

SCHOOL OF EARTH AND ATMOSPHERIC SCIENCES

The School of Earth and Atmospheric Sciences (SEAS) is comprised of the Departments of **Applied Geology, Geology, and Geography**.

Of three Departments, **the Department of Geography** has been the oldest one. In July 1932, the Geography Department has commenced teaching of Diploma in geography for the benefit of graduates of both science and humanities subjects. **M.Sc Applied Geography** as an academic programme has been started in the University Department in the year 1976. The Department has been the centre for a number of national and international seminars and workshops. To meet the demands of IT opportunities in mapping, the Department has started (a) Industry oriented **P.G. Diploma in GIS Management** and (b) **M.Sc. Spatial Information Technology**, in addition with the existing PG programme. The Ph.D programme of the Department has been known for its Multi-disciplinary approach.

The Department is an **Advanced Centre for GIS** related studies. It has got proven record in the thrust research areas of Resource Analysis for Sustainable Development, Geo-remediation in terms of the context of climatic and land management, Social area evaluation planning and EIA for human welfare. The Department has established state of art Laboratory for Digital Mapping and Spatial Analysis. It is equipped with Windows NT 2000, and Linux servers, intelligent nodes with 17/19 inch monitors. The Lab. Is supported by AO plotter, printer, scanner and digitizing table advanced software - Arc GIS, ERDAS, IDRISI, Geomedia professional, Geomatica, ENVI, Mapinfo, and Microstation.

The Department has established collaboration with Universities in Canada, USA, Japan, The Netherlands and Australia. It is being supported by the University Grants Commission (UGC) under Special Assistance Programme (SAP) and Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions (FIST) Programme of DST.

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The **Geology** department concentrates on Micropaleontological Studies including Paleoenvironment, Stratigraphy, Micropaleontology of Seas and Oceans, Igneous and Metamorphic Petrology, Geochemistry, Environmental Geology, Sedimentology and Sedimentary Petrology, Marine Geology, Petrography of Construction sands and Monumental stones, Aquifer sands, Oil well and reservoir studies, Sedimentary Pollution and Hydrology. The sophisticated facilities and equipment of Geology department are: Computers, Micropaleontology Laboratory, Sample Processing Laboratory, Petrological Laboratory, Geo-chemical Laboratory and Hydrogeology Laboratory. With these facilities Consultancy work can be undertaken in the following areas : Sedimentary, Petrology and Sedimentology, Marine Geology, Sedimentary Stratigraphy, Petrography of construction sands, Petrography of monumental stones (Archaeology), Aquifer sand study, Sedimentary Mapping - Limestone spread and quality assessment; sedimentology of Ceramic raw materials such as clays and other minerals; Environmental assessment in the areas of sand mining; Sedimentary, Petrological Studies in Petroleum industry and Coal, Lignite areas; Aqua-soil-sediment Pollution studies.

The Department of **Applied Geology** was established in the University of Madras in 1952 and has been functioning since then in the Guindy Campus, A.C.College Buildings, Chennai - 25. During the last four decades, the Department has made tremendous strides in academics and research. Till date, the Department has produced 40 Ph.D., 10 M.Phil., and about 350 M.Sc. Applied Geology scholars. Presently, 10 Ph.D. researchers, 3 M.Phil. scholars, and 19 M.Sc. students are pursuing their respective programmes.

The Department has the facilities and infrastructure for carrying out petrological, sedimentological micropaleontological, geochemical, hydrogeological, geophysical, oceanographic, palaeoceanographic, palaeoclimatic, geomorphological and coastal environmental investigations. The Department offers consultancy services for: (a) delineation of potential zones of groundwater and groundwater assessment, well design and construction, demarcation of salt water-fresh water interface and river basin studies (b) ore reserve estimation and preparation of thin sections of minerals, rocks, fossils, and polished ores (c) geological and geophysical investigations for civil engineering problems (d) granite quality studies (e) groundwater analysis (f) rock, mineral, and ore analysis, (g) environmental impact analysis, pollution studies (h) processing and interpretation of geological/geophysical, geochemical, and hydrogeological data and mathematical modelling and (i) remote sensing and GIS applications to geological and environmental studies including integrated coastal zone management (ICZM).

The Department houses the *Climate Change Research Unit*, which was established on 26 April 1995. Presently, work is in progress in three frontier areas: (i) iron oxidation by photochemical processes in the upper oceanic water, (ii) organic carbon remineralization in coastal sediments, (iii) carbon and oxygen isotopic study of foraminifers. This unit maintains *global data* on atmospheric concentration of *greenhouse gases* from 1967 onwards on CD-ROM and as hard copy. In addition, it also maintains a dedicated library for literature on global change issues.

The Geological Museum of the Department is a treasure house for collections of rocks, minerals, fossils, etc., and has been visited by several schools in the city.

Faculty

Dr. N. Sivagnanam - Chairperson

Geography

N. Sivagnanam, Ph.D. - Professor and Head
 T. Vasantha Kumaran, Ph.D. - Professor
 R.Jegannathan, Ph.D. - Reader
 V. Madha Suresh, Ph.D. - Lecturer
 G.Baskaran, Ph.D. - Lecturer
 M.Sakthivel, Ph.D. - Lecturer

Geology

S.P. Mohan, Ph.D. - Professor and Head
 V. Rammhoan, Ph.D. - Professor
 S. Ramaswamy, Ph.D. - Professor
 S. Srinivasalu, Ph.D. - Lecturer (on lien)
 Sheek Mohamed Hussain, Ph.D. - Lecturer
 M. Suresh Gandhi, Ph.D. -Lecturer

Applied Geology

P. Periakali, Ph.D. -Professor & Head
 K.K. Sharma, Ph.D. -Professor
 P.Narayana Ballukraya, Ph.D. -Professor
 S.G.D. Sridhar, Ph.D. -Lecturer
 N. Rajeshwara Rao, Ph.D. -Lecturer
 R. Krishnamoorthy, Ph.D. -Lecturer
 M. Jayaprakash, M.Sc. -Lecturer

M.Sc APPLIED GEOGRAPHY

| Courses | Number of Credits | L | T | P | C |
|-------------------------------|---|---|---|---|---|
| FIRST SEMESTER | | | | | |
| EAS C001 | Fundamentals of Cartography (C) | 2 | 1 | 0 | 3 |
| EAS C002 | Applied Geomorphology(C) | 2 | 1 | 0 | 3 |
| EAS C003 | Atmospheric and Oceanographic Studies | 2 | 1 | 0 | 3 |
| EAS C004 | Seminar-I-(Review and / Appraisal - Regional Geography / Global Issues) (C) | 0 | 0 | 2 | 2 |
| EAS C005 | Practical-I-Techniques of Mapping and Map Analysis (C) | 1 | 1 | 2 | 4 |
| Electives from the Department | | | | | |
| EAS E001 | Coastal and Ocean Resource Studies | 3 | 0 | 0 | 3 |
| EAS E002 | Watershed Management | 3 | 0 | 0 | 3 |
| EAS E003 | Scientific Philosophy and Methodology | 3 | 0 | 0 | 3 |
| EAS E004 | Micro-climatic Studies | 3 | 0 | 0 | 3 |
| EAS E005 | Scientific Reasoning in Geography | 3 | 0 | 0 | 3 |
| SECOND SEMESTER | | | | | |
| EAS C006 | Fundamentals of GIS (C) | 2 | 1 | 0 | 3 |

| Courses | Number of Credits | L | T | P | C |
|-------------------------------|--|---|---|---|---|
| EAS C007 | Fundamentals of Modern Surveying and Remote Sensing (C) | 2 | 1 | 0 | 3 |
| EAS C008 | Settlement and Population Geography (C) | 2 | 1 | 0 | 3 |
| EAS C009 | Seminar-II-(Application of Quantitative Techniques and/ Methodology including GIS) (C) | 0 | 0 | 2 | 2 |
| EAS C010 | Practical-II- GIS : Inputs, Transformation and Analysis (C) | 1 | 1 | 2 | 4 |
| Electives from the Department | | | | | |
| EAS E006 | Urban and Metropolitan Studies | 3 | 0 | 0 | 3 |
| EAS E007 | Theoretical Economic Geography | 3 | 0 | 0 | 3 |
| EAS E008 | American Studies | 3 | 0 | 0 | 3 |
| EAS E009 | Satellite Remote Sensing | 3 | 0 | 0 | 3 |
| EAS E010 | Sustainable Development and Adaptive Management | 3 | 0 | 0 | 3 |
| THIRD SEMESTER | | | | | |
| EAS C011 | Environmental Science (C) | 2 | 1 | 0 | 3 |
| EAS C012 | Concept and Trends in Geography (C) | 2 | 1 | 0 | 3 |
| EAS C013 | India's Economic Development (C) | 3 | 0 | 0 | 3 |
| EAS C014 | Seminar-III-(Mapping and Analysis) (C) | 0 | 0 | 2 | 2 |
| EAS C015 | Practical-III- Interpretation Techniques (C) | 1 | 1 | 2 | 4 |
| Electives from the Department | | | | | |
| EAS E011 | Advanced GIS and applications | 2 | 1 | 0 | 3 |
| EAS E012 | Digital Image Processing and Modelling | 2 | 1 | 0 | 3 |
| EAS E013 | Advanced GIS Modelling | 2 | 1 | 0 | 3 |
| EAS E014 | Geography of Health Care | 2 | 1 | 0 | 3 |
| FOURTH SEMESTER | | | | | |
| EAS C016 | Tour, Field work and Report (C) | 0 | 1 | 1 | 2 |
| EAS C017 | Internship(C) | 0 | 0 | 3 | 3 |
| EAS C018 | Project (C) | 0 | 0 | 6 | 6 |

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|----------|-----------------------------|---|---|---|---|-----------------|
| EAS C001 | Fundamentals of Cartography | 2 | 1 | 0 | 3 | Dr.R.Jaganathan |
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To gain skill in the field of Cartography and more specifically in drafting thematic maps-History and Development of Cartography: History, sequence of development, impact of changing technology, Information age and mapping; Cartography Tomorrow- Shape of the Earth and Coordinate Systems: Basic Geodesy, Geographic Coordinates, Map projections-conformal and mathematical projections and properties, Scale, Reference and Plane Coordinate System- Data for Mapping, Compilation and Generalization: Traditional survey methods, Automated Survey methods, Remote Sensing, Census and Sampling; compilation process, cartographic abstraction, generalisation, accuracy and reliability - Map Design and Symbolization: Perception and design, colour theory and pattern creation; feature attributes, point, line, areas and volumes; Qualitative and Quantitative symbols, graded symbolization - Layout and Map Production: Map elements- typography and lettering; portraying land surface form; socio economic aspects map production and reproduction

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|----------|-----------------------|---|---|---|---|----------------|
| EAS C002 | Applied Geomorphology | 2 | 1 | 0 | 3 | Dr.G.Bhaskaran |
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Learn conceptualisation of geomorphological investigation and related applications-Scope of Applied Geomorphology: Scale and landscape analysis – land systems and units for systematic analysis- terrain evaluation-Energy flow in geomorphic system: System concepts – availability of power – solar radiation- rotation of energy-heat, relative energy and surface processes-climatic and tectonic changes and impacts-Weathering, mass wasting and development of Hillslopes: Mechanical, chemical and biological weathering- structure, process and time in weathering- soil formation-mass wasting- causes and classes of mass wasting-hill slope evolution-Penk and Davisian views-Process geomorphology: Drainage basin, erosion, sedimentation and structural adjustments in the fluvial system; waves, evolution of shores and construction and destruction of coastal region; arid landforms and its evolution- karst and speleology; glacial process, erosion and depositional landforms-Methodological Issues: Mapping and statistical analysis; Morphometric, landscape and land evaluation, Hazard analysis

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|----------|---------------------------------------|---|---|---|---|----------------|
| EAS C003 | Atmospheric and Oceanographic Studies | 2 | 1 | 0 | 3 | Dr.M.Sakthivel |
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A comprehensive understanding of atmosphere and oceans at intermediate level - Meaning and Scope; Atmosphere: Its composition (gaseous) and structure; Insolation and Radiation, heating of land and water; Temperature and pressure: variations in temperature and pressure; temperature zones, heat balance, and pressure belts - Global wind circulation: Tricellular meridional circulation; trade winds, easterlies and westerlies and polar winds; Air masses: Continental and maritime; fronts and their types; clouds; Precipitation: thunderstorms, cyclones (tropical and temperate) and anti-cyclones - Climatic classifications; Indian climates and climatic zones; micro climates, agro climates and urban climates; Global climate change; global warming and their likely impacts on human life on earth - Oceans: Ocean relief, temperature and salinity distribution; ocean deposits and their types; ocean currents: theories on movements; El Nino, La Nino - Coral Reefs: fringing and barrier reefs and atoll; Theories of their origin and explanations; Sea floor spreading, sea level changes and their implications

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|----------|--|---|---|---|---|-------------|
| EAS C004 | Seminar-I (Review and / Appraisal – Regional Geography/Global issues | 0 | 0 | 1 | 1 | All faculty |
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Learn the art of selecting a problem and review of literature. The student will present a simple article on the basis of review of selected literature on any of the first semester subjects.

