical properties of rocks – Deformation – brittleness, Plastic and Elastic properties. Foliation and lineation, types of Cleavages, Schistosity, crenulations – Orientation of foliation Within strain ellipsoid. Time relationship between Crystallization and deformation, calculation of Paleostress</td></tr>
<tr><td>Unit : III</td><td colspan="3">Folds: Geometry of fold, Fold terminology classification of scheme for folds and Mechanism of folding. Recognition of folds in the field. Salt intrusion and salt domes. Unconformities and its types.</td></tr>
<tr><td>Unit : IV</td><td colspan="3">Joints: Geometry of Joints, classification joints and its significances. Mechanism of Joints. Faults – classification – types of faults. Mechanism of faults. Recognition of faults in the field.</td></tr>
<tr><td>Unit : V</td><td colspan="3">Plate tectonics, oceanic and continental drift, Geological and Geophysical evidences, Determination of the order of superposition in the fields, Geological surveying and Mapping – Use of contour and topographical maps.</td></tr>
<tr><td colspan="4">Reference and Textbooks:
Billings, M. P. (2013). Structural geology (3rd ed.). New Delhi: PHI Learning Pvt.
Billings, M. P. (2016). Structural geology (3rd ed.). Noida: Pearson India Education Services Pvt.
Chadha, S. K. (2010). Elements of geological maps: For geology (2nd ed.). New Delhi: CBS Publication. Gokhale, N. W. (1996). Exercise on geological and dip-strike problems. New Delhi: CBS Publication.
Gokhale, N. W. (2012). A manual of problems in structural geology. New Delhi: CBS Publication.
Gokhale, N. W. (2013). Manual of geological maps. New Delhi: CBS Publication.
Gokhale, N. W. (2015). A guide for field geology. New Delhi: CBS Publication.
Gokhale, N. W. (2017). Theory of Structural Geology. New Delhi: CBS Publication.
Hobbs, B. E., & Ord, A. (2015). Structural geology: The mechanics of deforming metamorphic rocks. Waltham, MA: Elsevier.
Lahee, F. H. (2002). Field geology (6th ed.). New Delhi: CBS Publication.
Marshak, S., & Mitra, G. (2018). Basic methods of structural geology. Noida: Pearson India Education Services Pvt.Ltd.</td></tr>
<tr><td>Outcomes</td><td colspan="3">➢ Interpret the relative timing of formation of structures, the kinematics of deformation, and the progressive deformation histories in these regimes.
➢ Students will be able to identify key applications of plate tectonic movement’s and the historical events of the earth.</td></tr>
</table>

Name of the Course Teacher: Dr. K. Prabakaran

Semester - I			
Course code: 464106	**Practical - Advanced Crystallography, Mineralogy and Palaeontology**	**Credits : 2**	**Hours : 4**

1. Crystal models of type minerals in each class of systems
2. Megascopic & Microscopic identification of Quartz, Feldspar, Feldspathoid, Pyroxene, Amphibole groups
3. Megascopic& Microscopic Identification of important Silicates: Tourmaline, Topaz, Beryl, Zircon, Rutile, Apatite, Calcite, Gypsum
4. Megascopic& Microscopic Identification of Metamorphic Minerals: Garnet, Cordierite, Kyanite, Sillimanite, Andalusite, Sphene, Staurolite, Chondrodite.
5. Determination of Optical properties of Minerals by Classical methods
6. Identification and description of Mega Fossils. – I
7. Identification and description of Mega Fossils. – II
8. Identification and description of Mega Fossils. - III
9. Methods of separation of microfossils - Identification of selected Taxa of the following microfossil groups under the stereo binocular microscope and observation of morphological characters of some particular species of Benthic and Planktonic Foraminifera.

Name of the Course Teacher: Dr. R. Karikalan

Semester - I			
Course code: 464107	**Practical - Remote Sensing & GIS and Structural Geology**	**Credits : 2**	**Hours : 4**

1. Stereo vision Test and Anatomy of Pocket, Prism & Mirror Stereoscopes.
2. Interpretation of Aerial Photographs (Stereo vision).
3. Study of Various Visual Remote Sensing Equipments.
4. Interpretation of Black & White and False Color Multi Band Imagery.
5. Preparation of Histogram generation for raw satellite data and plot cumulative frequency curve.
6. Stretch the rectified range of digital number given raw satellite data using linear stretching method
7. Scanning and Geo-referencing, Onscreen Digitization, Editing, Labeling and Preparation of vector layers of Thematic map.
8. Projection and Transformation of vector layers & length / area calculation for geometric objects
9. Generation of non-spatial data base with Unique-Id and Linking of Spatial and Non Spatial data.
10. GPS survey and map making and Generation of 3D images
11. Analysis of topographic contours: shapes- mapping of different types of slopes-mapping of folds and faults from the contours.

Name of the Course Teacher: Dr. K. Prabakaran

Semester - II			
Course code: 464201	**Igneous and Metamorphic Petrology**	**Credits : 5**	**Hours : 5**
Objectives	➢ To give a basic understanding of the mechanisms which control the diversity of igneous rocks and to emphasis the relationship between tectonic settings of igneous Rocks. ➢ To consider the interrelationships between deformation, compositional groups of Metamorphic rocks, Facies and Metasomatism.		
Unit : I	Origin of Magma - Process of partial melting of magma. Bowen's Reaction and its application to Petrogenesis. Viscosity, temperature and pressure relationships in magmas; IUGS classification of plutonic and volcanic rocks, Magma evolution and differentiation – Fractional crystallization, gravitational differentiation, gas streaming, Liquid immiscibility and Assimilation. Forms and structures of intrusive and extrusive igneous Rocks and their Petrogenetic significance. Classification of igneous rocks- CIPW, IUGS, Niggli, Tyrrel Rosenbusch, Irvine and Baragar.		
Unit : II	Phase Rule and equilibrium in silicate system. Binary and Ternary magma system – Two component system of crystallization. Three component systems. Basic rocks - Acidic rocks - Alkaline rocks. Diversity of igneous rocks, Petrographic Provinces, Variation diagrams. Petrogenetic provinces of Deccan traps, Columbia River basalts. Bushveld igneous complex, Skaergaard intrusion, Still Water Complex, Carbonatite and Alkaline Rock complex of India, Oceanic Rift valleys; MORBs – Tholeiites – Ophiolite.		
Unit : III	Agents and types of metamorphism. Limits and physic-chemical controls (pressure, temperature, fluids and bulk rock composition) of Metamorphism; Common minerals of metamorphic rocks, Field observations, Petrographic classification of common metamorphic rocks. Texture and structures metamorphic rocks. Metamorphic Grades and Zone concept – Depth Zones, contact metamorphic zones, Bavrourian Zones, Franciscan Zone, Dharwarian zone and paired metamorphic belts.		
Unit : IV	Metamorphic Facies and concepts. View of Eskola, Winkler, Turner and Verhogen of facies. Graphical representation of facies – diagram ACF, AKF and AFM. Gibbs phase rule and Goldschmidt mineralogical phase rule. Metamorphic differentiation, Metasomatism, Granitisation. Thermal, Cataclastic and Regional metamorphism and Their effects on Carbonates, Argillaceous, Arenaceous. Acid, Basic and Ultra basic igneous rock. Retrograde metamorphism.		
Unit : V	Migmatisation, Charnockitisation, Paliogenesis and Anataxis, Origin of Ecologite,Origin of Amphiboite, Metamorphic in relation to plate tectonics, Magmatic emplacement and Orogenesis. Application of trace elements, REE and stable isotope geochemistry in Metamorphism.		

Reference and Textbooks:

Best, M. G. (1986). *Igneous and Metamorphic Petrology*. New Delhi: CBS Publication.

Ehlers, E. G., & Blatt, H. (1999). *Petrology: Igneous, sedimentary, and metamorphic*. New Delhi: CBS.

