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 Deemed University

2018 MHRD Swachh Campus Rank : 4

2021 nirf National Institutional Ranking Framework Rank : 33

2021 QS University Rankings Asia Rank : 199

FACULTY OF SCIENCE

DEPARTMENT OF GEOLOGY

M.Phil., GEOLOGY

REGULATIONS AND SYLLABUS

(For the candidates admitted from the Academic Year 2022 - 2023)

DEPARTMENT OF GEOLOGY
M.PHIL. GEOLOGY

REGULATIONS AND SYLLABUS

[For the candidates admitted from the Academic Year 2022 – 2023 onwards]

ALAGAPPA UNIVERSITY

(A State University Accredited with "A+" grade by NAAC (CGPA: 3.64) in the Third Cycle andGraded as Category-I University by MHRD-UGC)

Karaikudi - 630003, Tamil Nadu

The Panel of Members-Broad Based Board of Studies

Chairperson: Dr. V. Sugumar, Designation: Assistant Professor and Head i/c, Department of Geology, Alagappa University, Karaikudi, Teaching Experience:14 Years, Research Experience: 14 Years, Area of Research: Crustacean Biology & Marine Biomaterials	
Foreign Expert: Name: Dr. M. V. Prasanna, Designation: Associate Professor and Head, Department of Applied Geology, University: Curtin University, Malaysia, Teaching Experience:15, Research Experience:15, Area of Research: Hydrogeochemistry, geophysics, Metal Pollution.	
Indian Expert: Name: Dr. Shaik Mahammad Hussain, Designation: Professor and Head, Department of Geology, University of Madras, Chennai, Tamilnadu. Teaching Experience: 30, Research Experience:32, Area of Research: Environmental Micropaleontology.	
Indian Expert: Name: Dr. M. Satyanarayanan, Designation: Principal Scientist, CSIR- National Geophysical Research Institute, Research Experience:18 Years, Area of Research: Geochemistry	
Service Organization Expert: Name: Dr. M. Sundararajan, Designation: Principal Scientist, National Institute for Interdisciplinary Science & Technology (NIIST), Kerala, Experience: 18 Years Area: Sedimentology, Remote Sensing and GIS	
Members (All Department faculty)	
Name: Dr. K. Prabakaran, Designation: Assistant Professor, Department of Geology, Alagappa University, Karaikudi, Teaching Experience: 6 Years, Research Experience: 6 Years, Area of Research: Hydrogeology	
Alumnus/Alumna: Name: Mr. S. Ramanathan, No. 5 Udhayam Nagar 1st Street Old GH Back Side, Karaikudi	

M.PHIL. GEOLOGY

CREDIT STRUCTURE

Course Code	Course / Title	Credit	Hours/ Week	Marks		
				Internal	External	Total
I SEMESTER						
466101	**Course - I** Research Methodology	4	4	25	75	100
466102	**Course - II** Recent Advances in Geology	4	4	25	75	100
466103	**Course – III** General Skills in Science	4	4	25	75	100
	Library/ Literature Collection/ Discussion		18	-	-	-
	Total	**12**	**30**	-	-	**300**
II SEMESTER						
466201	**Course - IV** Recent Advances in Hydrogeology – (Area of Specialization)	4	4	25	75	100
	Library/ Literature Collection/ Discussion		10	-	-	-
466999	Dissertation & *Viva Voce*	8	16	50	150	200
	Total	**12**	**30**	-	-	**300**
	Grand Total	**24**	**60**	**150**	**450**	**600**

ALAGAPPA UNIVERSITY
DEPARTMENT OF GEOLOGY

Karaikudi -630003, Tamil Nadu.