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| EAS C005 | Practical-I-Techniques of Mapping and Map Analysis | 1 | 1 | 2 | 4 | Dr.N.Sivagnanam |
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Skills in handling physical and socio- economic data are upgraded. The student uses the map and statistical information for generating map outputs-Map Appreciation and Conventional signs: thematic, topographic and atlas maps and appreciation Relief Mapping and Analysis : Relative relief and slope maps; height and hypsometric curves; stream Analysis - Climate and Hydrology: Climo and climatograph; rainfall variability intensity maps temperature and rainfall profiles; dispersion deviation graph ; aridity and water balance - Population and Economic Data Mapping: Dot maps, density maps-colour and grey scale patterns; index of concentration and diversification; transport network analysis; flow maps - unantitative Symbolisation and Location Maps: Located representation of tourism and facilities; point and line pattern analysis; cartograms and 3D maps

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| EAS C101 | Spatial Statistics and Mathematics | 2 | 1 | 0 | 3 | Dr.N.Sivagnanam |
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The fundamentals of mathematics and statistical principles relating to mapping science is taught - Fundamental Statistics : Tables and graphs- scales of measurement and nature of data- statistical summaries-sampling procedures and probability distribution - Statistical Analysis: Basics of simple correlation and regression – hypothesis testing, parametric and non-parametric methods-regression, multiple regression and models – multivariate analysis – factor analysis and correspondent analysis - Basics Mathematics: Set theory- algebra-matrix algebra – map algebra - Data collection, analysis and modelling in physical geography – case studies - Data collection, analysis and modelling in human and economic geography – case studies.

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|----------|------------------------|---|---|---|---|-------------------|
| EAS C102 | Physical Resource Base | 2 | 1 | 0 | 3 | Dr.V.Madha Suresh |
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A comprehensive course on physical resources and its relevance to GIS data and objects - The basis of physical resources : A physical environment – nature and organisation and matter – earth chemistry – the matter and the complementary and lithosphere, atmosphere and biosphere - Energy : Energy and atmospheric dynamics – energy exchange in lithosphere and hydrosphere – energetics to biosphere – the cycle of energy balance - Land and Water : the distribution of land and water – relief, geomorphology, ocean and seas – land capability and limitations – a fresh water and hydrological cycle – world metallic and non-metallic minerals and limits – earth radiation and radio-active minerals - Biosphere and Ecosystems : Biomes and natural regions – biological communities and their diversity the concept of eco system – eco-system, material transfer energy and community - Atmospheric dynamics : the structure and composition – air chemistry and bo-element cycle – planetary temperature, wind and precipitation systems – climate, microclimate, forecasting – climatic regions and climatic change

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|----------|--|---|---|---|---|-------------|
| EAS C103 | Seminar-I (Review and Appraisal of Mapping and Information Techniques) | 0 | 0 | 1 | 1 | All faculty |
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Learn the art of selecting a problem and review of literature. The student will present a simple article on Review and Appraisal of Mapping and Information Management Techniques

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|----------|---------------------|---|---|---|---|-----------------|
| EAS C006 | Fundamentals of GIS | 2 | 1 | 0 | 3 | Dr.R.Jaganathan |
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The concepts of GIS, components of GIS and application areas of GIS are comprehensively understood - Basic Spatial Perspective and GIS Concepts: Spaces, Spatial data characteristics, Spatial Referencing, Geographical matrix, GIS definition, Approaches and Components; History and Development of GIS - Data Models and Management: Spatial Data Models – Vector and Raster data models; Data Base, Data Models and applications - Data Collection, Capture and Geoprocessing: Sources, Input methods, editing, re-projection,

geometric Transformation, map scale, precision and accuracy - Manipulation, Analysis and Display: Vector and Raster based point, line and area data analysis; output for spatial decisions - Geographic Information Technologies and Applications : Remote Sensing, GPS and Cartography for GIS Modelling and Applications

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| EAS C007 | Fundamentals of Modern Surveying and Remote Sensing | 2 | 1 | 0 | 3 | Dr.G.Bhaskaran |
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The science and Technology of Remote sensing is appraised. The advent of remote sensing in environmental remote sensing is explained - Introduction to surveying: principles of surveying – measurement technology – traditional survey methods – automated survey systems - Concepts of energy and radiation - principles, components of remote sensing systems, energy interactions, atmospheric windows; Interactions of earth surface features, spectral regions and principal methods of data acquisition, active and passive methods of sensing, concepts of resolutions - Platforms, sensors, radiation records, format of photographic, digital imagery and non-imagery data, Data Products and Limitations; Photographic system of sensing; Satellite system of sensing - Sensors and sensing, optical mechanical and electronic sensor systems, microwave sensing, thermal scanning - Interpretation basics and methodology; *In-situ* support, collateral; Digital Image Processing; Classification and maps; Measurements and Instruments - Remote Sensing Applications in Resources.

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|----------|--------------------------------------|---|---|---|---|----------------|
| EAS C008 | Settlements and Population Geography | 3 | 0 | 0 | 3 | Dr.M.Sakthivel |
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It helps the student to upgrade understanding of population and settlements, especially in the context of Indian reality - Settlement Geography - Settlement Geography – scope and content, rural-urban continuum; Evolution of settlements – old and new world settlements, village and society, village house types and land use - Indian villages – morphology, structure, function, location and historical aspects; Rural settlements – site, situation, form and functional aspect, rural settlement and land use - Urban settlements – Morphology and structure, distribution, hierarchy and rank-size rule, urban land use, CBD ; Urban continuum – umland and hinterland, urban fringe and blight, urban and suburbia, urban renewal.

B. Population Geography

Population Geography –scope, content and trends, relevance of population geography in the 21st century;Population data – Census and vital statistics, study of demography; Population distribution and structure, density and composition, growth pattern - Dynamics of population – fertility, morbidity and mortality factors, demographic transition, population changes; Population movements – commuting, rural-urban movements, intra national and international migrations;Population policies and theories – population resources, food security, population programmes, theories.

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| EAS C009 | Seminar-II (Application of Quantitative Techniques and/Methodology including GIS) | 0 | 0 | 1 | 1 | All Faculty |
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Using scientific methodology or quantitative techniques, the student has to prepare a short research paper and present it

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| EAS C010 | Practical-II- (GIS : Inputs, Transformation and Analysis) | 1 | 1 | 2 | 4 | Dr.R.Jaganathan |
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Techniques of GIS methodology from data creation to fundamentals of GIS analysis is used for skill development

(A) Manual Exercises

Raster Data Encoding : Point, runlength, block chain, quadtree; Raster coding for point,line area and elevation data Vector Data Encoding : Topological and non topological encoding principles; point,line,area and elevation coding; GRID and TIN principles-Mapematics: Set theory and Boolean operations; local, neighborhood and regional operations of overlay analysis

(B) Online (Computer) Exercises

Data capture, transformation and thematic mapping: map scan, registration and projection; feature creation (point, line, and area), coverage editing, building topology; attribute data editing and integration, class interval selection, thematic mapping and output –Ground truth support: Use of GPS for siting and routing; GPS with field data attributes

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| EAS C104 | Socio Economic Resource Base | 2 | 1 | 0 | 3 | Dr.V.Madha Suresh |
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A course on socio - economic aspects relating to GIS database generation, analysis and modeling - The basis of socio-economic resources : The components of socio-economic environment – population, economic base and economic activities – social groups and cultures – technology and development - Human resource: population distribution, density, growth and fertility changes – settlements and rural and urban continuum – cities, urban agglomerations and urban regions – world cultural regions - Primary economy : Primary economic activities and general world patterns agriculture and its determinants - Locational principles for manufacturing and patterns of

manufacturing – manufacturing heart lands and regions – determinants of trade and transport – import, exports and world trade - Regionalism : Principles of regions and regionalism – A factors growth and development – developed and developing world – segregation at local, national and international level and conflict – economic and cultural regions of the world.

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| EAS C105 | Seminar-II (Application of Remote Sensing or and GIS) | 0 | 0 | 1 | 1 | All Faculty |
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Using Application of Remote Sensing/GIS, the student has to prepare a short research paper and present it

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|----------|-----------------------|---|---|---|---|-------------------|
| EAS C011 | Environmental Science | 2 | 1 | 0 | 3 | Dr.V.Madha Suresh |
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This is a succession of geography and climatologic for understanding environmental and ecological implications - Environment and Society: Environment, resource utilisation and limits- environment, economy, religion and society-environment and quality of life - Concepts of Environment and Ecology–environmental components, structure and functional interactions- cycling of materials and energy flows - ecology principles, population and community ecology species, populations and communities - Bio-geo chemical cycles: system concept, sedimentary cycles, hydrological cycle, gaseous cycle, food chain and materials transfer - Problems of Nature and Man: Natural hazards, disasters and adjustments; Human Interventions By agriculture, mining, forestry and settlement activities- pollution problems, solid waste, land, water and air pollution and impacts - Environmental management: Environmental information management, EIA principles and methodologies, EIA case studies; Indian Environmental System and overview

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| EAS C012 | Concepts and Trends in Geography | 2 | 1 | 0 | 3 | Dr.T.Vasanthakumaran |
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Conceptual understanding of geographical knowledge and historical trends are evaluated - Intellectual Challenge and Philosophy of Geography: The urgency of teaching history and philosophy of geography; The Four Traditions in Geography; Dualism: geography as a science: ideographic and homothetic; against geography - The Importance of Geographic Viewpoint: Why place and geography matter; paradigms and revolutions in geography; Approaches in geography: Determinism, Voluntarism, Possibilism, Probablism, Existentialism, Phenomenology, and Humanism - Geography and Geographers: Values in Geography and Anne Buttimer; Diffusion and time geography and Torsten Hagerstrand; Models and modelling in geography and Peter Haggett; Indian geographers: S.P. Chatterjee, C.D. Deshpande; R.L. Singh; R.P. Misra; R. Vaidyanathan; A. Ramesh and little known geographers - Geography and Theorising: Deduction, Induction and Paradeduction; Description, Explanation, Prediction and Prescription; Types of Explanation: Genetic, deductive, inductive and functional; Quantitative and Qualitative Revolutions in geography: Positivistic and humanistic methods - Geographical Research and Future of Geography: Applied geography and applied research; interdependence and uniformity among social and other sciences; The future of geography and geographers.

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| EAS C013 | India's Economic Development | 3 | 0 | 0 | 3 | Dr.M.Sakthivel |
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A comprehensive course for resources of India and development planning is the focus- 'Resources are not, but they become', the nature, resources and culture relations; Economic Development: meaning and principles; Indian development: one or several paths?; social organisation and technology mix in India: phases of economic development and positioning of India - The physical and Human environment of India: land, relief, structure, physiographic divisions; monsoons and climate, water resources, soils and vegetation -human resources, neighborhoods and communities; human competition and conflicts; human capacity building for development; urbanization - Land uses and land utilisation in rural and urban areas; Agricultural development in India; stages of development; problems and prospects: agriculture is a gamble on monsoon; land holds the future for India - Industrial development in India: factors and stages of development in select industries: cottage industries, textile and steel industries; Infrastructures: power, energy, irrigation, trade and transport development - Economic development in India: community economic development and regional development; integrated rural and urban development; Regional disparities: causes and consequences; towards bridging the gap; Development planning for agriculture, industry and infrastructures: what and how; where to put what and how; Sustainable development for a sustainable India.