Hatch, F. H., Wells, A. K., & Wells, M. K. (2003). *Petrology of the igneous rocks*(13th ed.). New Delhi: CBS Publication.

Hyndman, D. W. (2014). *Petrology of igneous and metamorphic rocks*(2nd ed.). New Delhi: McGraw-Hill publ. Company.

Johnson, W. M., & Maxwell, J. A. (2017). *Rock and mineral analysis*(2nd ed.). New Delhi: MEDTECH.

McBirney, A. R. (1993). *Igneous petrology*(2nd ed.). Boston London: Jones & Bartlett.

Pettijohn, F. J. (2004). *Sedimentary rocks*(3rd ed.). New Delhi: CBS Publications.

Philpotts, A. R., & Ague, J. J. (2016). *Principles of igneous and metamorphic petrology*(2nd ed.). New

<table>
<tr><td colspan="2">Delhi: Cambridge University Press.
Rabindra Nath, H. (2012). Practical approach to petrology. New Delhi: Cbs.
Turner, F. J., & Verhoogen, J. (2004). Petrología ígnea y metamórfica(2nd ed.). New Delhi: CBS Publication.
Tyrrell, G. W. (2018). The Principles of Petrology. New Delhi: AITBS.
Winter, J. D. (2018). Principles of igneous and metamorphic petrology. Noida: Pearson India Education Services.</td></tr>
<tr><td>Outcomes</td><td>➢ This course presents a broad review of igneous rocks, emphasizing their tectonic associations, interrelationships and Petrogenesis as well as mineral assemblages and reactions in Metamorphic rocks.
➢ Understand the review metamorphic facies, facies series and their distribution, as well as the thermal and tectonic controls on Metamorphism.</td></tr>
</table>

Name of the Course Teacher: Dr. R. Karikalan

Semester - II			
Course code: 464202	**Sedimentary Petrology**	**Credits : 5**	**Hours : 5**
Objectives	➢ To learn the basic concepts and classification of sedimentary rocks. ➢ Students to understand the mode of transportation and deposition environment of Marine, Fluvial, Aeolian and Tectonic influence of Sedimentary sequence.		
Unit : I	Weathering of Pre-existing Rocks – Physical and Chemical Weathering Processes. Statistical parameters of sediments Size, Shape, Sphericity, Roundness. Classification of Sedimentary rocks – General classification, Classification based on texture and composition, Genetic classification. Sedimentary Structures - Classification of Structures - Mechanical and chemical Structures; sedimentary environments and facies - facies models for Fluvial, Glacial, Deltaic, Siliciclastic shallow and deep marine environments.		
Unit : II	Nature and Origin of Sedimentary Rocks: Broad Classification and Composition of Sedimentary rocks – Textures, Structures and their Environmental Significance - Petrography of Clastic and Non clastic rocks- Mineralogy and Chemical composition of Siliceous, Iron bearing rocks - Phosphorites and Evaporites - Nodules and Diagnostic Segregates - Folk and Dunham's Classification - Lithification and Diagenesis; Quantitative grain size analysis.		
Unit : III	Transitional and Marine Environments - Products of Environment - Subsurface Environments - Subsurface pressure – Temperature – Fluids and Fluid flow in sedimentary basins- Sedimentology. Evolution of Sedimentary Basins: Tectonism and Evolution of basins, Origin of Petroleum and Gas and Metallogeny – Geophysical models and Tectonic theory.		
Unit : IV	Aeolian and Glacier deposits – Process and Depositional environment. Grain size analysis of sediments and their geological significance. Graphical representation of Textural data – Histogram, Frequency Curve, Cumulative curve. Non - Marine deposits, Transitional and marine deposits.		
Unit : V	Heavy mineral analysis, mineral geochemistry, depositional environments and provenance. Scanning Electron Microscope, Sieve analytical instruments, Heavy mineral separations (mechanical and electromagnetic).		

Reference and Textbooks:

Boggs, S. (2016). *Principles of sedimentology and stratigraphy*(5th ed.). Noida: Pearson India Education Services Pvt.Ltd.

Gokhale, N. W. (2013). *Fundamentals of sedimentary rocks*. New Delhi: CBS Publication.

Leeder, M. (2016). *Sedimentology and sedimentary basins: From turbulence to tectonics*. New Delhi: TectonicsWiley India Pvt.

MacLane, M. (1995). *Sedimentology*. New York: Oxford Univ. Press.

Nichols, G. (2012). *Sedimentology and Stratigraphy*(2nd ed.). New Delhi: Wiley India Pvt.

Paarikh, S. S. (2017). *Sedimentary rocks in the field*. New Delhi: Random Publications.

Perry, C., & Taylor, K. (2007). *Environment Sedimentology*. Newyork: Blackwell Publishing.

Reading, H. G. (2012). *Sedimentary environments: Processes, facies and stratigraphy*(3rd ed.). New Delhi: Wiley India, Pvt.

Sengupta, S. M. (2016). *Introduction to sedimentology*(2nd ed.). New Delhi: CBS Publication.

Sukhtankar, R. K. (2010). *Applied sedimentology*. New Delhi: CBS Publication.

Outcomes	➢ Interpret the processes responsible for the deposition of the sediment from the nature of the sediment and sedimentary structures present within the sedimentary rock. ➢ Recognize the methodology of carrying out scientific research in the field of Sedimentary geology.

Name of the Course Teacher: Dr. K. Prabakaran

Semester - II			
Course code: 464203	**Geomorphology**	**Credits : 5**	**Hours : 5**
Objectives	➢ Geomorphology formation and denudation of the Earth's of Earth interior, Tectonic processes, the resulting constituent rocks and the different physical environments. ➢ To understand the landforms and Earth processes - Denudational, Fluvial, Marine, Aeolian and Glacial.		
Unit : I	Basic Principles of Geomorphology Denudational Geomorphology - Process of Weathering - Types of Landforms - Resources, Hazards and Environmental appraisals and Management in Denudational Geomorphic Systems. Tectonic Geomorphology - Types of Landforms – Resources and Hazards.		
Unit : II	Fluvial Geomorphology - Drainages (Classification, Morphology and Types) - Life Cycle Of River Systems (Youthful, Mature and Old Stages), Migratory Behavior of Rivers – Resources and Hazards.		
Unit : III	Coastal Geomorphology - Coastal Zone Processes, Classification of Shorelines, Constructional and Destructional Landforms (Emerging and Submerging coasts) – Resources and Hazards.		
Unit : IV	Aeolian Geomorphology - Processes in Arid Region, Landform Types and Morphology, Resources and Hazards. Volcanic Geomorphology - Origin of Volcanoes, Landforms, Resources and Hazards.		
Unit : V	Ground Water Generated Landforms and its types - Biogenic Landforms, Glacial Geomorphology Landform Types. Major geomorphic features of India – coastal, peninsular and extra peninsular.		

Reference and Textbooks:

Chandra, S. D. (2018). *Encyclopedia of Geomorphology*. Jaipur: Oxford Book Company.

Devi, R. (2018). *Geomorphology*. New Delhi: Randson Publication.

Devi, R. (2018). *Text Book of Geomorphology*. New Delhi: Pratham Publications.

Fookes, P., Lee, E., & Griffiths, J. (2007). *Engineering geomorphology: Theory and practice*. Scotland: Whittles Publications.

Huggett, R. J. (2017). *Fundamentals of Geomorphology*(3rd ed.). London: Routledge.

Kale, V. S., & Gupta, A. (2014). *Introduction to Geomorphology*. Hyderabad: Universities Press India Pvt.

Roy, A. B. (2010). *Fundamentals of geology*. Oxford: Alpha Science International.

Summerfield, M. A. (2001). *Geomorphology and global tectonics*. Chichester: John Wiley & Sons.

Thornbury, W. D. (2019). *Principles of Geomorphology*(3rd ed.). New Delhi: New Age International.