REGULATIONS AND SYLLABUS-(CBCS-University Department)

[For the candidates admitted from the Academic Year 2022 – 2023 onwards]

Name of the Department: **Department of Geology**

Name of the Subject Discipline: **Geology**

Programme of Level: **Master of Philosophy**

Duration for the Course: Full Time (One Year)

1. Choice-Based Credit System

A choice-Based Credit System is a flexible system of learning. This system allows students to gain knowledge at their own tempo. Students shall decide on electives from a wide range of elective courses offered by the University Departments in consultation with the Department committee. Students undergo additional courses and acquire more than the required number of credits. They can also adopt an inter-disciplinary and intra-disciplinary approach to learning, and make the best use of the expertise of available faculty.

2. Programme

"Programme" means a course of study leading to the award of a degree in a discipline.

3. Courses

'Course' is a component (a paper) of a programme. Each course offered by the Department is identified by a unique course code. A course contains lectures/ tutorials/seminar/project / practical training/report writing /Viva-voce, etc or a combination of these, to meet effectively the teaching and learning needs.

4. Credits

The term "Credit" refers to the weightage given to a course, usually in relation to the instructional hours assigned to it. Normally in each of the courses credits will be assigned on the basis of the number of lectures/tutorial/laboratory and other forms of learning required to complete the course contents in a 15-week schedule. One credit is equal to one hour of lecture per week. For laboratory work one credit is equal to two hours.

5. Semesters

An Academic year is divided into two **Semesters.** In each semester, courses are offered in 15 teaching weeks and the remaining 5 weeks are to be utilized for conduct of examination and evaluation purposes. Each week has 30 working hours spread over 5 / 6 days a week.

6. Medium of Instruction: English

7. Departmental committee

The Departmental Committee consists of the faculty of the Department. The Departmental Committee shall be responsible for admission to all the programmes offered by the Department including the conduct of entrance tests, verification of records, admission, and evaluation. The Departmental Committee determine the deliberation of courses and specifies the allocation of credits semester-wise and course-wise. For each course, it will also identify the number of credits for lectures, tutorials, seminars etc. The courses are designed by teachers and approved by the Departmental Committees. Courses approved by the Departmental Committees shall be approved by the Board of Studies/Broad Based Board of Studies. A teacher offering a course will also be responsible for maintaining attendance and performance sheets (CIA -I, CIA-II, assignments and seminar) of all the students registered for the course. Mentor is responsible for submitting the performance sheet to the Head of the department. The Head of the Department consolidates all such performance sheets of courses pertaining to the programmes offered by the department. Then forward the same to be Controller of Examinations.

8. Programme General Objectives- (PGO) Minimum 6 objectives are required

PGO -1	To develop the interest and broaden the understanding of subjects in Geology
PGO -2	To provide the enriching and transformative educational experience for our students with a strong foundation of vital and practical knowledge in geological sciences.
PGO -3	To promote significant pedagogical and research practices within and outside the sector to enable our students to think critically, visualize and produce ideas with innovation and application.
PGO -4	To impart them, necessary skills like problem-solving, communication, interpersonal and leadership skills which they can transfer to their career or profession that they wish to track.
PGO -5	Demonstrate the ability to conduct independent basic or applied research
PGO -6	To engage actively with relevant stakeholders and society in general, via participation, co-operation and consultation outside the traditional limitations of the branch, locally, nationally and globally.

9. Programme Specific Objectives-(PSO)- Minimum 6 objectives are required

PSO-1	To design and expand scientific tools to study and examine the earth processes and geo-resources
PSO-2	To prepare students for careers in the field of Geology
PSO-3	To impart knowledge of Geology with special prominence on various applied aspects of earth science.
PSO-4	To enhance knowledge of applied Geology with more refined tools and techniques
PSO-5	To develop practical skills through filed exposure
PSO-6	To develop project executive skills via dissertation on different aspects of geology

10. Programme Outcome-(PO) - Minimum 6 objectives are required

PO-1	Students will acquire a solid base of knowledge in the science of geology
PO-2	The student will acquire knowledge regarding advanced technologies in geology
PO-3	The learner will be enhanced with scientific skills to promote research and development activities
PO-4	Gain an understanding of the societal relevance of earth systems
PO-5	Students will join in various premier government and private organizations
PO-6	Students will develop the aptitudes and dispositions necessary to help democratize society by obtaining and maintaining employment as a professional geologist

11. Eligibility for admission

The Master Degree under 10+2+3+2 pattern of education in Geology with a minimum of 55% of marks and above, or equivalent CGPA. However, the minimum marks for the SC/ST students would be 50%.