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| EAS C014 | Seminar-III (Mapping and Analysis) | 0 | 0 | 1 | 1 | All Faculty |
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The application of mapping and analysis techniques is used for writing and presenting a long research paper

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| EAS C015 | Practical-III- Interpretation Techniques | 1 | 1 | 2 | 4 | Dr.G.Bhaskaran |
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Mostly computer lab. Exercises on vector and raster based GIS data generation, analysis and modeling - Graphical plots for interpretation; Correlation, regression and multivariate applications - Visual interpretation: basic measurements relating to tone, texture, color, scale, distance and areas use of interpretation keys and collateral; Interpretation of land uses, land cover, geomorphology, vegetation, settlement and environmental

mapping - Image registration: geometric correction and transformation; Raster data: display, enhancement and image manipulation - Raster map: overlay analysis and surface modelling; Digital data- bit map studies and Training Site generation; supervised and unsupervised classification - Image registration and Map modelling: projection transformations; surface interpolation, location, and accessibility.

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| EAS C106 | GIS Modelling and Applications | 2 | 1 | 0 | 3 | Dr.R.Jaganathan |
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This course discusses theory and applications of GIS modelling through data models and advanced techniques of GIS to solve real world problems - Logical, Arithmetic and Network models: Reclassification, aggregation, overlays-: Optimization, rule based land suitability modelling- parameters - planning new routes, optimizing traffic control systems - 3-D and Location and Allocation models: estimate of point to point visibility, shadow regions, slope and aspect, terrain and geomorphic modelling, hydrologic modelling- allocation of land for different resources and siting - GIS for Inventory and Management: cadastral, climate- Flood forecasting- Environmental Impact Assessment and Visual Impact Assessment - Integrating GIS, GPS and remote sensing for resource development- GIS for Network Analysis and Management: Vehicle navigation -Utility applications - Location based services - GIS project development - GIS for Problem Solving: spatial decision support system for integrated resource assessment -LUC modeling and site suitability- Environmental Decision Making and implementation.

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| EAS C107 | Risk Analysis and Vulnerability | 2 | 1 | 0 | 3 | Dr.T.Vasanthakumaran / Dr.G.Bhaskaran |
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Introduction and overview of course : Definitions, concepts, perceptions, risks, hazards, vulnerabilities, ethical and legal considerations for governments, businesses, non profit organizations and the community: Identification of critical and important functions, both internal and external - Developing a systematic approach to identifying risks, hazards and vulnerabilities risk/hazard/vulnerability estimation, matrix, and assignment of priorities – Survey and assessment tools and methodologies - Risk mapping, computer modeling, GIS and other tools for risk assessment Field vulnerability assessments: instructions and procedures - Review and discussion of existing research on risk assessment – Emergency Management: Special tasks of risk/vulnerability assessments: medical, veterinary, business/industrial, education, local government, other - Capabilities Assessment tool: Identification and examination of options to deal with risk and vulnerabilities.

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| EAS C108 | Spatial Modelling and Programming | 2 | 1 | 0 | 3 | Dr.N.Sivagnanam |
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The students are training in the principles of developing spatial modelling and writing C++ or related scripts - Digital Map Analysis: Concepts and Principles , Compilation issues and Strategies, Boundary issues, Neural networks and Fuzzy logic - Dynamic/Interactive Cartography, VRML, hypermaps, Web and Internet GIS, Open GIS: Implementation – generic and knowledge based mapping, Inter-operable and and -Entrepreneur GIS - Facility Management principles: Cost distances capacity and accessibility concepts and standards Single facility versus multiple facility location; allocation issues-Multi-criteria evaluation and decisions - Problem solving by computers: Programming by procedural languages- OOP, GUI, and programming, Problem solving, data handling and memory management - C++ Programming: Statements, data types, functions, and pointers – data arrays, structures, and classes – inheritance and polymorphism – extension to JAVA, html and VRML concepts and applications- Case studies and applications

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| EAS C109 | Seminar-III | 0 | 0 | 2 | 2 | All Faculty |
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Spatial Analysis and Decision Making Principles are used for writing and presenting a research paper. The paper can be on GIS/ RS / script writing problems.

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| EAS C110 | Practical-III-Spatial Data Analysis and Surface Modelling | 1 | 1 | 2 | 4 | Dr.G.Bhaskaran |
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Starting from raster and vector data management, the course puts emphasis on various interpolation methods, distance minimization principles and 2D and 3D modelling and displays. Interpretation Basics-Spectral reflectance Profiles, features and wavelength regions; Interpretation of Photomorphic / image products: use of black/white, color, FCC, thermal, radar images - Geometrical characteristics: scale and projection; Use of Instruments and equipment: stereoscopes, planimeter, stereometer and interpretation equipment - Digital Image Manipulation: Raster data: display' enhancement and filters; Raster map: overlay analysis and multi-image manipulation; Bit map studies and training sites; Supervised and unsupervised classification Digital Mapping- Statistical Mapping: Graphs zscores, index construction, correlation, regression and residuals.DTM: DEM and TIN; map modelling

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| EAS C016 | Tour-Field work and Report | 0 | 1 | 1 | 2 | All Faculty |
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The students will submit report based on fieldwork in the fourth/second semester. This course work contains - Plan and schedule of the work carried out and comprehensive report on the fieldwork.

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| EAS C017 | Internship | 0 | 0 | 3 | 3 | All Faculty |
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Each candidate has to spend at least 8 weeks in an institution / industry /educational Institution/ business house where mapping or GIS or remote sensing or a combination of these above is the main activity which may also include marketing of such products. At the end of the internship the candidate has to produce an experience certificate and a report.

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| EAS C018 | Project | 0 | 0 | 6 | 6 | All Faculty |
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The project can be taken highlighting any issue relating to geographic knowledge and analysis. All data analysis and survey related projects shall necessarily present in a series of thematic maps. The data analysis mapping and documentation shall be conducted in the Remote Sensing and Computer Applications Laboratory of the Department

ELECTIVE COURSES

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|----------|--|---|---|---|---|-------------------|
| EAS E001 | Coastal and Ocean Resources Management | 2 | 1 | 0 | 3 | Dr.V.Madha Suresh |
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Combination of land, water, vegetation and people and their activities has to be understood and appropriately design for GIS analysis

Coastal Studies: Definitions, Meaning and Scope - Coastal zone as a Resource Base – Marine Living and Nonliving Resources - Components that concern us - Sustainable coastal zone management - Rivers to the Sea Concerns – Coastal Development Activities - Coastal Pollution

Coastal zone: land-water interface, international initiatives for coastal zone protection; international assessments of needs and priorities of coastal zone;UN Conventions; UNEP and national programmes for coastal zone – Fisheries and Aquaculture Management - Defence of the coastal areas and coastal zone management: principles, bases for decisions on coastal zone development; essential national and international linkages; Land use zoning on the land and in the coastal waters; use of land use planning principles in the coastal zone; difficulties and constraints -Coastal habitats and community modifications: fisheries and other living resources; unsustainable exploitation of fisheries, coral reefs; Coastal Zone Analysis for sub-regional applications: Indian ocean scenarios and policy options – Wetland Ecosystems - Planning and management of coastal zone: coastal zone regulation (CZR) in India; successes and failures of coastal zone management; A resource management strategy for India's coastal region – Integrated Coastal Zone Management – Principles, Needs, Policy and Legislation – Remote Sensing Application in ICZM - Coastal Zone Information System - EIA

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| EAS E002 | Watershed Management | 2 | 1 | 0 | 3 | Dr.G.Bhaskaran |
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To introduce the basic concepts of watershed and create the awareness in the field of natural resource management - Watershed: Philosophy and Concept of Watershed - Delineation and codification of watershed – Watersheds and administrative decisions - Structure and functions: Geomorphic, meteorological and hydrological Parameters: Rainfall intensity, runoff characteristics, sedimentation rate and discharge rate, soil, landuse characteristics on runoff and infiltration - Natural resources and human responses in watershed: soil, forest, water as natural resources and population interaction with them - Integration of watershed functions, processes and human interactions - Resource management: (Water conservation and water Harvesting – Soil conservation - Joint forestry management – landuse management) -Maintenance and We: Participatory Rural Appraisal in Watershed programme - Empowerment of Women and other gender issues - Equity issues in Watershed management – Financial management and Accounting procedures – Monitoring and Evaluation in Watershed.

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| EAS E003 | Scientific Philosophy and Methodology | 2 | 1 | 0 | 3 | Dr.N.Sivagnanam |
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The students gain knowledge on philosophy and methods of science, scientific explanations and theory abstraction - Research: Types of research and Investigation-objectivity of research in arts, humanities, pure sciences, social sciences and applied sciences- basics of scientific philosophy and explanation - The Scientific Method: Alternatives of scientific research- inductive and deductive reasoning- paradigms, models and theories-strategies of descriptive, experimental and historical and problem solving research - Research Design: Problem identification and analysis- methods of acquiring knowledge- methods, techniques and tools in research- statement of objectives and hypothesis- data and measurements- sampling and data collection - Methods of Study and Analysis: Pilot surveys – case study methods- fieldwork for socio- economic survey and tools- objectives of analysis- analysis design- hypothesis testing and reliability - Report Writing and Publishing : Reports, seminar papers (short and long) and dissertations – style manuals for formating and citations – presentation and use of computer and multimedia resources- basics of manuscript editing for the press

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| EAS E004 | Micro - climatic Studies | 2 | 1 | 0 | 3 | Dr.M.Sakthivel |
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Micro climate applied in relation to agriculture and urban areas - Introduction: The Ground Layer of the atmosphere – local climate and its components – scope and content of micro climatic studies - Agro Climatology:

Sub Light and Temperature on Crops – topography, soils and temperature regime – soils and ground level moisture – local air circulation and effects – crops, moisture requirements, evapo-transpiration, water balance, critical growth periods – pests, diseases and local climate - Urban Climatology: Morphology and land use on micro climatic elements – day-night variations – effects of wastes and pollution – hydrologic effects and urban climate - Climate and human comforts : Air and water needs of the human body – local atmosphere and loss of energy and water – local climate and human diseases – effects of air plumes and temperature inversion - Micro climatic information and management – Data collection and sampling – surveying principle – Equipment for data collection – use of graphs and charts – GIS methodology for mapping query and surface analysis.

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| EAS E005 | Scientific Reasoning in Geography | 2 | 1 | 0 | 3 | Dr.T.Vasanthakumaran |
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Concerns and Goals in Geographic research: current emphasis in geography – meaning of accounting for spatial variations – establishing laws and theories in geography - nature and function of Theories, Theory Construction: Relationship between theory construction and conceptual integration – well formed theory – alternative methods for constructing Theory

Natural of Models : Meaning of model in a general sense – multiple variable Linear Models – purpose and use of Models – procedure for developing Models, Measurement and Statistics : Need for measurement – levels of measurement - nominal, ordinal, interval and ratio measurement and related statistics - Normative theories and geographic reasoning : Normative Models – Agriculture structure- Rent theory –locations and patterns in agriculture – industrial location theory – least cost locational theory - Spatial manifestations of choice process – locations and migrations; gaming simulation as a mechanism for illustrating the process of locational decision making – spatial choice process and migration decisions - Behavioral variability and geographic reasoning : Human and other spatial behaviors – relationship between spatial behavior and the structure of spatial systems – attitude as a spatially relevant behavioral variable – search and learning in spatial behaviors

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| EAS E101 | Land Resource Management | 2 | 1 | 0 | 3 | Dr.R.Jaganathan |
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This course addresses land resources analysis, planning and management with GIS techniques - Land Resources: Concept of land, land units and resources- land evaluation- land information requirements-land Management environmental and institutional perspectives - Principles of Physical Regionalisation: Regional concepts – boundary delimitation- classification types- geomorphological and ecological concepts - Systems for land resource assessment: Parametric and physiographic systems-landscape systems – land unit concepts - Assessment and Management: Land classifications, land use system, IT and Sustainable Management Model (SLM)- rural-urban sector – land use planning - Land Information Management: LIM, DSS for land use planning and land management- Approaches to problem solving-LIM programmes in national and international level-UN Organizations

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| EAS E011 | Advanced Statistics Analysis in Geography | 0 | 2 | 2 | 4 | Dr.N.Sivagnanam |
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Course is on the use of statistics and multivariate analysis in spatial data analysis and modeling - Population and Statistics: Single and Multiple Populations – Multivariate Normal Distribution – Probability and “Z” distribution Parametric and Non Parametric tests- Sequence data analysis: time series analysis – autocorrelation and cross correlation concepts, Fourier series and wavelet transform methods - Points to surfaces: spatial trends – Krigging methods – trend surface analysis – residual mapping and interpretation. - Correlation and Regression: multiple regression and multivariate correlation – regression models – stepwise and circular relations - mapping residuals. - Multivariate Analysis: discriminant analysis – cluster analysis – PCA and factor analysis – MDS and correspondent analysis – canonical correlation analysis.