Outcomes	➢ Students learned the morphology of the landscape and related processes in areas influenced by Fluvial, Glacial, Denudation, Aeolian, Coastal, and Arid systems. ➢ Students to gain the scientific ideas and theories about the development of the landscape and geomorphologic issues at local, regional and global scales.

Name of the Course Teacher: Dr. R. Karikalan

Semester - II			
Course code: 464501	**Natural Hazards and Management**	**Credits : 5**	**Hours : 5**
Objectives	➢ To educate the process of Natural hazards and understand the major threats to Coastal ecosystem ➢ To evaluate the disaster mitigation and understand the environment status of the environment and marine ecosystems for management the hazards.		
Unit : I	Introduction to Disaster, Hazard, Vulnerability and Risks – Disasters: Types of disasters – Earthquake, Tsunami, Landslide, Flood, Drought, Fire etc Remote sensing in Mapping of lineament , Mapping of geomorphological features, Remote sensing & GIS in Landslide vulnerability mapping-Landslide classification - Factor of safety – Risk assessment – Mitigation Strategies -Causes, Impacts including social, economic, Political, environmental and health.		
Unit : II	Remote sensing and GIS - Mapping and mitigation of disasters such as flood , Tsunami –Flood vulnerability mapping in remote sensing and GIS- Detection of causative factors of flood -Tsunami vulnerability mapping in Remote sensing and GIS- drought - Volcanic - Glacial -Salt water intrusion - Soil erosion - Reservoir Siltation — Remedial strategies -Forest fire and Environmental hazards.		
Unit : III	Coastal Protection Structures: Natural and Artificial, impact on coasts, beach stability, ocean and sea beach nourishment; interaction of waves with structures like seawalls, groins, breakwaters, revetments and replantation. Implementation of Coastal Regulation Zones and their Protection.		
Unit : IV	Disaster Prevention, mitigation and preparedness community based Disaster Risk Reduction. Roles and responsibilities of- community, Panchayat Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre		
Unit : V	Managerial organization: Role of national and international agencies and organizations in ocean management. UNESCO, FAO, IMCO, UNEP, UNDP, NIOT, NIO, MOEFs and CPCB, MPEDA.		

Reference and Textbooks:

Agardy, T. (Ed.). (1994). *The science of conservation in the coastal zone, new insights on how to designer, implements and monitor marine protected areas*(Vol. 8). Switzerland: A marine conservation and development report. IUCN, Gland.

Burby, R. J. (1999). *Cooperating with nature: Confronting natural hazards with land use planning for sustainable communities*. Boulder, CO: NetLibrary.

Gamble, J. K. (1977). *Law of the sea. Inference outcomes and problems of implementation*(E. Miles, Ed.). Ballinager: Cambridge Mass.

Godschalk, D. R. (2005). *Natural hazard mitigation: Recasting disaster policy and planning.* Washington, DC: Island Press.

Groman, J. (2002). *The Atlas of Natural Disasters*. Friedman/Fairfa Publishing.

Gubbay, S. (1995). *Marine protected areas: Principles and techniques for management*. London: Chapman & Hall.

Ingleton, J. (1999). *Natural disaster management: A presentation to commemorate the International Decade for Natural Disaster Reduction (IDNDR), 1990-2000*. Leicester: Tudor Rose.

Kelleher, G., & Phillips, A. (1999). *Guidelines for establishing marine protected areas*. Gland: IUCN.

Mileti, D. A. (1999). *Disasters by Design: A Reassessment of Natural Hazards in the United state*. Joseph Henry Press book.

Natrajan, R., Dwevedi, S. N., & Ramachandran, S. (1991). *Coastal zone management*. Chennai: Ocean data center. Anna University.

Veziroğlu, T. N. (1984). *The biosphere, problems and solutions: Proceedings of the Miami International Symposium on the Biosphere, 23-24 April 1984, Miami Beach, Florida, U.S.A.*Amsterdam: Elsevier. Waugh, W. L. (2000). *"Living with Hazards, Dealing with Disasters: An Introduction to Emergency Management"*. Newyork: Sharpe80 Business Park.	
Outcomes	➢ The students evaluate the Natural hazards, major threats to Coastal ecosystem & Disaster mitigation ➢ Students may create the awareness about the natural hazards to the public.

Name of the Course Teacher: Dr. R. Karikalan

Semester - II			
Course code: 464204	**Practical - Igneous, Metamorphic and Sedimentary Petrology**	**Credits : 2**	**Hours : 4**

1. Megascopic identification of Igneous, sedimentary and metamorphic rocks.
2. Microscopic identification of Rock Fabrics, Mineral assemblages of Igneous, sedimentary and metamorphic rocks.
3. Calculation of C.I.P.W, Norm, Niggli values - variation diagrams: Binary- Harker,
4. Niggli; Ternary variation diagrams. ACF, AKF and AFM diagrams - REE distribution patterns and Petrogenetic significance of rocks.
5. Modal analysis of rocks by point counter-Semi quantitative estimation of chemical composition of rocks, interpretation.
6. Grain size analysis of sediments – Graphical representation of data - Statistical parameters of grain size - Variation of grain size with distance of transport and their environmental interpretation
7. Exercises in grains size, Sphericity, roundness calculation –
8. Heavy mineral analysis (methods of separation and analysis. Provenance interpretation).

Name of the Course Teacher: Dr. R. Karikalan

Semester - II			
Course code: 464601	**Geological Field Tour**	**Credits : 3**	**Hours : ---**

Name of the Course Teachers: Dr. R. Karikalan &Dr. K. Prabakaran

Semester - III			
Course code: 464301	**Economic Geology**	**Credits : 5**	**Hours : 5**
Objectives	➢ Understand the fundamental of mineral exploration and distribution of mineral occurrences. ➢ Students to identify minerals and understand the method of processing the Coal and other economic minerals.		
Unit : I	Brief outline of World's mineral Resources, Mining Laws of Major and Minor minerals; NMP, NMEP. Tenor, grade, Mode of formation of mineral processes. Geologic thermometer, Magmatic differentiation, Magmatic concentration, Sublimation, contact Metamorphism / Metasomatism, Hydrothermal Process, Sedimentation, Evaporation, Residual / Mechanical concentration, oxidation and supergene enrichment.		
Unit : II	Controls of ore localization, Fluid inclusion, Metallogenetic epochs and Provinces. Classification of Mineral deposit, Bateman and Lindgren classification. Geophysical exploration of mineral deposits. Metallic mineral deposit – Geologic setting and genesis, World and Indian occurrences of Gold, Silver, Platinum, Copper, Lead, Zinc, Tin, Aluminium, Iron, Manganese, Nickel, Chromium, Cobalt, Molybdenum Tungsten, Vanadium, Uranium and Thorium.		
Unit : III	Minerals used in the manufacture of cement, Abrasives, Refractoriness, Paints, Pigments and Insulators. Strategic, Critical and essential minerals, Marine mineral resources. Mineral wealth of TamilNadu and India. National mineral policy; Mineral Concession Rules; Marine minerals resources and laws of the sea.		
Unit : IV	Coal – origin of Coal and Coalification processes, Properties of Coal; Rank, Grade, Classifications of Coal, Macroscopic and microscopic constituents of Coal, Coal Petrology; Proximate and ultimate analysis. Distribution of coal in Tamil Nadu and India. Reserve estimation of mine through UNFC.		
Unit : V	Ore microscope, Preparation of polished surface of ores, physical and optical properties of ore mineral, micro chemical techniques and application of ore microscopy. Techniques of investigation in ore mineral graphic studies.		

Reference and Textbooks:

Anthony M. Evans, (2012). *Ore geology and industrial minerals; An Introduction*, Wiley India Pvt. Ltd, New Delhi, 3rd.ed.

Baliyan, N. (2018). *Rare Earth Elements*, New Delhi, Random publication.