12. Minimum Duration of programme

The programme is for a period of one academic year. The year shall consist of two semesters viz. Odd and Even semester. Each semester there shall be not less than 90 working days.

13. Components

A M. Phil programme consists of a number of courses. The term “course” is applied to indicate a logical part of the subject matter of the programme and is invariably equivalent to the subject matter of a “paper” in the conventional sense. The following are the various categories of the courses suggested for the M. Phil programme:

A. Core courses (CC)- "Core Papers" means "the core courses" related to the programme concerned and project work offered under the programme and shall cover core competency, critical thinking, analytical reasoning, and research skill.

B. Dissertation (Maximum Marks: 200**)**

The duration of the Dissertation shall be a minimum of three months in the fourth semester.

- **Plan of work**

<u>Dissertation</u>

The candidate shall undergo Dissertation Work during the final semester. The candidate should prepare a scheme of work for the dissertation and should get approval from the guide. The candidate, after completing the dissertation work, shall be allowed to submit it to the university department at the end of the final semester. If the candidate is desirous of availing the facility from other departments / universities / laboratories / organizations they will be permitted only after getting approval from the guide and HOD. In such a case, the candidate shall acknowledge the same in their dissertation/project work.

- **No. of copies of the dissertation/project report/internship report**

The candidate should prepare four copies of the dissertation and submit the same for the evaluation of examiners. After evaluation, one copy will be retained in the department library and one copy is to be submitted to the University (Controller of Examinations) and one copy for guide and one copy can be held by the student.

- **Format to be followed for dissertation report**

The format /certificate for thesis to be followed by the student are given below

- Title page
- Certificate
- Acknowledgment
- Content as follows:

Chapter No.	Title	Page number
1	Introduction	
2	Aim and objectives	
3	Materials and methods	
4	Result	
5	Discussion	
6	Summary	
7	References	

- **Format of the title page**

Title of Dissertation work

Dissertation submitted in partial fulfilment of the requirement for the degree of Master of Philosophy to the Alagappa University, Karaikudi -630003.

By

(Student Name)
(Register Number)
University Logo

Department of Geology

Alagappa University

(A State University Accredited with "A+" grade by NAAC (CGPA: 3.64) in the Third Cycle andGraded as Category-I University by MHRD-UGC, 2019: QS ASIA Rank- 216, QS BRICS Rank-104,QS India Rank-20)

Karaikudi - 630003

(Year)

- **Format of certificates**

Certificate -Guide

This is to certify that the **Dissertation** entitled "----------" submitted to Alagappa University, Karaikudi-630 003 in partial fulfilment for the degree of Master of Philosophy in Geology by Mr/Miss ---------- (Reg No) under my supervision. This is based on the results of studies carried out by him/her in the Department of Geology, Alagappa University, Karaikudi-630 003. This dissertation or any part of this work has not been submitted elsewhere for any other degree, diploma, fellowship, or any other similar titles or record of any University or Institution.

Research Supervisor

Place: Karaikudi
Date:_____

Declaration (student)

I hereby declare that the dissertation entitled **"----------"** submitted to the Alagappa University for the award of the degree of Master of Philosophy in Geology has been carried out by me under the guidance of Dr. **----------**, Assistant Professor, Department of Geology Alagappa University, Karaikudi – 630 003.This is my original and independent work and has not previously formed the basis of the award of any degree, diploma, associateship, fellowship, or any other similar title of any University or Institution.