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| EAS E103 | Fundamentals of Information Systems and Management | 2 | 1 | 0 | 3 | Dr.G.Bhaskaran |
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The principles of Information Systems and Management related aspects are taught - Information Technology: Meaning, scope and developments in information technology; Information technology firms: What they are and how they do things; Opportunities the IT industries offer. - Information Systems: Concepts and overview of information systems; A systematic framework for Information Systems; Components of information systems; Information systems design, analysis and management; Managerial overview of hardware, software, people, data and institutional linkage - Database Management Systems for Information Systems: Data resources, structure and functional aspects; graphic database, data storage and hypermedia; Data design issues and output designs. - Internet and Information Management: Internet, Intranet, and Extranet; Electronic communication tools: electronic mail, e-conferencing, web-publishing and file transfers - Information Systems – Case Studies and Management: Management information systems: needs, design and action; library resource information systems; human information systems; and other types of information systems; Information decision support system: Knowledge-based search process; Artificial intelligence technologies: Artificial intelligences and Expert Systems.

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| EAS E006 | Urban and Metropolitan Studies | 3 | 0 | 0 | 3 | Dr.M.Sakthivel |
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Students are exposed on issues relating to urban and metropolitan structure, land uses and regions. The students also gain knowledge about urban metropolitan analysis and planning - Basic issues in urban system and Indian Urbanisation study – objectives of urban development, national and international policies in urban planning-historical trends, patterns of growth of urban population and urban centres, regional variations - Structure and classification of Indian urban centres - size and hierarchical variation, urban classification, metropolitan centres and metropolitan areas; Urban functional zones, location of social facilities and functional zones, urban infrastructure and amenities, public transport system, and problems - Urban housing and economy – residential and non-residential housing, housing for the poor, housing and basic amenities, housing and open space; Urban economy and land use – land use characteristics of small and large centres - Urban problems – urban pollution, urban heat islands, land and water contamination, solid waste management, urban crime, political and ethnic segregation. - Urbanization in Tamil Nadu – growth relating to urban population and urban centres; Urban centers – structure and functions – functional classification.

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| EAS E007 | Theoretical Economic Geography | 2 | 1 | 0 | 3 | Dr.R.Jaganathan |
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The principles of location, distance and resource utilisation are dealt with along side economic principles of demand, supply price and transaction - Basic concepts: location, distance, space, spatial analysis and spatial organisation; economic activity, interaction and economic landscape - Principles of demand, supply, market, economies of scale; Scale agglomeration, cost and price; The principles of heterogeneous landscape and resource variation - Economic activities: primary - location and interaction mechanism –Von-Thunen location theory – application in time-space environment; Manufacturing activity- Smith, Weber and Isard; Tertiary activity-Christaller, Losch and Perrou. - Pole of transport in spectral development; regional planning- concepts of growth centres, area and sectoral plans.- Data, mapping and GIS implementation in economic geography; Recent trends and scope of economic geography

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| EAS E008 | American Studies | 3 | 0 | 0 | 3 | Dr.N.Sivagnanam |
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A comprehensive course on South and North American countries, their people, their land, resources, economy and culture - Nature of American lands – relief, climate, drainage, soils; Flora and fauna and ecological regions - People of Americas – demographic regions, population ecology, settlement patterns; Cultural landscapes – political system, language, religious realms and ethnicity - American agriculture – agricultural types and crops, agricultural regions, bio-cultural activities; Mineral wealth – power and fuel, metallic and non-metallic minerals, mining activities; American Industry – structure and industrial regions; Transport development in Americas - Urban America – morphology, structure and distribution of urban centres, urban problems; Welfare in America – economic and social welfare, minorities and women - Co-operation in America – inter and intra- regional co-operations, American interests in other parts of the world; Scope of Area studies, regional studies and world regional geography

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| EAS E009 | Satellite Remote Sensing | 1 | 1 | 1 | 3 | Dr.G.Bhaskaran |
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The fundamentals of Satellite Remote Sensing and its relevance to scientific research are discussed - Introduction to Satellite remote sensing: Electromagnetic radiation: interaction of radiation with the surface and atmosphere. Platforms: airborne, satellites. Sensing Systems: Passive, active systems - Image interpretation: Elements of interpretation – image interpretation strategies – image interpretation keys - Visual image interpretation - digital image Analysis: digital data: Storage and transmission of data. Image Processing : Pre-processing, image enhancement, image classification, post processing- Data compression and transfer - Microwave systems : antenna theory, sensitivity, radiometry, atmospheric effects. Radar system : radar theory, scattering techniques, SLAR, SAR, advances in radar techniques. Applications of microwave and radar systems - Applications of Remote Sensing: Agricultural – water resources – weather and climate – forest and Rangeland – engineering – natural hazards – coastal zone – bio-diversity land use planning - Case studies : Image analysis for problem solving – resource assessment methods -GPS and GIS based mini-project

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| EAS E010 | Sustainable Development and Adaptive Management | 1 | 2 | 1 | 4 | Dr.T.Vasanthakumaran |
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Collective wisdom is ultimately adopted for local development planning and management. This also makes sustainable development a reality - Concepts and Theory: One World, One People; Our Common Future; Earth Summit; The Paradigm of Sustainable Development; Agenda 21; Earth Summit + 5; What Sustainable Development Means to us; Think Globally, Act Locally - Earthscapes: The Age of Extinction; Biodiversity as a sacred space; Cultivating Diversity; Sustainable Livelihoods; Green Health Boom; The EIA Farce; Biopiracy and Traditional Knowledge; Legal Spaces for Conservation; Educating for Diversity - Models of Development: Kerala Model of Development; Community Management - Tank Irrigation Development in South India; Capacity Building: An Approach to People - Centred Development - Adaptive Ecosystem Approach: Components of the Adaptive Management Approach: Workshops, Models, Institutional and Jurisdictional Issues; Mechanistic versus Adaptive Management - Key Aspects of Successful Adaptive Ecosystem Projects: Communication, Support for

paradigm viability, A goal-oriented institutional setting, Funding; Case Studies: Toronto, Hamilton and Chennai - Ecosystem Approach to Human Health.

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| EAS E104 | Survey and Field work Techniques | 2 | 1 | 0 | 3 | Dr.V.Madha Suresh |
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The method of undertaking field work and collection of physical, chemical characteristics of the earth surface are the bases of the course - Objectivity in field surveys; Field work and surveys, measurement and recording - Field work design and sampling issues; Equipment in geomorphic and soil surveys; GPS for site fixing, routing and contouring - Hydrology and water quality data; Ground truth collection for remote sensing support - Village survey principles and methods; Urban land use surveys; Land system and land use surveys - Computer support for data management, interpretation and surface modelling; Data integration and GIS

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| EAS E105 | Spatial Analysis | 2 | 1 | 0 | 3 | DR.N.Sivagnanam |
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It is a course for a serious spatial analysis methodology based on Operations Research Techniques and combinatorial programming - Concepts of Space, space constructs, space and time, spatial analysis and planning; Evaluation of spectral opportunities: cost, distance, capacity, equity and welfare - Spatial locations: aggregation and distribution principles, central facilities, noxious locations - Spatial partitions and districting ;Spatial interaction : principles, variations and consequences - Locational planning problems: - Single locations, P-median problems; Allocation Problems and Methodology; and use analysis and decision making - Objectives, constraints and methodology in spatial facility planning; Analysis of school locations and health care centres; Municipal Waste Handling – Location allocation strategies and GIS

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| EAS E011 | Advanced GIS and applications | 2 | 1 | 0 | 3 | Dr.T.Vasanthakumaran |
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Raster and Vector GIS are explored for real world problems understanding analysis and applications - Data Quality and Structure: Review of Preliminary GIS; Spatial data guidelines and standards; Data sources and validation; Spatial data quality and structure - Computational Support for GIS: Integration of data systems and computational support for high level modelling of spatio-temporal phenomena; GIS data capture and conversion; Computational support for spatial information systems: models and algorithms - Spatial Analysis and Error: Concepts-rich approach to spatial analysis, theory generation and scientific discovery in GIS; generating spatial hypotheses from spatial data; Spatial structure of error in digital elevation data - Analysis and Modelling in GIS: Generalisation, Visualisation, Spatial Interpolation, Overlay operations, distance transformation; Triangular Irregular Network (TIN) and Digital Elevation Models (DEM) - Applications of GIS: Some key issues in information sharing and the implementation of GIS; Modelling environmental systems with GIS; Using GIS to target agri-environment policy; GIS for utility infrastructure

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| EAS E012 | Digital Image Processing and Modelling | 2 | 1 | 0 | 3 | Dr.G.Bhaskaran |
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Remote Sensing Technology data is manipulated for feature extraction, spatial analysis and raster based GIS modeling - Image Processing Overview: data acquisition, processing / analysis and output concepts and components; Statistical and mathematical foundations: matrix algebra and its applications – probability theory, sampling, estimation and interpolation / extrapolation principles - Decision making principles: parametric and non-parametric decision, Window and Kernel estimators, classification and clustering principles; Digital Image Processing System: an overview of hardware and software, processing principles - Data acquisition and digital image format; Pre-processing: enhancement, contrast manipulation, density slicing, and color coding; Image Rectification: noise, removal, spectral, radiometric and geometric corrections - Unsupervised classification' filtering, generalisation and thematic map extraction; Supervised classification: training sites, classifiers accuracy of estimates; in-situ support: field data collection, equipment in field data collection – radiometers and GPS - Data Interpretation: concepts of GIS, map, remote sensing, field work and attribute data integration; Post classification task: design and layout principles, map output.

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| EAS E013 | Advanced GIS Modelling | 2 | 1 | 0 | 3 | Dr.N.Sivagnanam |
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GIS Technology is used to model the real world problems - Models, Modelling and Data Analysis: concepts and types; Spatial interaction models and Modelling; Data Exploration and Visualization - Geomatics and spatial representation: Spatial data organization, spatial problem, representation, dimensions, topologies, and tessellations of regular and irregular cells - Spatial Modelling: Methods of Spatial Interpolation, extrapolation and approximation; data Transformation; attribute data, modelling and integration - Conceptual Modelling : modelling of line oriented objects; Modelling for area and volumes; Spatial object modeling - Analytical Modelling and Multicriteria Decisions: Binary and index models; Modelling physical, environmental, human and decision making process; multicriteria and spatial decision support systems for problem solving

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| EAS E014 | Geography of Health Care | 3 | 0 | 0 | 3 | Dr.T.Vasanthakumaran |
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The issues relating to geographic analysis of disease and health care and delivery are introduced - Approaches to Health Care Analysis: Medical geography: scope, meaning and developments; Contemporary geography of health care: scope, meaning and developments; Approaches: Location, Social Indicator and Behavioural approaches; Spatial levels and approaches - Diseases and Health: Infectious, degenerative, chronic, inherited, genetic and disorders; Disease ecology and epidemiology; organic, inorganic, bacterial and fungal factors of health.- Deficiencies and Health: Nutrition and food habits; Nutritional deficiencies and diseases; Disease patterns in India and Tamil Nadu - Society, Culture and Health: Sanitation, modernisation, ways of living and emerging health issues in Indian society and in Tamil Nadu; food habits, family and community life, tradition, religion and health - Health Care and Delivery Systems: Health care systems and delivery in India and Tamil Nadu; Medical services and facilities, health information and planning; Issues and prospects.