Bateman, A. M. (1967). *Economic mineral deposits*: 2d ed. New York: J. Wiley.

Guilbert, J.M. Park, F.C. (2015). *The geology of ore deposits*, CBS Publication, New Delhi.

Pohl, W. L. (2011). *Economic Geology: Principles and Practice*. Somerset: Wiley.

Prasad, U. (2006). *Economic geology: Economic mineral deposits*. New Delhi: CBS Pub.

Robb, L., *Introduction to Ore-Forming Processes*, Wiley India Pvt. Ltd, New Delhi.

Rodrige, A. (2018). *Coal Geology*, Oxford Book Company, Jaipur.

Thomas, L. (2012). *Coal Geology*, Willey India Pvt. Ltd, New Delhi.

Outcomes	➢ Detailed knowledge and the ability to interpret the Minerals, Coal and ore deposits. ➢ An understanding the roles of a Geologist in the Mineral exploration industries.

Name of the Course Teacher: Dr. R. Karikalan

Semester - III			
Course code: 464302	**Hydrogeology**	**Credits : 5**	**Hours : 5**
Objectives	➢ Understanding the Components of the aquifer properties, Recharge, Seawater intrusion and pump test for well design. ➢ To study on Ground water exploration, Ground water quality, Pollution and the Quality management.		
Unit : I	Hydrological cycle, origin and occurrence of Groundwater, Vertical distribution of Groundwater. Aquifer – Definition types of aquifer, water yielding properties of Rocks – Porosity, void ratio, Permeability, Specific Yield, Specific Retention, Transmissibility, Hydraulic conductivity and ranges in representative rocks. Darcy's law and its applications; Bernoulli equation.		
Unit : II	Groundwater Recharge methods – Spreading, Flooding, Irrigation, Pit, Recharge well, Watershed and management. Rainwater harvesting, Sea water intrusion – Physical and other characteristics of Sea water intrusion within coastal basin and Islands Recognition of Sea water intrusion – Prevention and control of Sea water intrusion.		
Unit : III	Pump test – Methodology and necessity for pumping test. Pump testing in non flowing wells- constant discharge test, constant draw down test, step draw down test pump test in flowing wells – Theims, Jacob's and chow's methods. Groundwater provinces of India.		
Unit : IV	Hydrological exploration – Study of water table, Surface water bodies, Springs and Seepages. Geophysical exploration methods – Gravity, Magnetic, Electrical Resistivity, Seismic - Wenner and Schlumberger – Depth sounding curving, cumulative curving and inverse slope methods of interpretation. Drilling techniques and well construction, Resistivity well logging, self potential logging.		
Unit : V	Groundwater Quality – Major ions, trace elements and Isotope applications. Water Pollution, types of pollutions and controlling methods, water purification methods. Ground water problems and Management.		

Reference and Textbooks:

Chahar, B. R. (2015). *Groundwater hydrology*. New Delhi: McGraw Hill.

Chaturvedi, M. C. (2012). *India's waters*. Boca Raton, FL: CRC Press.

Chidambaram, S. (2018). *Groundwater: Hydrogeochemical investigations of using integrated technique*. New Delhi: My Research Publications.

Davie, T., & Quinn, N. W. (2019). *Fundamentals of hydrology*. London: Routledge.

Dobrin, M. B., & Savit, C. H. (1988). *Introduction to Geophysical prospecting*. New York: McGraw-

Hill. Gokhale, N. W. (n.d.). *All about water.* Cbs & Distributor 2009.

Grughanam, B. (2009). *Essentials of Hydrogeology*, New Delhi, New India Publishing Agency.

Hammer, M. J., & J., H. J. (2005). *Water and waste-water Technology. Upper Saddle River*: Pearson Prentice Hall.

Healy, R.W. (2017). *Estimating Ground Water Recharge*, Cambridge, Cambridge University Press

Manahan, S. E. (2011). *Water chemistry: Green science and technology of nature's most renewable resource*. Boca Raton, FL: CRC Press.

Mani, J. S. (2012). *Coastal hydrodynamics*. New Delhi: Prentice-Hall of India Pte.

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<tr><td colspan="2">Mathur, S., Kumar, R., & Singh, R. (2017). Water on Earth: The Story of Its Origin, Habitats, Neglect and Regeneration. Jaipur, India: Rawat Publications.
Raghunath, H.M. (2014) Hydrology: Principles, analysis, design. New Delhi: New Age International (P) Limited.
Reimold, R. J. (1998). Watershed management. New York: McGraw-Hill.
Rizvi, S. M. (2008). Geomorphology and hydrogeology: A handbook. New Delhi: CBS & Distributors.
Tejankar A.V, (2018). Groundwater, Jaipur. Oxford Book Company
Todd, D. K. (2009). Groundwater hydrology. New delhi, India: John Wiley & Sons.</td></tr>
<tr><td>Outcomes</td><td>➢ Understand the ability to Measure the Average rainfall, Evaporation and Evapo-transpiration over a Watershed.
➢ The students can exploration the Ground water Strategy and Management the water issues.</td></tr>
</table>

Name of the Course Teacher: Dr. K. Prabakaran

Semester - III			
Course code: 464502	**Geochemistry**	**Credits : 5**	**Hours : 5**
Objectives	➢ To understand the Isotope Geochemistry, Exploration Geochemistry and Environmental Geochemistry. ➢ To know the concept of Litho & Pedo, Litho, Hydro Geochemical Survey Sand Biogeochemical surveys.		
Unit : I	Geochemical structure and composition of earth, Geochemical distribution of elements in the Geosphere, Geochemical affinity, Geochemical classification of elements. Geochemistry of Geosphere, Lithosphere, Hydrosphere, Biosphere and Atmosphere. Geochemical cycle, Geochemical mobility of ions.		
Unit : II	Mineral stability, compositional changes in minerals, Geochemistry of River Water, Seawater, Sea floor Hydrothermal systems, Ground water and Lakes. Characteristics of Magma, Melting of rocks, Water in Magmas Eutectic melting point. Distribution of trace components between rocks and melts. Geochemical keys and path finder for Elements.		
Unit : III	Isotope Geochemistry – Radioactive Decay, Determining Isotope, Decay time, Potassium – Argon Systematics, Uranium – Thorium – Lead Systematics, Types of Isotopes – Fractionation, Isotope exchange between minerals and water. Carbon, Oxygen and Sulphur Isotopes, First order decay and growth equation.		
Unit : IV	Exploration geochemistry – Primary and Secondary dispersion pattern – back ground Values. Geochemical anomaly – Geochemical sampling. Principles and techniques used in the design and implementation of Geochemical exploration survey.		
Unit : V	Environmental Geochemistry – Atmosphere Aquatic Environment – Marine, Fluvial, Lacustral and Aerosol. Lithogeochemical, Hydrogeochemical and Biogeochemical survey. Geochemical Instrumentation.		

Reference and Textbooks:

Anderson, G. M. (n.d.). *Thermodynamics of natural systems: Theory and applications in geochemistry and environmental science*, Cambridge University Press.

Brownlow, A. H. (1996). *Geochemistry.* Upper Saddle River, NJ: Prentice Hall.

Drever, J. I. (2002). *The geochemistry of natural waters: Surface and groundwater environments.* Upper Saddle River, NJ: Prentice Hall.

Faure, G. (1986). *Principles of isotope geology*. New York: Wiley.

Krauskopf, K. B., & Bird, D. K. (2003). *Introduction to geochemistry*. New York: McGraw-Hill Custom Pub.

Mason, B. (1966). *Principles of geochemistry*. New York: J. Wiley & Sons.

Mason, B., & Moore, C. B. (1982). *Principles of geochemistry*. New York: Wiley.

Misra. (2011). *Introduction to Geochemistry; Principles and Applications*. Cambridge University Press.

Rabindra, H. N. (2011). *Geochemical analysis*: Cbs & Distribu.