Place: Karaikudi **(----------)**
Date:_____

14. Teaching methods:

The classroom teaching would be through conventional lectures and use of OHP and Power Point presentations. The lecture would be in such a way that the student should participate actively in the discussion. Student seminars shall be conducted and scientific discussions shall be arranged to improve their communicative skill. Periodic tests shall be conducted and special attention would be given to the slow learning students.

15. Attendance

Students must have earned 75% of attendance in each course for appearing for the examination. Students who have earned 74% to 70% of attendance need to apply for condonation in the prescribed form with the prescribed fee. Students who have earned 69% to 60% of attendance need to apply for condonation in the prescribed form with the prescribed fee along with the Medical Certificate. Students who have below 60% of attendance are not eligible to appear for the End Semester Examination (ESE). They shall re- do the semester(s) after completion of the programme.

16. Examination

The examinations shall be conducted for theory to assess the knowledge required during the study. There shall be two systems of examinations viz., internal and external examinations. The internal examinations shall be conducted as Continuous Internal Assessment tests I and II (CIA Test I & II).

A. Internal Assessment

Theory -25 marks

Project -50 Marks (assessed by Dissertation supervisor)

B. External Examination

Theory - 75 marks

Project and Viva Voce -150 Marks (assessed by Guide/HOD/External Examiner)

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.

At the end of second semester, viva-voce will be conducted on the basis of the Dissertation report submitted by the student. One internal and one external examiner (Head of the Department (HOD) will conduct the viva-voce jointly.

C. Scheme of External Examination (Question Paper Pattern)

Theory - Maximum 75 Marks

M.Phil. Geology
466XXX: Course title
(2022-23 onwards)

Time: 3 Hours Max. Marks – 75

Answer all questions. All questions carry equal marks. (5 × 15 = 75 marks)

1. either or type question from UNIT I
2. either or type question from UNIT II
3. either or type question from UNIT III
4. either or type question from UNIT IV
5. either or type question from UNIT V

Dissertation - Scheme of evaluation

Dissertation	100 Marks
Internal (Dissertation Supervisor)	50 Marks
Viva voce	50 Marks
Total	200 Marks

17. Results

The results of all the examinations will be published through the Department where the student underwent the course as well as through University Website

18. Passing minimum

The candidate shall be declared to have passed the examination if the candidate secures a minimum of 50% in the University external examination and 50% of the total (Int+Ext) marks. For the dissertation work and viva-voce, a candidate should secure 50% of the marks for pass. The candidate should compulsorily attend viva-voce examination to secure pass in that course. Candidate who does not obtain the required minimum marks for a pass in a Course/dissertation report shall be required to reappear and pass the same at a subsequent appearance.

19. Classification of the successful candidate

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First class. All other successful candidates shall be declared to have passed in the Second class.

Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in First class with Distinction provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the programme in the first instance and within a period of one academic year from the year of admission to the programme only are eligible for University Ranking.

A candidate is deemed to have secured first rank provided he/she

(i) should have passed all the papers in first attempt itself

(ii) should have secured the highest overall grade point average (OGPA)

20. Maximum duration of the completion of the programme

The maximum period for completion of M.Phil., Degree in Geology shall not exceed ten semesters continuing from the first semester.

21. Conferment of the Degree

A candidate shall be eligible for the conferment of the Degree only after he/ she has earned the minimum required credits for the Programme prescribed therefore (i.e. 24 credits).

22. Commencement of this Regulation

These regulations shall take effect from the academic year 2022-23 i.e., for students who are to be admitted to the first year of the programme during the academic year 2022-23 and thereafter.