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| EAS E106 | Microwave Remote Sensing and Applications | 2 | 1 | 0 | 3 | Dr.G.Bhaskaran |
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It helps the student to upgrade understanding of Active Remote Sensing, especially in the field of RADAR systems and its applications - Microwave Fundamentals: EMR and Microwave Bands – Microwave interaction with atmospheric and earth's surface features – System parameters of principles – Remote Sensing Radars - Passive microwave remote sensing: Basics of emissivity – Theory of radiometry – Sensors - applications in atmospheric, land and ocean studies - RADAR Imaging: Radar equation on measurements and discrimination - geometry of Radar image – Imaging and products - Image processing, SAR interferometry - Radar Applications in Geomorphology, Hydrology and Geology – Oceanography – Agriculture – Rural and Urban landuse - Radar Applications in Soil moisture analysis – Rural landuse and land development – Urban structure – Quality assessment – Population estimation – Urban Heat Island.

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| EAS E107 | Urban Information System | 2 | 1 | 0 | 3 | Dr.M.Sakthivel |
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Designing database for streets, land parcels, house sites and high rise buildings are some of the challenges for GIS based Urban Information System - Introduction: The study of Ekistics – Morphogenesis of urban centres – city structure and land use ecology and functional regions of cities - Landscape ecology – city landscape elements – Hierarchical format of city landscape – system approach to city landscape studies - Human components of the urban areas – people and housing patterns – basic and non-basic activities on city landscape – transportation network, city movement and commuting – social facilities - Urban Public administration –urban revenue system – municipalities facilities and services – crime and police administration – entertainment and shopping – public health and health care system

SELF-STUDY COURSES FOR

M.Sc APPLIED GEOGRAPHY AND SPATIAL INFORMATION TECHNOLOGY

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| EAS S101 | Tourism, Leisure and Hospitality Studies | 1 | 2 | 1 | 4 | Dr.T.Vasanthakumaran |
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The course is designed for planning a career in tourism and hospitality fields - Concepts and Theory: Meaning and scope of Tourism, Leisure and Hospitality Studies; Geography of Tourism: Meaning of Tourist System, Travel, Hospitality and Visitor Services; Society, Culture, Leisure and Recreation; Tourism Management Practices: Organisational Theories and Practices; Leisure and Recreation Theories and Practices. - Types of Tourism and Hospitality and Tourism Research: Cultural, Eco- and Ethno-Tourism, Coastal and Adventure Tourism; Research Methods and Computer Applications; Hospitality in a changing society: Multiculturalism and case studies; Creative and Perceptive Elements of Hospitality; Organising Hospitality Operations - Tourism Planning and Development: Living and Working Environments in agencies of tourism promotion; Planning and Policies for Tourism, Leisure and Hospitality; Tourism and Education, Case Studies - Tourism, Culture and Development. International Tourism and Cultural Component; Tourism Cultures in India, Case Studies: Tourism and Crafts, Tourism and Heritage, Tourism and Discovering another Culture; Problems giving cause for Concern: Risk of deterioration of the cultural Product, the Problem of the way the Institutions Operate, and the Problem of Funding - Strategies for Sustainable Tourism Development. Geophysical and Socio-ecological Characteristics of the Tourist Region (Tamil Nadu, India); Stakes involved in Natural Resources Management and Action Required (water resources, environmental degradation); Diversity and Distinctive Regional Features; Sustainable Development of Tourism in the Region

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| EAS S102 | Geography of Health and Environment | 1 | 2 | 1 | 4 | Dr.V.Madha Suresh |
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The issues relating to geographic analysis of disease and health care and delivery are introduced - Approaches to Health Care Analysis: Medical Geography: Scope, Meaning and Developments; Contemporary Geography of Health Care: Approaches: Location, Social Indicator and Behavioural Approaches; Spatial Levels and Approaches - Diseases and Health: Infectious, Degenerative, Chronic, Inherited, Genetic and Disorders;

Disease Ecology and Epidemiology; Organic, Inorganic, Bacterial and Fungal Factors of Health - Deficiencies and Health: Nutrition and Food Habits; Nutritional Deficiencies and Diseases; Disease Patterns in India and Tamil Nadu - Society, Culture and Health: Sanitation, Modernisation, ways of Living and Emerging Health Issues in Indian Society and in Tamil Nadu; Food Habits, Family and Community Life, Tradition, Religion and Health - Health Care and Delivery Systems: Health Care Systems and Delivery in India and Tamil Nadu; Medical Services and Facilities, Health Information and Planning; Issues and Prospects – Ecosystem Approach, The issue, The Approaches, Lessons and Successes – Future Directions.

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| EAS S103 | River Basin Analysis | 0 | 2 | 2 | 4 | Dr.G.Bhaskaran |
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River basins are the basic units for integrated land, water, humans and land use management. This course helps to generate and analyse the data relating to comprehensive river basin study - River basins: basins, sub basins and niche basins – systems concepts and basins – river basins and morphogenetic implications - Basin morphology: degradation and aggradations factors – channel development – morphology and river discharge- Basin Morphometry : Altimetric characterisers – shape and trend characteristics, stream characteristics – area characteristics- Profiles: The Longitudinal profile – Re constructed profile and eroded landforms – slope movements and profiles- Integrated Basin Management: Erodability and erosivity analysis – hydro metrological characteristics – hydro morphological characteristics – Basin and water Balance – conjunctive use of groundwater

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| EAS S104 | Business GIS | 1 | 2 | 1 | 4 | Dr.R.Jaganathan |
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GIS implementation is an organisational issue. GIS for business opportunities has to be analysed and planned - GIS capabilities, uses and implementation: private GIS use – GIS enterprise and internal organisational management – GIS public resource management system – Decision Support and GIS - Data Business: Spatial data generation for industry and business – data business for government – public data for awareness and utilities – attribute data in GIS business – Data minimizing and warehousing activities - Industry applications: property development and real estate – minimizing and ore based industries – land capability and water resource management – whole sale and retail trade outlets – Institutional training and NGO activities- trade and tourist information - Public Interest advice: Insurance cover and natural hazards – insurance occupation and urban living – disease and health care – travel plan and query – social facilities. - Cartographer and consultant: Remote Sensing, spatial data analysis and modelling – map designing and printing – property development – e-governance – EIA – Internet GIS.

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| EAS S105 | Gender Studies | 1 | 3 | 0 | 4 | Dr.M.Sakthivel |
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Gender Structure: Definition. Gender and Sex, Feminism, Gender learning and relation to crimes specific to women; Equity and Equality, Genesis, Basic Principles and its Applications, Gender Complementary: Nature, Growth and Health - People of India: Women in India in the International context, Cultural region, religion, growth of the female Population-Domestic violence and distribution patterns in developing countries, Women development programmes and women’s agencies in India - Literacy and Education: Elementary Education in India and the world, Education of Urban women, Education of Rural women, overview of the status of women in India, Marriage and Age, Political Power-voters- General Elections -Environment for Living: Urban and Rural households- Geographies of work: Invisible work, unreported work- Women workers in cities, marginal workers, categories of work-Agriculture-Rural women work on family land – wage labour of women on the land- as Cultivators – as Labourers - Changing Jobs and Changing world: Emerging Technologies and Employment Opportunity Regular works in Industry- Household Industry in rural - Household industries in towns and cities. Services-women in service sector- Trade and commerce.

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| EAS S106 | E-Governance and Social Administration | 1 | 3 | 0 | 4 | Dr.G.Bhaskaran and Dr.R.Jaganathan |
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Through E-Governance decisions are taken very easily and quickly for problem solving - Introduction of e-governance: definition and need for e-governance- Internet Infrastructure and e-governance- e-governance in Development- Internet and e-governance - Study of Social administration: Social Administration and the provision of welfare- public, private, voluntary sector-public finance - evaluating policy - Introducing e-governance: fields of implementation of e-governance -e-administration- e-services- e-democracy-Service provision and public participation-government initiatives - Development, implementation and GIS: challenges for development- e-governance model - impact of technology – e-governance Capacity Building-implementation of e-governance-GIS applications - E-governance and developing countries: Setting up an e-governance policy- new technologies and community development- e-governance in India –transforming district administration- local, municipal, national level administration

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| EAS S107 | Traditional Ecological Knowledge Systems | 1 | 2 | 1 | 4 | Dr.T.Vasanthakumaran |
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Native’s understanding of the flora and fauna and ecology is a treasure trove for planning sustainable development. This course is on reviving traditional knowledge for good use- A Framework for Understanding

Traditional Knowledge: Indigenous / Traditional knowledge defined; TEKS and its component systems: Biotic, Cultural and Technical; Local communities and indigenous knowledge; TEKS and sustainable livelihoods; and TEKS and sustainable development - AINTHINAI Theory. Thinaï theory as a framework for traditional knowledge of Tamil Nadu; Tamil country, region, language and culture; Five cultural regions of Tamil Nadu: Kurinji (montane), Mullai (pastoral), Marudham (riverine), Neidhal (littoral), and Palai (arid); Markers: Spatial and Temporal (topographical fabric), Object (people, deity, flora and fauna, musical instruments), and thematic (essence); and Spatial organisation of Tamil Society - TEKS Case Studies: TEKS and sustainable bio-diversity, food security and seven-system management of the Kollihills; Fishing and Craft traditions of the Coromandel coast; TEKS and environmental management under arid conditions in Thevaram Basin - Integrating TEKS for Development: Local Health Traditions; Rural and Urban Practices; Complementary Medicine; Examples of cultural and technical knowledge from across India and Tamil Nadu - Practical Significance of Indigenous/Traditional Knowledge. Putting TEKS to good use in Planning, Conservation, Resources and Environment Management, and Development.

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|----------|--|---|---|---|---|-------------------|
| EAS S108 | Environmental Impact Assessment and Management | 1 | 3 | 0 | 4 | Dr.V.Madha Suresh |
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Environment of the Earth, which is only living plant for human being, is stressed - The Concept of Environment and Ecosystem: The Problem - Environmental Impacts of Human Actions - Environmental Changes Natural and Man Made - Environmental Impacts and the stage of Technological Development - Administrative Procedure: Designing Administrative Procedure – Sequence of Environmental Planning – Decision-making - EIA: Definition – Need - Initial Environmental Initiation – Steps in EIA – Systematic Approach for using EIA – EIA Methodologies - Assessment of Impact: on Development Activities and Land use – on Surface Water Environment – Prediction and Assessment of Impacts – Environmental Audit - Environmental Planning and Management: Concept of Environmental Management, Aspects and Approaches to Environmental Management

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| EAS S109 | Location and Allocation Methodology | 0 | 2 | 2 | 4 | Dr.N.Sivagnanam |
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Issues relevant to location-allocation, multi-objective and multi-criteria methods of spatial analysis are addressed - Theoretical Background: Weber concepts-central place theory- contributions of Locsh and Isard-classification- location problems - Single Source Location Problem – Maximum, minimum and optimal strategies-problems of continuous spaces and on routes - Multi-facility P-Median Problems – Spatial partitioning-discrete boundaries- hierarchical Boundaries – fuzzy boundaries - P-Medians on Continuous surface, P-median on a network-minimum, maximum problem- set covering problems - Multi-criteria Location Allocation Models - plant layout planning – location allocation modelling

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| EAS S110 | Chemical Geography | 1 | 3 | 0 | 4 | Dr.N.Sivagnanam and Dr.M.Sakthivel |
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The work chemistry is a complex system of biogeo-chemical cycles and geobio-chemicals cycles. The relevance of comprehensive understanding on energy, earth, atmosphere and bios-sphere chemistry is undertaken - Earth Chemistry: Cosmochemistry, Universe Solor System, Earth and Elements, Energy, Geo-chemisry.- Lithosphere : Structure, composition and temperature; rocks; radiogenic and non-radiogenic variations; geo-chemical cycles - Atmosphere: Structure and coposition; gaseous cycles; radiation balance; oxygen, nitrogen and ozone; airpollution - Hydrosphere: Global perspectives; chemistry of surface and ground waters; ocean chemistry; acidic, basic and salt aspects of water; hydrological cycle - Biosphere: Nutriants in the biosphere; light and dark processes in food production; plant and animal chemistry; bio-chemical cycles; pest control and fixing.