Winter, J. D. (2001). *An introduction to igneous and metamorphic petrology.* Upper Saddle River, NJ: Prentice Hall.

Wood, B. J., & Fraser, D. G. (1992). *Elementary thermodynamics for geologists*. Oxford: Oxford Univ. Press.

Outcomes	➢ The students to recognize the Sampling techniques and geochemical analyses. ➢ The students can interpret the various geochemical surveys.

Name of the Course Teacher: Name of the Course Teacher: Dr. R. Karikalan

Semester - III			
Course code: 464303	**Practical – Economic Geology**	**Credits : 2**	**Hours : 4**
1. Megascopic identification of metallic minerals 2. Megascopic identification of non-metallic minerals 3. Megascopic identification of industrial minerals 4. Microscopic identification of metallic minerals 5. Microscopic identification of non-metallic minerals 6. Ore reserve estimation from sampling data 7. Ore reserve computation by included, triangular and polygonal methods			

Name of the Course Teacher: Dr. R. Karikalan

Semester - III			
Course code: 464304	**Practical – Hydrogeology**	**Credits : 2**	**Hours : 4**

1. Mapping of Ground water provinces of India.
2. Drainage mapping and watershed delineation and codification.
3. Resistivity survey and interpretation for ground water targeting.
4. Working out Transmissivity, permeability and storage co-efficient using Teim, Theis, Jacob and Walton methods.
5. Mapping of areas of salt water intrusion from resistivity data.
6. Mapping of groundwater suitability for drinking, agriculture and industrial purpose.
7. Remote Sensing and GIS for artificial recharge.

Name of the Course Teacher: Dr. K. Prabakaran

Semester - IV			
Course code: 464503	**Engineering Geology, Mining Geology, Ore Processing and Environmental Geology**	**Credits : 5**	**Hours : 5**
Objectives	➢ To understand the mechanical properties of Rocks and Soils. The understood the surface and sub-surface mining exploration techniques. ➢ To explore the Knowledge of Ore Processing techniques and concepts of Environmental Geology.		
Unit : I	Engineering properties of Rocks – Dimensional stone properties and its importance, road materials and its properties. Physical and Engineering properties of Soil. Test for selecting rock sites for construction – Laboratory, Field and instrument Testing of rocks.		
Unit : II	Role of Engineering Geology in Civil Engineering projects – Dams, Reservoirs, Tunnel, Road cuts, Roads, Highways and Bridge construction, site improvement for Engineering constructions.		
Unit : III	Ore prospecting methods, sampling techniques, Ore reserve estimation methods. Classification of mining methods, Surface mining methods, Alluvial mining methods and outline of Granite mining methods. Various sub-surface mining methods, outline of underground Coal mining methods. Underground Hydraulic mining methods. Mine Machineries.		
Unit : IV	Ore dressing general principles – Size reduction, Rod, Ball and Tube mills. Screening – principles of magnetic separation and electrostatic separation. Floatation – beneficiation of Coal and some important metals – Copper, Aluminum, Iron. Gold, Manganese, Titanium, Zinc and Lead.		
Unit : V	Mining Hazards – control measures, Mining Lease –Mining Laws - Law and Regulation of coastal Mining – Environmental impact in onshore and off shore mining. Environmental impact and management plans for mining projects.		

Reference and Textbooks:

Ambasht, R. S., & Ambasht, P. K. (2016). *Environment and pollution: an ecological approach* (5th ed.). New Delhi: CBS Publishers & Distributors Pvt. Ltd.

Annadurai, R., & Nagalakshmi, R. (2016). *Text Book of Engineering Geology*. New Delhi: Ane Books Pvt. Ltd.

Arogyaswamy, R. N. P. (2017). *Course in mining geology* (4th ed.). New Delhi: CBS Publication.

Bangar, K. M. (2016). *Principles of engineering and geology.* New Delhi: Standard publisher's distributors.

Bell, F. G. (2007). *Engineering geology* (2nd ed.). Amsterdam: Butterworth-

Heinemann. Berry, W. K. (2016). *Water pollution*. New Delhi: CBS Publication.

Blyth, F. G. H., & Freitas, M. H. (2017). *Geology for engineers* (7th ed.). Boca Raton: CRC Press.

Doren, K. L. (2016). *Air pollution*. New Delhi: CBS Publication.

Garrison, T., & Ellis, R. (2018). *Essentials of oceanography*. Boston, MA: Cengage Learning.

Guha, S. K. (2010). *Induced earthquakes*. New Delhi: Springer.

Gupta, R. C. (2016). *Fuels, furnaces and refractories*. New Delhi: Prentice-Hall Of India.

Jain, S. K. (2016). *Mineral processing*. New Delhi: CBS Publication.

Kehew, A. E. (2017). *Geology for engineers and environmental scientists* (3rd ed.). Chennai: Pearson

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<tr><td colspan="2">India Education Services.
Kramer, S. L. (2014). Geotechnical earthquake engineering. Harlow: Pearson Education.
Levorsen, A. I. (2004). Geology of petroleum (2nd ed.). New Delhi: CBS Publication.
Maruthesha, R. M. T. (2017). Engineering geology; Laboratory Manual. New Delhi: MEDTECH-Scientific International Pvt. Ltd.
Moon, C. J., Whateley, M. K. G., & Evans, A. M. (2012). Introduction to mineral exploration. New Delhi: Wiley India Pvt. Ltd.
Nagesh, P. C., & Maruthesha, R. M. T. (2018). Text Book of Geology; for Engineers. New Delhi: MEDTECH-Scientific International Pvt. Ltd.
Narayanan, P. (2011). Environmental pollution: principles, analysis and control. New Delhi: CBS Publishers & Distributors PVT.
Pandey, V. kumar, & Mishra, A. (2017). Handbook of Engineering Geology. New Delhi: CBS Publication.
Parthasarathy, A., Panchapakesan, V., & Nagarajan, R. (2016). Engineering geology. New Delhi: Wiley India Pvt Ltd.
Paul, P. R. (2014). Essentials invitation to Oceanography. Burlington: Jones & Bartlett Learning.
Reynolds, S. J., Johnson, J. K., Morin, P. J., & Shaw, C. M. (2011). Exploring Geology (4th ed.). New Delhi: McGrew Hill Education Pvt. Ltd.
Sah, S. L. (2016). Mineral Exploration Industry. New Delhi: Random publications.
Sasikumar, K., & Krishna, S. G. (2015). Solid waste management. New Delhi: PHI Learning.
Singh, P. (2017). Engineering and general geology. New Delhi: S.K.Kataria & sons.
Singh, R. D. (2015). Principles and practices of modern coal mining. New Delhi: New Age International Publishing.
Sivakugan, N., Bo, M. W., & Arulrajah, A. (2011). Laboratory testing of soils, rocks, and aggregates. New Delhi: J. Ross publishing.
Subhash, R. C., & Indra, S. N. (2016). Mine and minerals economics. New Delhi: PHI Learning Pvt.
Vaidyanathan, S. (2011). An introduction to disaster management; natural disasters and manmade hazards. New Delhi: IKON Books publishers.
Venkat, R. D. (2018). Engineering Geology (2nd ed.). Noida: Vikas publishing house, Pvt Ltd.</td></tr>
<tr><td>Outcomes</td><td>➢ The students to identify the engineering properties of rocks and soft sediments assist with geological investigations for dams, reservoirs, tunnels, bridges, foundations and shore line engineering constructions.
➢ The students may acquire knowledge on mining geological investigations and mining operations.</td></tr>
</table>