Semester - I			
Coursecode: 466101	**Research Methodology**	**Credits : 4**	**Hours : 4**
Objectives	➢ To learn the research methods and how to write the thesis. ➢ To understand the field instruments and collecting of samples ➢ To analyze the samples and generate the data.		
Unit : I	**INTRODUCTION TO RESEARCH** Definition – Scientific Method – Bias and Prejudice in Scientific research – Hypothesis, Theory and Scientific Law – Research design – Preparation of Research project – Report writing.		
Unit : II	**THESIS WRITING** Structure of thesis – Copyright Waiver – Declaration – Title page – Abstract – Acknowledgments – Table of contents – Introduction – Literature review – Materials and Methods – Theory – Research and discussion – Conclusions and suggestions for further research work – Summary References – Bibliography – Footnotes and Endnotes and Appendices.		
Unit : III	**FIELD WORK IN GEOLOGY** Field instruments (Geological Rock Hammer, Brunton, GPS, Altimeter, Pedometer), Essentials of topographic and geological maps and mapping – Pre – requirements and sampling of geological specimens (fossils, rocks, minerals ,oriented rocks, oriented minerals, groundwater and unconsolidated sediments), Measurements of structural features in rock types – bedding, lineation, fold, fault, shear zone and unconformity.		
Unit : IV	**INSTRUMENTATION AND LABORATORY PROCEDURE** General principles, description and uses of following: Polarizing microscopes, Ore microscopes, Scanning Electron Microscope, Mirror stereoscope, Heavy mineral separators (mechanical and electromagnetic). Analytical instruments: General Principles, description and uses of following; XRF, XRD, Atomic Absorption Spectrophotometer, Electron Probe Micro Analyzer, Inductively Coupled Plasma – MS. Publication Ethics		
Unit : V	**PUBLICATION ETHICS** Publication ethics: definition, introduction and importance - Best practices / standards setting. Initiatives and guidelines: COPE, WAME, etc. - Conflicts of interest - Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types - Violation of publication ethics, authorship and contributor ship - Identification of publication misconduct, complaints and appeals - Predatory publisher and journals.		

Suggested Readings:-

Philips, E.M and Pugh, D.S., 1994. 'How to get a PhD: a handbook for students and their supervisor's. Open University Press, Buckingham, England.

Tufte, E.R., 1983. 'The visual display of quantitative information'. Graphics Press, Cheshire.Mishra R.P., Research Methodology. Concept Publishing Co, New Delhi.

Lahee H., 1959. Field geology, McGraw – Hill.

Babu S.K and Sinka D.K (1987) Practical Manual for Sedimentology CBS publishers and Distributors.

Outcomes	➢ To understood the research methodology and thesis writing. ➢ Realized how to operate the field instruments and collect the samples. ➢ Gain the knowledge about generate data and interpreted the results.

Semester - I			
Course code: 466102	**Recent Advances in Geology**	**Credits : 4**	**Hours : 4**

Objectives	➢ To learn the physical and structural components. ➢ To learn the sedimentology and geochemistry importance and its advances ➢ To understand the petrology, hydrology, remote sensing and GIS recent techniques.
Unit : I	**PHYSICAL GEOLOGY AND STRUCTURAL GEOLOGY:** Glacier, Seas and Ocean; Earthquake, Volcanoes, Landslides. Coastal Vulnerability studies using Geospatial Technology, Major tectonic forces, Micro tectonism; Folds, Faults and their mechanism, Stereographic projection analysis of dip and strike problem, Thickness calculation of Sandstone.
Unit : II	**HYDRO GEOLOGY** Watershed Management, Morphometric analysis of any land forms; Water qualities-Major ion, Trace element and Isotopes. Geophysical Resistivity Methods – Wenner and Schlumberger method, Well logging techniques: River linking and Conjunctive use of ground water, Rain water Harvesting, Aqueous geochemical modelling, HYCH environmental computer programme. Major river basins in Tamilnadu.
Unit : III	**REMOTESENSING AND GIS:** Digital photogrammetry, DEM and its application of SRS – Interaction with EMR, Geological application of Satellite data, Fundamentals of GIS, Vector and Raster data, Buffering, Overlay analysis, GIS application for Geological studies.
Unit : IV	**SEDIMENTOLOGY AND GEOCHEMISTRY**: Statistical methods and computer applications in Sedimentology - Stable and Radiogenic isotope geochemistry of rocks - Mobile belts and their relation with Cratons and formations of Granulites, Anorthosites and Granites - Plate Tectonics, Generation of magmas and their evolution.
Unit : V	**GEOLOGY OF TAMIL NADU:** Petroliferous basins of India - Important petroliferous reservoirs of East and West Coasts of India viz., Bombay offshore Basin, Cambay Basin, Cauvery Basin, Krishna-Godavari (K-G Basin) and Assam Shelf Basin.