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| EAS S111 | Bio-Geography | 1 | 3 | 0 | 4 | Dr.N.Sivagnanam and Dr.R.Jaganathan |
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Exposes the students to the limits and adaptation of flora and fauna and other related ecological issues in spatial contexts - Mapping Distribution: Sources of Information – Methods of Survey – Methods of Mapping Distribution – Mapping Vegetation - Biotic resources use and misuse – ecosystem stability and disturbance; human impact – ecosystem and environmental pollution, managed and urban eco-system - Distribution as a geographical quantity: Patterns of distribution in small territories – Patterns of distribution at continental scale – clustered and dispersed distributions – Comparison of regional and continental distribution – The Historical perspective - Vegetation classification and correlation: structural classification functional classification – humid temperate climates and forest types – Raunkiaer Analysis – Altitudinal compassion of life- Desert climates and vegetation types - Migration and dispersal: seasonal and periodic migration – permanent migration – Goods theory of plant migration – effect of topography – inter-continental migration.

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| EAS S112 | Methods and Strategy for Natural Resources Management | 1 | 3 | 0 | 4 | Dr.G.Bhaskaran and Dr.N.Sivagnanam |
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This course addresses natural resources and problems associated with the usage of natural resources and the techniques available to evaluate, develop, and manage natural resources - Introduction to Resources: Concepts,

classification and appraisal- Natural resources – natural resource economics - management of natural resources: government–other agencies - Resource Assessment-I : Land evaluation methods- land classification methods-soil and water conservation- land use and Land cover mapping- land use planning and development - Resource Assessment-II: Water resource assessment- watershed analysis and management-coastal and ocean resources and management- fisheries management - Risk assessment: Wildlife, forest, recreational, agricultural and rangeland assessment - Ecological Risk Assessments (ERA)- Natural Resource Damage Assessments (NRDA)- damage of natural resources - Remote sensing and GIS applications: natural resource surveys and monitoring– strategies for natural resource management- millennium eco-system assessment project-resources utilization and conservation in India.

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| EAS S113 | Web Cartography and GIS | 1 | 3 | 0 | 4 | Dr.R.Jaganathan and Dr.M.Sakthivel |
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Web based Mapping is used to get quick information for decision making - Need for Web Cartography and GIS: New mapping environment- web maps-New cartographic realm-GIS and Web GIS-Internet and World Wide Web - Web map Publishing and Design: Basic publishing and web map functionality – web map design-colour-symbol design – placement of names-factors - Advanced mapping environment: Web Atlases– maps and multimedia systems-animated maps and multi- dimensional display-Web maps in geo-spatial infrastructure- Open GIS Web Mapping Activities - Visual thinking and cyberspace: Visualization and exploratory data analysis-strategies- visualizing spatial data in the Web-spatial Visualization through Cartographic Animation - Web map and Decision Making: Web cartography and weather, road traffic and tourism - maps, GIS and the need for rule based cartography-on-line mapping resources and mapping - spatial information policy

ELECTIVE COURSES FOR OTHER DEPARTMENTS

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|----------|-------------------------|---|---|---|---|-----------------|
| EAS E114 | Geography of Tamil Nadu | 3 | 0 | 0 | 3 | Dr.N.Sivagnanam |
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A comprehensive understanding of Land, People and Tamil Nadu - Introduction to Tamil Nadu: Physical and Human Geography; The People and the Economy; Administration and Social Conditions: Government, Health and Education; Language and Culture: Cultural Life, Arts and Press; Livelihoods and Security (4 lectures) - Physical Geography of Tamil Nadu: Location, Physical Divisions, Climate, Soils, Drainage and Vegetation (4 lectures) - Human Geography of Tamil Nadu: Population: Numbers, Growth, Densities and Distribution; Age, Gender and Occupation; Rural and Urban Areas of Tamil Nadu; Sectors of the Economy: Agriculture, Industry, Services and Infrastructures (4 lectures) - Programmes and Strategies: Integrated Rural and Urban Development; Rural Poverty Alleviation; Health and Family Welfare; Tamil and Culture Development; Problems and Prospects (4 lectures) - Regional Development: Causes of Regional Disparities in Development; Inter-District Disparities in Tamil Nadu; Dimensions of Regional Development in Tamil Nadu through the Planning Era; Issues and Strategies for Sustainable Development (4 lectures).

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|----------|----------------------------|---|---|---|---|----------------------|
| EAS E115 | Geography of Trade and Aid | 3 | 0 | 0 | 3 | Dr.T.Vasanthakumaran |
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A paper on economic geography relating to trade and aid - Geography of Trade and Aid: International and National Trade; International Aid and National Pride; Trade with Aid; International Trade Agreements; GATT, UNCTAD, WTO - North-South; Unparalleled growth and increased inequality; Developing countries and how deeply integrated are they? What rich can do to the poor? What poor can do to the rich and themselves? - Economic Liberalisation: Trade winners and losers from liberalisation; Does globalisation increase poverty and inequality? Role of institutions and organisations; An agenda for action - The World Trade Organisation: Development and Trade; Technical assistance and training; Intellectual property; WTO agreements; Goods and services; The Multi-trading System; The Doha Meet and the balance sheet; e-Commerce and e-Governance. - Globalisation and Global Changes: Four aspects of globalisation: Trade, Movement of Goods, Spread of Knowledge, and Technology; Global economy; Indian economy in the global markets; Globalisation: Threat or Opportunity? Globalisation and new geography of conflicts; Conflict resolution; Global inequality, global warming, global power and governments.

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| EAS E116 | Basics of Physical Geography | 3 | 0 | 0 | 3 | Dr.V.Madha Suresh |
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A first level course on land, atmosphere and hydrosphere - Landforms: Earth and its Structure, Rocks and Relief, Weathering, Slopes, Rivers and Drainage Basins and Glacial and periglacial landforms - Weather and Climate: The Atmosphere and its Energy, Moisture in the Atmosphere, Air motion, The general Circulation, Weather, Climatic Types, Local Climate and Change - Soils, Plants and Animals: Soils, The working of Ecosystems, Environmental Controls, Dispersal and Adaptation, The historical Factors in the Distribution of species, Major Natural Ecosystems - Physical Geography and Man: Human Impact on the Natural Environment – Modification of Landforms, Atmosphere and Ecosystems - Applied Physical Geography: Environmental hazards and Management, Economic value, Resource Evaluation –

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| EAS E117 | Basics of Remote Sensing and Applications | 1 | 1 | 1 | 3 | Dr.G.Bhaskaran |
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A comprehensive understanding on the use of Environment Remote Sensing and its applications - The fundamental principles: The component of Remote Sensing system- Energy interaction on earth surface features- Sensor-Sensing and Data products - image interpretation –principles and methods – satellite imagery interpretation – interpretation keys - Remote Sensing and natural resource management: Mapping Geology, Drainage, and Soils-Land use land cover analysis-Mineral and mining- Ocean resources and remote sensing - Remote Sensing and settlement Management: Rural and Urban Mapping-Rural land use and land capability planning- Urban land use, Transportation and facility management applications - Remote Sensing and Regional planning: Resources and Environmental region delineation- Assessing Environmental Sensitivity –assessing changes - Remote Sensing and Disaster Management: Remote Sensing meteorology and climatic condition- Earthquake services-Flood and drought monitoring-Monitoring Hilly area

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| EAS E118 | Basics of GIS and Applications | 1 | 1 | 1 | 3 | Dr.R.Jaganathan |
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A first level course on GIS – raster, vector, TIN data and Integration of attribute data and Applications - GIS definition, function and components – Raster and Vector Data – Attribute data – Cartography and GIS – Geodatabase model -Representation of Surfaces and Elevation - GIS data sources: Maps, Remote Sensing and Statistical reports – socio-economic surveys- Field survey and GIS - GIS analysis and output: Query – presentation of description and patterns – Relationships – Areas and Classification- GIS application: Map Making –Facility Management - E- Governance- land use land capability application –Water Resource Management - GIS Facility and Governance: Site and Service planning in GIS – GIS in Health and Crime mapping and management - Cadastre information – Urban information

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| EAS E119 | Basics of Economic Geography | 2 | 1 | 0 | 3 | Dr.V.Madha Suresh |
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The principles of resources and primary, secondary and tertiary economic activities are explained.- The subject: The concept of Economy and Economic Geography - Primary, Secondary, Tertiary Activities - Man and Resources: Land Forms, Climate, Vegetation, Soil, Mineral, Water and Man - Primary Economic Activities: World Natural Regions - Agriculture Regions - Mineral Regions and Mineral Production - Secondary Economic Activities: Type of Manufacturing Activities - Major Industries and Industrial Regions - Tertiary Economy: Ports, Harbor and Commodity Tread-Railway Networks -International Tread, Exports and Imports

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| EAS E120 | Basics of Spatial Data and Cartography | 2 | 1 | 0 | 3 | Dr.R.Jaganathan |
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Objective elements and methods are explained - Spatial data: definition of spatial data-location information and associated attributes- sources, spatial referencing-scales of measurement- the three-dimensional data - Spatial sampling and areal differentiation: point, line and area sampling principles- random, systematic and systematic sampling for spatial data generation- Choropleth and isorhythmic principles - Cartography and basic framework: The science of map making- types of maps – maps and atlases - Map scale-Indian maps, scales and index- latitude and longitude, time, distance and area measurement of maps - Using Maps: Use of symbols and conventional signs- measurement from maps, map reading - Map Making: Principles of designing- map elements – map layout - Map and their Use: Topographic maps- relief and climatic maps – statistical and economical maps the domain of economic map – maps and GIS-map making and decision making

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| EAS E121 | Urban Studies | 3 | 0 | 0 | 3 | Dr.M.Sakthivel |
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The intricacies of urban areas are understood - Nature, scope and significance of urban geography, different approaches to the study of urban geography, recent trends Origin and growth of urban centres, past and present, trends of urbanisation in India since 1901 - Classification of urban centres on the basis of a. size, b. function-comparative assessment, urban density gradient - Urban Morphology: Land use Models - Urban expansion: vertical and horizontal, urban sprawl, urban fringe, suburban growth and characteristics, the concept of development of satellite towns, new towns, conurbation, metropolis, megalopolis - City Region Concept: Umland, rank size rule, urban planning, renewal and associated problems, urban environmental problems, remedial measures

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| EAS E122 | Geography of Human Resource Development in India | 3 | 0 | 0 | 3 | Dr.T.Vasanthakumaran |
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India population, its distribution, structure and potentials are understood - Demographic Trends: Demographic transition in India; The geography of fertility in India; Urban growth and village roots in India - Features of Indian Urbanisation: Urban India through Censuses; Indian City and its Population Problems; Large Indian Cities: the four metropolises; Intermediate and small cities; Factors and processes of spatial segregation in India - Contrasts in Development: North India: A study of Population, Economy, Demographic Dimensions, Urbanisation, Health, Dimensions of Poverty; South India: A study of Population, Economy, Demographic Dimensions, Urbanisation, Health, Dimensions of Poverty - Health and Epidemics in India: Diffusion of HIV/AIDS in India, Emergence of New Health Care Networks in India; Case studies - Women and Minorities in

India: A geography of sex ratio in India; Geopolitics of refugee flows in India; Underprivileged minorities in India: Women, Dalits and Tribals

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| EAS E123 | Geography of Community Action Planning | 3 | 0 | 0 | 3 | Dr.T.Vasanthakumaran |
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Community Action is on the basis of various technique including PRA and village resource mapping - Geography of a Community: Place, Folk and Work Triology of Geddes; Building Bridges to a Sustainable Future; Mechanisms of Collaboration and Making Collaboration Work; Lessons from People Working Together; Creating Opportunity for Place, Folk and Work (5 lectures) - Theory in Practice: Geography and Development: The Orthodoxy and the Challenges; Action Planning, Strategic Planning, and Development Planning Practice; Challenging the Orthodoxy of Planning and Working Assumptions; Action Planning in Theory: New Realism and Alternative Paradigm, Characteristics, Action Planning Menu, Action Planning and Process (5 lectures) - Tools for Practice: Community Projects, Village and City Plans; Tools and Techniques; Concerns of Community Processes; The Community and the Outsider; Levels of Participation: Appropriate Levels of Participation; A Model for Participation; A Model for Partnerships; and A Model for Collaboration (5 lectures) - Tools in Operation: Community Action Planning (Microplanning): Problem Identification and Prioritisation; Strategies, Options and Tradeoffs; Planning for Implementation; Monitoring and Evaluation; Planning for Real: Goal Oriented Planning and People-Oriented Planning (5 lectures). - Case Studies: Participation Matrix: Project Stages: Initiate, Plan, Implement and Maintain; Level of Community Involvement: Information, Consultation, Partnership, Self-Help; A Framework for Participation Matrix; Community Planning Forum: The Format: Interactive displays, Open forum, Workshop groups, Networking, and Feedback; Case Studies of Community Action Planning: Desertification and Community Action Planning in Thevaram Basin; and Replication of a Methodology for Community Action Planning in Tribal Kollihills (5 lectures).