Name of the Course Teacher: V. Agastheeswaran

Semester - IV			
Course code: 464504	**Petroleum Geology**	**Credits : 5**	**Hours : 5**
Objectives	➢ The students to understand the formation of Petroleum and exploration techniques. ➢ To learn the Geophysical survey and drilling methods of reservoirs.		
Unit : I	Petroleum – Composition, Origin of Petroleum – Inorganic and organic theories. Generation, Migration and accumulation of Oil and Gas. Reservoir rocks, Porosity and Permeability. Structural, Stratigraphic and combination traps. Petroleum basins in India.		
Unit : II	Reservoir pressure measurement and its significance, Geothermal gradients and its Measurements, Recovery of Hydrocarbon and reservoir management. Source and effects of Heat energy.		
Unit : III	Geophysical exploration – Seismic Refraction and Reflection method – Processing of Seismic data – Migration, Seismic interpretation – Interpretation of Geology from data, VSP (Vertical Seismic Profile) data acquisition, Gravity and Magnetic exploration Methods.		
Unit : IV	Carbon cycle, Origin, Composition and Structure of Organic matter, accumulation of Organic matter and generation of Hydrocarbon. Optical and geochemical methods for source rock characterization and maturation assessment.		
Unit : V	Well site Geological techniques, Drilling methods, well planning, classification and selection of Drilling pits. Monitoring of drilling wells. Exploration policy and project Management of Oil wells.		
Reference and Textbooks: Chandra, D., Singh, R. M., & Singh, M. P. (2000). *Text Book of Coal (Indian Context)*. Varanasi: Tara Printing Works. Glick, D. C., & Taylor, G. H. (1998). *Organic petrology: a new handbook incorporating some revised parts of Stachs Textbook of coal petrology; with 70 tables in the text*. Berlin: Borntraeger. Levorsen, A. I. (2004). *Geology of petroleum* (2nd ed.). New Delhi: CBS Publication. Russel, F. (2012). *Petroleum geology & petrography*. Nottingham: Auris Reference. Selley, R. C. (2016). *Elements of petroleum geology* (2nd ed.). New Delhi: AcademicPress. Stach, E., & Murchison, D. (1982). *Stachs textbook of coal petrology*. Berlin: Gebrüder Borntraeger.			
Outcomes	➢ The Main Technical issues in exploring Onshore and Offshore Petroleum Reservoirs using Seismology, such as in assessing the suitability of using common Seismic methods for Petroleum targets. ➢ Using various Seismic Techniques to enhance signals and suppress noise in reflection seismic data to help Detecting hydrocarbon reservoirs.		

Name of the Course Teacher: Name of the Course Teacher: Dr. R. Karikalan

Semester - IV			
Course code: 464999	**Project Work**	**Credits : 8**	**Hours : 16**

Project Dissertation:

Project Dissertation will be carried out by the student themselves with the interest of the student as well as the interest of the faculty with mutual understanding, expertise and interest. The students continuously evaluated the work carried out day to day for further events. Finally the faculty will be given instruction how to write the dissertation with different components, topics and the material, text, problems to be addressed in each assignment title. The dissertation will consist of Introduction, Review of Literature, Materials and Methods, Results and Discussion, Summary and Conclusion, References/Bibliography. Of course, appropriate statistical tools must be followed for the assessment of data. A proper preparation of Graphs, Diagrams and Flow charts must be included in the Dissertation. Appendix may also be taken into Consideration if necessary.

NME – Non Major Elective Courses offered by the Department of Geology to other Department Students.

1. **Disaster Management and Mitigation**
2. **Remote Sensing and Geographic Information Systems**

I - Non Major Elective Course Syllabus			
Course code: 464701	**DISASTER MANAGEMENT AND MITIGATION**	**Credits : 2**	**Hours : 3**
Objectives	➢ To educate the process of natural disaster and understand the major threats to Earth system. ➢ To evaluate the Disaster mitigation and understand the environment status of the Environment and marine ecosystems for management the disaster.		
Unit : I	Introduction to Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, Psychosocial.		
Unit : II	Disaster cycle - Prevention, mitigation and preparedness community based Disaster Risk Reduction. Roles and responsibilities of- community, Panchayat Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre.		
Unit : III	Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- Scenarios in the context of India - Relevance of indigenous knowledge, Appropriate technology and local resources.		
Unit : IV	Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements - Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.		
Unit : V	Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to Disaster management.		

Reference and Textbooks:

Agardy, T. (Ed.). (1994). *The science of conservation in the coastal zone, new insights on how to designer, implements and monitor marine protected areas* (Vol. 8). Switzerland: A marine conservation and development report. IUCN, Gland.

Burby, R. J. (1999). *Cooperating with nature: Confronting natural hazards with land use planning for sustainable communities*. Boulder, CO: NetLibrary.

Gamble, J. K. (1977). *Law of the sea. Inference outcomes and problems of implementation* (E. Miles, Ed.). Ballinager: Cambridge Mass.

Godschalk, D. R. (2005). *Natural hazard mitigation: Recasting disaster policy and planning*. Washington, DC: Island Press.

Groman, J. (2002). *The Atlas of Natural Disasters*. Friedman/Fairfa Publishing.

Gubbay, S. (1995). *Marine protected areas: Principles and techniques for management*. London: Chapman & Hall.

Ingleton, J. (1999). *Natural disaster management: A presentation to commemorate the International Decade for Natural Disaster Reduction (IDNDR), 1990-2000*. Leicester: Tudor Rose.

Kelleher, G., & Phillips, A. (1999). *Guidelines for establishing marine protected areas*. Gland: IUCN.

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<tr><td colspan="2">Mileti, D. A. (1999). Disasters by Design: A Reassessment of Natural Hazards in the United state. Joseph Henry Press book.
Natrajan, R., Dwevedi, S. N., & Ramachandran, S. (1991). Coastal zone management. Chennai: Ocean data center. Anna University.
Veziroğlu, T. N. (1984). The biosphere, problems and solutions: Proceedings of the Miami International Symposium on the Biosphere, 23-24 April 1984, Miami Beach, Florida, U.S.A.Amsterdam: Elsevier.
Waugh, W. L. (2000). "Living with Hazards, Dealing with Disasters: An Introduction to Emergency Management". Newyork: Sharpe80 Business Park.</td></tr>
<tr><td>Outcomes</td><td>➢ The Students Evaluate the natural hazards, major threats to Coastal ecosystem & Disaster mitigation
➢ Students may create the Awareness about the Natural Hazards to the Public.</td></tr>
</table>

II- Non Major Elective Course Syllabus			
Course code: 464705	**REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS**	**Credits : 2**	**Hours : 3**
Objectives	➢ Attain a foundational knowledge and comprehension of the principles of remote sensing. ➢ Gain basic experience in the hands-on application of remote sensing data through visual interpretation and digital image processing (ENVI, ERDAS imagine) using GIS exercises.		
Unit : I	Principles of Photogrammetry, types of Aerial photographs, Properties of aerial photos, Photographic scale. Flight planning, Parallax relief displacement and vertical Exaggeration. Stereoscopy and stereoscopes.		
Unit : II	Introduction to Remote Sensing and its components–Principles of Remote sensing-ElectroMagnetic Radiation and spectrum, Spectral signatures of Soil, Rock, Water and Vegetation; EMR interaction with Atmosphere and Earth objects. Visual Interpretation Keys and elements.		
Unit : III	Satellite data acquisition, Resolution (Spectral, Spatial, Temporal and Radiometric). Platforms – Sensors – Scanning and orbiting mechanics of satellite data – LANDSAT, IRS and SPOT series of satellites – Thermal, near infra red and Microwave Remote Sensing –High resolution satellites (IKONOS, Quick Bird) – Remote Sensing development in India		
Unit : IV	Basic of GIS – definition, components of GIS, Data structure – Point, Line Polygon. Data basic structures - Raster and Vector data structure. Data conversion (Vector to raster; raster to vector). Sources of data, Different types of data entry methods.		
Unit : V	Data analysis – Digital Elevation Model-Contour, shaded relief map, slope, drainage analysis. GPS- Basic, control and user segments. Signal components – error in GPS Observation. GPS Mapping.		