Suggested Readings:-

Thornbury W.D (2002) Principles of Geomorphology, New Age international Pvt Ltd,New Delhi

Valdiya K.S (1987) Indian contex tata McGrau Hill, New Delhi. Environmental Hazards and Management.

Singh R.B(2006) Natural Hazards and Disaster Management Edward; Frederick, and Dennis (2016).

Henderson P ,1982 Inorganic geochemistry, Pergamon press Ltd. England

G.Davis “Statistical and Data Analysis in Geology” 2nd Edition, Wiley Inter

Isobel Clark – Practical Geostatistics.

KrumbeinW.C.andPettijohn F.J., Manual of Sedimentary Petrology, 1938

Outcomes	➢ To understood the physical and structural components. ➢ Realized the sedimentology and geochemistry importance and its techniques. ➢ To gain the recent advances of geological sciences.

Semester - I			
Course Code: 466103	**General Skills in Science**	**Credits : 4**	**Hours : 4**

Objectives	➢ To learn the computer operating skills. ➢ To learn the pedagogical science and communication skills ➢ To understand the learning and teaching skills.
Unit : I	**INTRODUCTION TO COMPUTERS** Computer Hardware: input devices and media – magnetic device and media – output devices and media – storage device and media - computer architecture – system software: types, operating system, and translators – Application software: types of language – application packages – integrated software - Introduction to operating system - Working with windows and office programs – Internet, Website and Email.
Unit : II	**COMPUTER OPERATING SKILLS** Starting a program and opening a document – saving and naming the document- create file and folders – deleting and un-deleting a document – closing a document – renaming and moving a document – finding a document- MS office: Word, Excel, Access, power point, out look and integrated office applications –C programming – Principles, classes and structure of C^{++} Programming.
Unit : III	**COMMUNICATION SKILLS IN ENGLISH** Understanding communication – greeting and introducing – making requests – asking for and giving permission – offering help – giving instruction and directions- art of small talk – participating in conversation – making a short formal speech –Describing the people, place, events and things. Telephone skill: understanding, handling calls, leaving message and making request. Written communication: report writing, note making - career skills: curriculum vitae and cover letters - Facing an interview and presentation skills – academic listening.
Unit : IV	**PEDAGOGICAL SKILL FOR SCIENCE TEACHERS** Science Teacher: Qualification, teacher competencies and professional growth. Theory and models of curriculum development: Concept and Technical scientific models of curriculum development - planning a science library – Handling of practical classes. Educational technology and classroom pedagogy: Educational Technology – Concept, Emerging technologies- New technologies on methodology of teaching, learning experiences and curriculum development. Micro-teaching: Meaning, teaching, skill of stimulus variation, questioning, explanation, reacting, linking and benefits.
Unit : V	**PRACTICAL TRAINING** Preparation of charts and models for handling classes of science teacher - Creating management documents e.g. Curriculum Plan, Time Table scheduling, Evaluation- Strategies etc – Learning to write and draw on the blackboard - Preparation of over head projector presentations - Preparation of power point/LCD presentations – Preparation of micro-teaching skills — Preparation of teaching materials – seminar classes for PG students- Preparation of album.

Suggested Readings:-

W.Joseph, Habraken, Microsoft office 2003, All in one, Que publishing, 2004.

Curtis Frye, Microsoft office Excel 2003 step by step, Microsoft press, 2004.