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| EAS E124 | Geography of Man and Culture | 3 | 0 | 0 | 3 | Dr.G.Bhaskaran |
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Understanding of Man and environment, settlement pattern, land use, culture and cultural regions are explained - Man and nature: Influence of land and climate on man- Determinism, Possibilism and man's adaptation - Civilized man: Anthoropo- geography regions-Language, Religion, and Cultural regions - Divided Civilization.- Human landscape and agricultural Landscape: Demographic regions, diffusion, cultural integration, population patterns and settlement landscape- Agricultural region, Diffusion and cultural integration in Agriculture - Political landscape and Mosaic of languages: political cultural regions, diffusion and politico cultural integration - linguistic culture region, diffusion and cultural linguistic integration - Religious, Folk and Ethnic landscape: Religious culture Region, diffusion and cultural integration in religion- Folk cultural regions, diffusion and cultural integration in folk geography- ethnic regions, cultural diffusion and ethnicity --ethnic cultural integration - Urban and Ethnic landscape – urban culture regions, diffusion and cultural integration and models of the city.

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| EAS E125 | Geography for Social Sciences | 3 | 0 | 0 | 3 | Dr.M.Sakthivel |
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This is geography made easy and interesting for students of social sciences - Geography as a Discipline: Meaning, scope and developments in geography; the subject matter of geography; Geography as a study of place and space; Geography as a space-time process; Geography as a behavioral study - Geography as a Social Science: Philosophy and methodology of geography and social sciences; Description, explanation and prediction in geography; Place-Folk-Wok Triology of Geddes; Geography and society; Geography and knowledge; Geography, doing and knowing - Geography as a Science: Scientific reasoning in geography; Generic versus Individualistic / Particularistic; Newer methods of geography: qualitative and participatory methods - Practical Significance of Geographical Theories: Urban land use theories; Spatial diffusion theories; Growth pole theories; Spatial preference theories; General spatial system theories - Application and Case Studies: Rural Studies and some cases; Urban studies and some cases; Environmental studies and some cases; Sustainable development studies and some cases; Watershed management studies

M.Sc SPATIAL INFORMATION TECHNOLOGY

| Core Courses | Number of credits | L | T | P | C |
|---|--|----------|----------|----------|----------|
| EAS C001 | Fundamentals of Cartography (C) | 2 | 1 | 0 | 3 |
| EAS C101 | Spatial Statistics and Mathematics(C) | 2 | 1 | 0 | 3 |
| EAS C102 | Physical Resource Base(C) | | | | |
| EAS C103 | Seminar-I-(Review and Appraisal of Mapping and Information) Techniques(C) | 0 | 2 | 2 | |
| EAS C005 | Practical-I-Techniques of Mapping and Map Analysis(C) | 1 | 1 | 2 | 4 |
| Electives from the Department | | | | | |
| EAS E001 | Coastal and Ocean Resources Studies | 2 | 1 | 0 | 3 |
| EAS E003 | Scientific Philosophy and Methodology | 2 | 1 | 0 | 3 |
| EAS E101 | Land Resource Management | 2 | 1 | 0 | 3 |
| EAS E102 | Advanced Statistics Analysis in Geography | 2 | 1 | 0 | 3 |
| EAS E103 | Fundamentals of Information System and Management | 2 | 1 | 0 | 3 |
| SECOND SEMESTER | | | | | |
| EAS C006 | Fundamentals of GIS(C) | 2 | 1 | 0 | 3 |
| EAS C007 | Fundamentals of Modern Surveying and Remote sensing | 2 | 1 | 0 | 3 |
| EAS C104 | Socio-economic Resource Base (C) | 2 | 1 | 0 | 3 |
| EAS C105 | Seminar-II-(Application of Remote Sensing or and GIS) (C) | 0 | 0 | 2 | 2 |
| EAS C010 | Practical-II- GIS : Inputs, Transformation and Analysis(C) | 1 | 1 | 2 | 4 |
| Electives from the Department | | | | | |
| EAS E006 | Urban and Metropolitan Studies | 3 | 0 | 0 | 3 |
| EAS E009 | Satellite Remote Sensing | 3 | 0 | 0 | 3 |
| EAS E010 | Sustainable Development and Adaptive Management | 3 | 0 | 0 | 3 |
| EAS E104 | Survey and Field Work Techniques | 3 | 0 | 0 | 3 |
| EAS E105 | Spatial Analysis | 3 | 0 | 0 | 3 |
| THIRD SEMESTER | | | | | |
| EAS C106 | GIS Modelling and Applications(C) | 2 | 1 | 0 | 3 |
| EAS C107 | Risk Analysis and Vulnerability (C) | 2 | 1 | 0 | 3 |
| EAS C108 | Spatial Modelling and Programming(C) | 2 | 1 | 0 | 3 |
| EAS C109 | Seminar-III-(Spatial Analysis and Decision Making)(C) | 0 | 0 | 2 | 2 |
| EAS C110 | Practical-III-Spatial Data Analysis and Surface Modelling(C) | 1 | 1 | 2 | 4 |
| Electives from the Department | | | | | |
| EAS E012 | Digital Image Processing and Modelling | 2 | 1 | 0 | 3 |
| EAS E013 | Advanced GIS Modelling | 2 | 1 | 0 | 3 |
| EAS E106 | Micro-wave Remote Sensing and Applications | 2 | 1 | 0 | 3 |
| EAS E107 | Urban Information System | 2 | 1 | 0 | 3 |
| FOURTH SEMESTER | | | | | |
| EAS C016 | Tour, Field work and Report (C) | 0 | 1 | 1 | 2 |
| EAS C017 | Internship (C) | 0 | 0 | 3 | 3 |
| EAS C018 | Project (C) | 0 | 0 | 6 | 6 |
| SELF- STUDY COURSES – OPTIONAL (For extra credits) | | | | | |
| FOR M.Sc APPLIED GEOGRAPHY AND M.Sc SPATIAL INFORMATION TECHNOLOGY | | | | | |
| THIRD SEMESTER | | | | | |

| Core Courses | Number of credits | L | T | P | C |
|---|---|----------|----------|----------|----------|
| EAS S101 | Tourism, Leisure and Hospitality Studies | 1 | 2 | 1 | 4 |
| EAS S102 | Geography of Health and Environment | 1 | 2 | 1 | 4 |
| EAS S103 | River Basin Analysis | 0 | 2 | 2 | 4 |
| EAS S104 | Business GIS | 1 | 2 | 1 | 4 |
| EAS S105 | Gender Studies | 1 | 2 | 1 | 4 |
| EAS S106 | E-Governance and Social Administration | 1 | 2 | 1 | 4 |
| FOURTH SEMESTER | | | | | |
| EAS S107 | Traditional Ecological Knowledge Systems | 1 | 2 | 1 | 4 |
| EAS S108 | Environmental Impact Assessment and Management | 1 | 2 | 1 | 4 |
| EAS S109 | Location and Allocation Methodology | 0 | 2 | 2 | 4 |
| EAS S110 | Chemical Geography | 1 | 3 | 0 | 4 |
| EAS S111 | Bio-Geography | 1 | 3 | 0 | 4 |
| EAS S112 | Methods and Strategy for Natural Resources and Management | 1 | 3 | 0 | 4 |
| EAS S113 | Web Cartography and GIS | 0 | 2 | 2 | 4 |
| ELECTIVE COURSES FOR OTHER DEPARTMENTS | | | | | |
| FIRST SEMESTER | | | | | |
| ELECTIVES | | | | | |
| EAS E114 | Geography of Tamil Nadu | 3 | 0 | 0 | 3 |
| EAS E115 | Geography of Trade and Aid | 3 | 0 | 0 | 3 |
| EAS E116 | Basics of Physical Geography | 3 | 0 | 0 | 3 |
| | | | | | |
| SECOND SEMESTER | | | | | |
| ELECTIVES | | | | | |
| EAS E117 | Basics of Remote Sensing and Applications | 1 | 1 | 1 | 3 |
| EAS E118 | Basics of GIS and Applications | 1 | 2 | 0 | 3 |
| EAS E119 | Basics of Economic Geography | 1 | 2 | 0 | 3 |
| THIRD SEMESTER | | | | | |
| ELECTIVES | | | | | |
| EAS E120 | Basics of Spatial data and Cartography | 3 | 0 | 0 | 3 |
| EAS E121 | Urban Studies | 3 | 0 | 0 | 3 |
| EAS E122 | Geography of Human Resources Development in India | 3 | 0 | 0 | 3 |
| FOURTH SEMESTER | | | | | |
| ELECTIVES | | | | | |
| EAS E123 | Geography of Community Action Planning | 3 | 0 | 0 | 3 |
| EAS E124 | Geography of Man and Culture | 3 | 0 | 0 | 3 |
| EAS E125 | Geography for Social Sciences | 3 | 0 | 0 | 3 |

M.Sc. GEOLOGY

FIRST SEMESTER

| Course Code | Course Title | C/E | Credits | | | | Course Faculty |
|-------------|--|-----|---------|---|---|---|---------------------------------------|
| | | | L | T | P | C | |
| EAS C201 | Stratigraphy and Sequence Stratigraphy | C | 3 | - | - | 3 | Prof.S.P.Mohan |
| EAS C202 | Paleontology | C | 3 | - | - | 3 | Dr.S.M.Hussain |
| EAS C203 | Physical Geology and Geomorphology | C | 3 | - | - | 3 | Dr.M.Suresh Gandhi |
| EAS C204 | Structural Geology & Geotectonics | C | 3 | - | 0 | 3 | Prof.S.Ramasamy Dr.M.Suresh Gandhi |
| EAS C205 | Paleontology and Structural Geology Practicals | C | - | - | 3 | 3 | Dr.S.M.Hussain Dr.M.Suresh Gandhi |
| | Elective Course I | E | 3 | - | - | 3 | |

ECOND SEMESTER

| | | | | | | | |
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| EAS C206 | Ore Geology & Mining Geology | C | 3 | - | - | 3 | Dr.M.Suresh Gandhi |
| EAS C207 | Mineralogy & Instrumentation Techniques | C | 3 | - | - | 3 | Prof.V.Ram Mohan |
| EAS C208 | Fuel Geology | C | 3 | - | - | 3 | Prof.S.Ramasamy Dr.S.M.Hussain |
| EAS C209 | Geological Mapping | C | - | - | - | 2 | All Faculty |
| EAS C210 | Mineralogy, Mining and Ore Geology Practicals | C | - | - | 3 | 3 | Prof.V.Ram Mohan Dr.M.Suresh Gandhi |
| | Elective Course II | E | 3 | - | - | 3 | |

THIRD SEMESTER

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|----------|--|--------------|---|---|---|---|--------------------------------------|
| EAS C211 | Igneous and Metamorphic Petrology | C | 3 | - | - | 3 | Prof.V.Ram Mohan |
| EAS C212 | Sedimentology and Sedimentary Petrology | C | 3 | - | - | 3 | Prof.S.Ramasamy |
| EAS C213 | Geochemistry and Engineering Geology | C | 3 | - | - | 3 | Dr.S.M.Hussain Dr.M.Suresh Gandhi |
| EAS C214 | Remote Sensing and Geographical Information System | Elective III | 3 | - | - | 3 | Prof.V.Ram Mohan Dr.S.M.Hussain |
| EAS C215 | Petrology, Remote Sensing and GIS Practicals | C | - | - | 3 | 3 | Prof.V.Ram Mohan Prof.S.Ramasamy |
| EAS C216 | Industrial Training | C | - | - | - | 2 | |