Reference and Textbooks:

Burrough, P. A., McDonnell, R., & Lloyd, C. D. (2015). Principles of geographical information systems (3rd ed.). Newyork: Oxford University Press.

Chandra, A. M., & Ghosh, S. K. (2015). *Remote sensing and geographic information system*(2nd ed.). New Delhi: Narosa Publishing House.

Chauhan, A., & Kumar, P. (2017). *Geospatial Technology and Water Management*. New Delhi: Discovery Publishing house Pvt.

Chun, Y., & Griffith, D. A. (2013). Spatial Statistics and Geostatistics: Theory and applications for geographic information science and technology. New Delhi: Publications India Pvt.

Dhawan, B. (2015). *Trends and techniques of geomorphology*. New Delhi: Random Publications.

Dwivedi, R. S., & Roy, P. S. (2016). *Geospatial technology: For integrated natural resources management*. Chennai, Tamil Nadu, India: Yes Dee Publishing Pvt.

Elangovan, K. (2006). *GIS; Fundamentals Application and Implementations*. New Delhi: New India Publishing Agency.

Foody, G. M., & Curran, J. P. (2013). Environmental remote sensing from regional to global scales. India Pvt Ltd: Wiley India Pvt.

Gaur, M. (2006). *Remote Sensing Applications in Dry land Natural Resources Management*. New

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Delhi: New India Publishing.
Gupta, R. P. (2018). Remote sensing geology (3rd ed.). Berlin: Springer-Verlag.
Jain, A. K. (2015). Fundamentals of digital image processing. Noida: Pearson India Education Services Pvt.
Jamwal, A. K., Chiranjeev, A., & Haque, A. (2010). Land use and resource management using GIS. New Delhi: Jnanada Prakashan in association with Confederation of Indian Universities.
Jensen, J. R. (2014). Remote sensing of the environment: An earth resource perspective(2nd ed.). Noida: Pearson India Education Services Pvt.
Joseph, G., & Jeganathan, C. (2018). Fundamentals of remote sensing(3rd ed.). Hyderabad, India: Universities Press.
Kumar, S. (2018). Remote sensing geology. Jaipur: Agrotech Press.
Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2015). Remote sensing and image interpretation. Hoboken: John Wiley & Sons.
Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2010). Geographical information systems and science. Chichester: Wiley.
Mallick, J., & Rahman, A. (2018). Thermal and optical remote sensing: Urban environmental studies. New Delhi: Rajat Publications.
Panda, B. C. (2005). Remote sensing: Principles and applications. New Delhi: Viva Books.
Pandey, S. N. (2015). Principles and applications of photogeology(2nd ed.). New Delhi: New Age International Publishing.
Pinder, G. F. (2013). Groundwater modeling using geographical information systems. New York: J. Wiley & Sons.
Ramasamy, S. M., & Kasturirangan, K. (2015). Remote sensing in geomorphology. New Delhi: New India Publishing Agency.
Ramasamy, S., Saravanavel, J., & Gunasekaran, S. (2016). Geomatics in applied geomorphology. New Delhi: New India Publishing Agency.
Robert, A. H. (2015). Interpretation of air photos and remotely sensed imagery. New Delhi: CBS Publication.
Samual, D. K. (2017). R statistics. New Delhi: New India Publishing Agency.
Soam, S. K., Sreekanth, P. D., & Rao, N. H. (2013). Geospatial technologies for natural resources management. New Delhi: New India Pub. Agency.
</td></tr>
<tr><td>Outcomes</td><td>➢ Students will be able to recognize and explain fundamental principles of remote sensing.
➢ Students will be able to identify the GIS applications of Land, Marine and atmospheric remote sensing and relate them to the properties of historical, current And planned remote sensing datasets.</td></tr>
</table>

CURRICULUM VITAE

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Educational qualification:

- PhD
- M.Phil
- M.Sc

Professional experience:

- Associate Professor – 22.08.2015- till
- Assistant Professor – From 22.08.2007 to 22.08.2015
- Lecturer – From 22.08.2003 to 22.08.2007

Recent publications:

- Kongeswaran, T and Karikalan, R (2019) Assessment of shoreline changes between Cuddalore and Nagapattinam coast, East coast of Tamilnadu, India using geospatial techniques, Disaster Advances 12 (12), 28-36.
- Kongeswaran, T and Karikalan, R (2018) A Study on the evolution of Coastal Geomorphology between Rameshwaram and Kilakkarai, East Coast of India,Indian J of Geo Mari Sci.
- Kongeswaran, T and Karikalan, R,(2018) A Study on the evolution of Coastal Geomorphology between Rameshwaram and Kilakkarai, East Coast of India,Indian Journal of Geo Marine Sciences.
- Kongeswaran, T and Karikalan, R (2017) A Study of Coastal Geomorphological features Changes In Part of East Coast from Cuddalore to Nagapattinam, Tamil Nadu using Remote Sensing & GIS Techniques, Geospatial Technologies for Rural Development, pp139-143.
- Kongeswaran, T and Karikalan, R (2016) Mapping of shoreline changes in between Devipattinam and Kilakkarai, Tamilnadu, Southeast Coast of Indian. Journal of Ocean Sciences 2 (1), 10-17.
- Kongeswaran, T and Karikalan, R (2016) Land use and land cover changes in the Gulf of Mannar using GIS Techniques, Journal of Ocean Sciences 2 (1), 6-13.

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Educational qualification:

- M.Sc., Ph.D.

Professional experience:

- Assistant Professor - 01.09.2015- till date
- Assistant Professor – From 24.08.2011 to 30.08.2015

Recent publications:

1. Naveen Raj T, **Prabakaran K**, Udhaya Gowtham G, Mahesh Kumar M, Aravind D, Saravana Vikash A (2016) "Landslide Hazard zonation mapping using Geospatial Technology in Bodimettu hills, Theni district, Tamilnadu" **International Journal of Engineering and Earth Sciences**, Vol.9 (4), pp.1454-1457, ISSN NO. 0974-5904. (Impact Factor: 0.042)

2. Kumar.G, **Prabakaran. K** and Selvam.G (2015) "Assessment of Groundwater Quality for Veppanthattai Taluk, Perambalur District, Tamil Nadu Using Remote Sensing and GIS Techniques" **International Journal of Recent Scientific Research**, Vol. 6, Issue 3, pp 3142-3146, ISSN NO.0976-3031.

3. Selvam. G, **Prabakaran. K**, Srinivasan. D and Kumar. G, (2015) "Assessment of Groundwater Quality in And Around Manapparai Block, Tamilnadu (India), **International Journal of Recent Scientific Research**, Vol. 6, Issue 3, pp 2903-2907, ISSN NO.0976-3031.

4. Sivapragasam. C, D. Venkat reddy, **Prabakaran. K**, M. Vigneswaran, S. Senthilkumaran, C.Sivaprasath and M. Varun kumar (2012) "Physico-Mechanical Properties of Select Granitoidal Rocks from a Part of Pandiyan Mobile Belt, India",**International Journal of Engineering and Earth Sciences**, Vol.5 (3), pp.437- 441, ISSN NO.0974-5904. (Impact Factor: 0.042)

Total Citation: 6**h-index:** 2**i10-index:** 1

CURRICULUM VITAE

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Educational qualification:

- Ph. D
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- M. Sc

Professional experience:

- Associate Professor

Recent publications:

- Priyadarsi D. Roy, Guillermo Vera-Vera Jason H. Curtis José L. Sánchez-Zavala Jesus David Quiroz-Jimenez Gowrappan Muthu Sankar, Response of arid northeast Mexico to global climate changes during the Pleistocene to the middle Holocene, Earth Surface Processes and Landforms, May 2019 on-line
- Roy, PD, Torrescano-Valle, N., Escarraga-Paredes, DS, Vela-Pelaez, AA, Lozano-Santacruz, R., Comparison of elemental concentration in near-surface late Holocene sediments and precipitation regimes of the Yucatan Peninsula (Mexico): a preliminary study, Geological and Mining Bulletin, December 2018; 129 (4), 693-706 on-line
- Torres-Rodríguez, E., Lozano-García, S., Caballero-Miranda, M., Ortega-Guerrero, B., Sosa-Nájera, S., Roy, PD, Pollen and non-pollen palynomorphs of Lake Chalco as indicators of paleolimnological changes in high-elevation tropical central Mexico since MY 5, Journal of Quaternary Science, October 2018; 33 (8), 945-957 on-line
- Montero-Martínez, G., Rivera-Arellano, J., Roy, PD, Rosado-Abón, A., Hernández-Nagay, DP Mendoza-Trejo, A., Content and composition of dissolved organic carbon in precipitation at the southern part of Mexico City, Atmosphere, July 2018; 31 (4), 331-346 on-line

Total Citation: 960**h-index:** 19**i10-index**: 32

CURRICULUM VITAE

Name : Dr. Tapas Kumar Biswal
Designation : Professor
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Educational qualification:

- Ph. D
- M. Sc

Professional experience:

- Professor

Honors and Awards:

- Departmental Awards for Excellence in Teaching, IIT Bombay, 2016.
- Excellence in Teaching Award, IIT Bombay, 2014.
- Excellence in Teaching Award, IIT Bombay, 2010.
- Recipient of National Mineral Award from Ministry of Mines, GOI, New Delhi, in Basic Geosciences, 2008 (Awarded in 2010).
- Excellence in Teaching Award, IIT Bombay, 2006.
- Won the best paper of the year 1987 medal from Mineralogical Metallurgical Society of India, Calcutta.

Recent publications:

- Tiwari, S.K. & Biswal, T.K. Palaeostress and magma pressure measurement of granite veins in the Neoproterozoic Ambaji granulite, South Delhi terrane, Aravalli–Delhi mobile belt, NW India: Implication towards the extension-driven exhumation of the middle–lower crustal rocks J Earth Syst Sci (2019)
- V Thirukumaran, TK Biswal, K Sundaralingam, V Sowmya, S Boopathi, R Mythili,Strain Pattern Analysis of Mylonites From Sitampundi-Kanjamalai Shear Zone, Thiruchengode, South India, Int J of Civil, Envir and Agri Engi (2019)
- Tiwari, S.K. , Biswal, T.K**.,** 2019. Dynamics, EPMA Th-U-total Pb monazite geochronology and tectonic implications of deformational fabric in the lower-middle crustal rocks, a case study of Ambaji granulite, NW India. Tectonics (DOI:10.1029/2017TC004891)

Total Citation: 637**h-index:** 14**i10-index:** 19

CURRICULUM VITAE

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Educational qualification:

- Ph. D
- M. Sc
- B. Ed

Professional experience:

- Professor (25 years)

Honors and Awards:

- Awarded Shiksha Rattan Puraskar from the government of Gujarat held at Mumbai

Recent publications:

- Palynodating and correlation of the Koyaguelan open cast mine, Lower gondwana, Godavari, valley coalfield, Andhra Pradesh, India authored by Madesh P et al., in African journal of Geo-science research in July 2015, 3(3): PP: 18-24.
- X-Ray diffraction Studies of Carbonate rocks around Western part of Palnad Sub Basin, Guntur District, Andhra Pradesh, P.Lokesh Bharani., S Baby Shwetha., P.Madesh., D. Shivakumar, International Journal of Advanced Research in IT and Engineering, Vol.4, No 7, PP: 1-7.
- Studies on soil types and its characteristic features in yalandur taluk of Chamarajanagar district, Karnataka State, authored by S.Baby Shwetha, P.Madesh and P.Lokesh Bharani, published in Indian Journal of Applied Research, Vol.2, Issue 10, Oct 2013, PP:168-171.
- Sedimentalogical aspects of Palnad basin, Kurnool Group, Andhra Pradesh, authored by P.Madesh, P.Lokesh Bharani and S.Baby Shwetha, published in PARIPEX- Indian Journal of Research, Vol.2, Issue 10, October 2013, PP: 166-167.

CURRICULUM VITAE

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Educational qualification:

- Ph. D
- M. Sc

Professional experience:

- Professor
- Associate Professor

Honors and Awards:

- Best Researcher Award received from EET CRS Science & Technology Awards, New Delhi
- Distinguished Scientist Award received from the Venus International Foundation Research Awards (VIFRA), Chennai
- Jawaharlal Nehru Memorial Fund (JNMF) Award in M.Sc. Degree for securing First Rank.

Recent publications:

- Mohammed Noohu Nazeer, S.M Hussain, N. Mohammed Nishath, V.M Krishna and D.Sunitha - Granulometric studies, rate of sedimentation and Ostracod distribution from a short core off Ongole coast, Andhra Pradesh, Bay of Bengal". Jour. Pal. Soc. India, vol.63, no.1, pp.111-118, June, 2018.
- Nimmy, P. M., Rajeshwara Rao, N., Nandita Nandan, T., Neelavannan, K. and Hussain, S. M. - Textulariid and Miliolid Foraminifera from a 50 cm core segment from the Arabian Sea International Journal of Creative Research Thoughts (IJCRT 2018 IJCRT), Vol. 6, Issue 2, April 2018, ISSN: 2320-2882, pp.957-973.
- S M Hussain, P Mahalakshmi and S Selvasundaram - Distribution of Ostracods in the Mangrove Location of Pulicat Lagoon,Tamil Nadu, South East Coast of India (April 2018). Asian Academic Research Journal of Multidisciplinary, vol.5, issue 4, pp. 234-250 (ISSN: 2319-2801).
- Shubhangi T. Fulmali1, S. M. Hussain, Sunitha D., and S. K. Humane - Diatoms Distribution and its Paleoenvironmental Implications in Pulicat Lagoon Tamil Nadu South East Coast of India. International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064, Volume 6 Issue 12, December, 2017.

Total Citation: 593h-index: 13i10-index: 23

CURRICULUM VITAE

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Educational qualification:

- Ph. D
- M. Phil
- M. Sc

Professional experience:

- Associate Professor - Pondicherry University
- Associate Professor – Annamalai University
- Reader – Annamalai University
- Senior Lecturer – Annamalai University
- Lecturer – Annamalai University

Honors and Awards:

- Panikishore award for Young Scientist and Best Paper presentation - Association of Hydrologists of India
- Honorary advisor - VRV consultants Pvt. Ltd.

Recent publications:

- S Gopinath, K Srinivasamoorthy, K Saravanan, R Prakash (2019) Tracing groundwater salinization using geochemical and isotopic signature in Southeastern coastal Tamilnadu, India,Chemosphere.
- K Srinivasamoorthy, G Ponnumani, S Gopinath, R Prakash (2019) Assessment of Radon in groundwater and associated human risk from Sankarabarani River Sub Basin, Southern India, Int J of Civil, Envi and Agri Engi.
- S Gopinath, K Srinivasamoorthy, K Saravanan, R Prakash, D Karunanidhi (2019) Characterizing groundwater quality and seawater intrusion in coastal aquifers of Nagapattinam and Karaikal, South India using hydrogeochemistry and modeling techniques, An Int J; Human & Ecol Risk Assessment

Total Citation: 2015**h-index:** 26**i10-index:** 45

CURRICULUM VITAE

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Educational qualification:

- Ph. D
- M. Sc

Professional experience:

- Scientist in Geological Survey of India – from 1986 to 1993
- Scientist in Central Groundwater Board – from 1993 to 2007
- Additional Charge in AMSE wing – form 2007 to 2010
- Scientist in Geological Survey of India, Shillong – form 2011 t 2012
- General Manager, Geology in Neyveli Lignite Corporation – from 2012 to till

Honors and Awards:

- CBIP award in 2016

CURRICULUM VITAE

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