Greg Harvey, Microsoft office Excel 2007 for dummies, For Dummies, 2006.

Guy Hart-DEavis, How to do everything with Microsoft office word 2007, Mac Graw-Hill professional, 2007.

Jim Boyce, Absolute beginner's guide to Microsoft office 2003, Que publishing, 2003.

Benny Raphael, F.C. Smith, Fundamentals of computer- aided engineering, John wiley&sons, 2003.

Dietel, "An introduction to operating system", AddisionWesley .

Ravi Sethi , "Principles of Programming Languages", Addison Wesley.

E.Balagurusamy, C^{++} programming, Tata Mc Graw Hill, New Delhi, 1995.

B.S.Gottfried, theory and programming with C, Mc Graw Hill publishers, New Yark, 1990.

L. Acklen et al , Microsoft office 97 professional Essentials, Prentice – Hall India, 1998.

Shelley O'Hara, Discover Office 97, Comdex computer publishing, 1997.

Harry chambers, Communication skills for scientific and technical professional, Perseus, 2001.

Outcomes	➢ To understand the computer operating skills. ➢ Realized the pedagogical science and communication skills ➢ To gain the learning and teaching skills.

Semester-II			
Course Code: 466201	**Recent Advances in Hydrogeology (Specialization)**	**Credits: 4**	**Hours:4**
Objectives	➢ Understanding the Components of the aquifer properties, recharge, seawater intrusion and pump test for well design. ➢ To study on ground water exploration, groundwater quality, pollution and the quality management.		
Unit: I	Scope and application of geohydrology – Ground water and hydrologic cycle – Components such as precipitation, evapotranspiration, infiltration, surface runoff and sub-surface distribution and movement of ground water and their estimation for the purpose of assessing water availability – Lithological, strati graphical and structural controls in occurrence and movement of ground water - Water-bearing properties of rock formations		
Unit: II	Porosity, permeability, compressibility of rocks, specific yield, hydraulic conductivity and storativity. Darcy's experiment, fluid pressure and hydraulic head. Types of aquifers: confined, semi-confined and unconfined aquifers and their characteristics – Springs - Types of ground water flow – Derivation of equations for steady and unsteady flow.		
Unit: III	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.		
Unit: IV	Types of water wells – Drilling techniques – Rotary and percussion drills – Well design and construction. Water well development methods – Collector wells and infiltration galleries – Types of pumps. Ground water contamination and pollution – Urban, agricultural and industrial contamination, remedial measures.		
Unit: V	Sea water intrusion in coastal aquifers, hydrodynamic equilibrium of fresh and saline water – Methods of controlling sea water intrusion – Exploration for ground water – Geological methods, Remote Sensing techniques, geomorphological inputs, gravity, magnetic, seismic and electrical methods of exploration.		

Suggested Readings:-

Agency.Chahar,B. R.(2015). Groundwater hydrology. NewDelhi:McGraw Hill.Chaturvedi,M. C.(2012).India's waters.Boca Raton, FL:CRC Press.

Chidambaram,S.(2018).Groundwater: Hydrogeochemicalinvestigation so fusing integrated technique. NewDelhi: My Research Publications.

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

Healy, R.W. (2017). Estimating Ground Water Recharge, Cambridge, Cambridge University PressRaghunath,H.M.(2014)Hydrology:Principles,analysis,design.NewDelhi:NewAgeInternational(P)Limited.

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

Rizvi, S. M. (2008). Geomorphology and hydrogeology: A handbook. New Delhi: CBS & Distributors.Tejankar A.V,(2018). Groundwater, Jaipur. Oxford Book Company

Outcomes	➢ Understand the ability to measure the average rainfall, evaporation and explore the water quality and seawater intrusion. ➢ The scholars can exploration the ground water strategy and management of the water issues .

Semester - II			
Course code: 466999	**Dissertation & Viva Voce**	**Credits : 8**	**Hours : 8**

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SCIENCE CAMPUS