FOURTH SEMESTER

| | | | | | | | |
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| EAS C217 | Micropaleontology | C | 3 | - | - | 3 | Dr.S.M.Hussain |
| EAS C218 | Geological Oceanography | C | 3 | - | - | 3 | Prof.S.Ramasamy |
| EAS C219 | Environmental Geology | C | 3 | - | - | 3 | Prof.S.P.Mohan Prof.V.Ram Mohan Dr.M.Suresh Gandhi |
| EAS C220 | Micropaleontology and Geochemistry Practicals | C | - | - | 3 | 3 | Dr.S.M.Hussain Dr.M.Suresh Gandhi |
| EAS C221 | Geological Instructional Tour | C | - | - | - | 2 | All Faculty |
| EAS C222 | Dissertation | C | - | - | - | 4 | All Faculty |
| EAS C223 | Viva-voce | C | - | - | - | 2 | |

Elective Courses (4 x 3 = 12)

| Semester | Course Code | Course Title | Course Faculty |
|-------------------------------|-------------|-------------------------------|-----------------------------------|
| First Semester – Elective I | EAS E201 | Stratigraphy and Paleontology | Prof.S.P.Mohan Dr.S.M.Hussain |
| Second Semester – Elective II | EAS E202 | Petroleum and Coal Geology | Prof.S.Ramasamy Dr.S.M.Hussain |

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| Third Semester – Elective III | EAS E203 | Remote Sensing and Geographical Information System | Prof.V.Ram Mohan |
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| EAS C201 | Stratigraphy and sequence Stratigraphy | C | 3 | - | - | 3 | PROF.S.P.MOHAN |
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- Unit I: Principles of Stratigraphy – Stratigraphic classification and nomenclature – Concept of rock Units- Time units and Time – rock Units – Lithostratigraphic Units – Biostratigraphic Units – Chronostratigraphic Units – Geologic time Units – correlation – Physical and Paleontologic evidences – Homotaxis
- Unit II : Lithology, distribution, tectonics and economic importance of the Precambrian rocks of India – Sargur Supergroup – Dharwar Supergroup – Sakoli Group – Sausar Group – Iron ore Group of Bihar and Orissa – Bundelkhand Group – Banded Gneiss complex – Aravalli Supergroup
- Unit III: Cuddapah and Vindhyan Basins – Paleozoic rocks – Paleogeography, Climatic conditions and Coal bearing formations of Gondwana – Triassic of Spiti – Jurassic of Kutch – Trichinopoly cretaceous – Bagh and Lameta Groups.
- Unit IV: Deccan traps – Classification and age – Ecocene, Oligocene and Miocene rocks – SiwalikSupergroup – Periods of glaciation – Karewas of Kashmir – Indo –Gangetic plains – Boundary - Problems: – Precambrian – Cambrian, Permian – Triassic, Cretaceous – Tertiary.
- Unit V: Historic perspective – Evolution, Concepts and principles – Relative sea-level, tectonics and Eustasy- Sediment supply – Sequences and System tracts.- Seismic stratigraphy – Recognition of System - tracts on seismic data – Outcrop and well data – Sequence stratigraphy of outcrops and cores – Chronostratigraphic charts – Construction of Chronostratigraphic charts from seismic data- Biostratigraphy – Fossil groups and Zonal schemes – Paleoenvironmental analysis – Sequence stratigraphy - Organic rich facies and system tracts - Hydrocarbon source rocks – Marine carbonates.

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| EAS C202 | Paleontology | C | 3 | - | - | 3 | Dr.S.M.Hussain |
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- Unit I: Origin and evolution of life – Phylogenetic and Ontogenic Analysis – Species Concept – Types of Fossils and Types of Species – Palingensis – Coenogenesis - Thanatocoenosis – Biocoenosis
- Unit II: Biomineralisation and Trace Fossils – Fossils and their uses – Biometrics – Major events in the history of Precambrian and Phanerozoic life
- Unit III: Functional morphology, Classification and evolution of Brachiopoda, Pelecypoda, Gastropoda, Cephalopoda, Trilobita, Coelenterata, Echinodermata and Graptolites.
- Unit IV: Functional morphology, evolution and significance of Plant Fossils, Fishes, Horse, Elephant and Man, Dinosaurs and their extinction.
- Unit V: Taphonomy and environmental factors, Oxygen and Carbon isotope studies of fossils and paleoclimates – Palaeobiogeographic Provinces.

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| EAS C203 | Physical Geology And Geomorphology | C | 3 | - | - | 3 | DR.M.Suresh Gandhi |
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Physical Geology

- Unit I: Earth and the solar system. Crust and Interior of the earth: Internal structure and chemical composition of various layers. Earth movement through time: orogenic and epirogenic phases, evidence of continental drift, evidence of sea floor spreading, evolution of plate tectonic theory, nature and types of plate margins, geometry, and mechanism of plate motion.
- Unit II: Tectonics of continental margins, continental shelves, divergent margins, active margins and marginal basins. Origin and distribution of island arcs. Origin and significance of mid-oceanic ridges and trenches. Evolution of oceans and continents. Relationship between orogeny, magmatism, metamorphism and metalogeny..
- Unit III: Seismic belts of the earth. Seismicity and plate movements. Neotectonics: active faults, geomorphological indicators, drainage changes, recurrent seismicity. Geodynamics of the Indian plate.

Geomorphology

- Unit IV: Landforms, their types and development. Weathering, transport and erosion. Landforms in relation to rock type, structure and tectonics. Development of soils and their types.
- Unit V: Geomorphic processes and their impact on various landforms and associated dynamics. Morphometric analysis. Geomorphological mapping based on genesis of landforms. Evolution of the major geomorphological features of the Indian sub-continent.

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| EAS C204 | Structural Geology And geotectonics | C | 3 | - | - | 3 | PROF.S.RAMASAMY |
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Structural Geology

- Unit I: Concepts of stress and strain. Stress-strain relationships of elastic, plastic and viscous materials. Measurement of strain in deformed rocks. Behaviour of minerals and rocks under deformation conditions.

- Unit II: Geometric classification of folds, mechanics of folding, folding in shear zones, geometry of superposed folding. Structural analysis in terrains with multiple deformations.
- Unit III: Foliation, lineation and fabric. Faults and fractures, geometry and mechanics of shear zones, brittle and ductile structures in shear zones, geometry of thrust sheets, joints
- Unit IV: Unconformities and basement-cover relations. Structural behaviour of igneous rocks, diapirs and salt domes. Introduction to petrofabrics.

Geotectonics

- Unit V : Major earth structure: major topographic features of the earth, present day tectonic activity, stable and unstable tectonic zones. Geological structure and plate tectonics. Structural interpretation in ancient orogenic belts

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| EAS C205 | Paleontology And Structural Geology Practicals | C | - | - | 3 | 3 | DR.S.M.Hussain DR.M.Suresh Gandhi |
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PALEONTOLOGY

Recognition of fossil groups (Coelenterata, Brachiopoda, Pelecypoda, Gastropoda, Cephalopoda, Trilobita, Echinodermata, Graptolites and Plant fossils) in an assorted assemblage and discussion on their taxonomy. Study of index fossils from Indian stratigraphic horizons and Order of Superposition. Study of modes of preservation of fossils.

STRUCTURAL GEOLOGY

Preparation and interpretation of geological maps and sections. Structural problems concerning economic and mineral deposits. Study of large scale tectonic features of the earth.

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| EASC206 | Ore Geology And Mining Geology | C | 3 | - | - | 3 | DR.M.Suresh Gandhi |
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Ore Geology

- Unit I: Modern concept of ore genesis: Global metalogeny as related to crustal evolution; Metalogenesis in space and time; Ore deposits and Plate tectonics; Ore deposits and ore minerals- Physico-chemical controls of deposition and post depositional changes in ores.
- Unit II: Magmatic process of mineralisation; Porphyre, skarn and hydrothermal mineralisation; Fluid inclusion studies; mineralisation associated with 1) ultramafic, mafic and acidic rocks, 2) greenstone belts, 3) komatiites, anorthosites and kimberlites and 4) submarine volcanism; Magma related mineralisation through geological time; Stratiform and strata bound ores; Ores and metamorphism-cause and effect relations;
- Unit III: Occurrence and distribution in India of metaliferous deposits- base metals, iron, aluminium, manganese, chromium, nickel, gold, silver, molybdenum. Strategic, critical and essential minerals. India's status in mineral production. National mineral policy.
- Unit IV: Indian deposits of non-metals – mica, asbestos, barites, gypsum, graphite, apatite. Gem- stones, refractory minerals, abrasives and minerals used in glass, fertilizer, paint, ceramic, and cement industries. Phosphorite deposits, Placer deposits, rare earth minerals.

Mining Geology

- Unit V: Mining geology: Planning, exploration exploratory mining of surface and underground mineral deposits involving diamond drilling, shaft sinking, drifting, cross cutting, winzing, stoping, room and pillaring, top-slicing, sub level caving and block caving. Surface and subsurface mining operations.

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| EAS C207 | Mineralogy And Instrumentation Techniques | C | 3 | - | - | 3 | Prof.V.Ram Mohan |
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Mineralogy

- Unit I : Concept of symmetry, point group, lattice and space group, principles of crystal chemistry, principles of optical and X-ray mineralogy.
- Unit II: Optical properties of common rock forming silicate minerals, uniaxial and biaxial minerals. Extinction angles, pleochroism, birefringence of minerals and their relationship with mineral composition, Twinned crystals. Dispersion - U-stage.
- Unit III: Systematic mineralogy: atomic structure, mineral chemistry and their P-T stability and mode of occurrence of common rock forming minerals.

Unit IV: Mineral assemblages. Gem and semi-precious minerals. Principles of geothermo-barometry. Instrumentation techniques

Unit V: Principles and geological application of atomic absorption spectrophotometry, inductively coupled plasma – atomic emission spectrometry, X-ray fluorescence spectrometry, scanning and transmission electron microscopy, electron probe micranalysis and X-ray diffractometry.

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| EAS C208 | Fuel Geology | C | 3 | - | - | 3 | PROF.S.Ramasamy DR.S.M.Hussain |
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Unit I: Definition and origin of kerogen and coal, Sedimentology of coal bearing strata, Rank, grade and type of coal, Indian and International classifications, chemical characterization, Macroscopic ingredients and microscopic constituents, concept of macerals and microlithotypes.

Unit II: Coal petrology, Application of coal petrology in hydrocarbon exploration, solving industrial and geological problems, Maturation of coal and generation of methane in coalbeds, Coal forming epochs in the geological past, Geological and geographical distribution of coal deposits in India, Detailed geology of few important coal fields of India.

Unit III: Composition and different fractions of petroleum, Origin, nature and migration of oil and gas, Environment of formation, Porosity and permeability bearing on the migration and formation of petroleum, Reservoir rock, source rock and cap rock, Characteristics of various Traps, Reservoir fluids-water, oil and gas occurrence, Elements of Geological, geophysical and geochemical methods of exploration.

Unit IV: Elements of well drilling, Cable tool drilling, Rotary drilling, Various types of onshore and off-shore drilling units, Casings, Fishing, Blow-outs, Well logging procedures, Well completion techniques, Primary, Secondary and Enhanced Oil Recovery methods, Oil bearing basins of India and the world, Geology of productive oil fields of India.

Unit V: Mode of occurrence and association of atomic minerals in nature. Atomic minerals as source of energy. Methods of prospecting and productive geological horizons in India. Atomic fuels and environment, Nuclear power stations of India and future prospects.

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| EAS C209 | Geological Mapping | C | - | - | - | 2 | All Faculty |
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| EAS C210 | Mineralogy, Mining And Ore Geology Practicals | C | - | - | 3 | 3 | PROF.V.Ram Mohan DR.M.Suresh Gandhi |
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Mineralogy

Microscopic and megascopic study of rock forming minerals using optical accessories. Depending upon availability of facility, exercises in sample dissolution, determination of elemental composition of minerals and rocks by flame photometer and AAS. Exercises on thin section and polished section making, etching and staining.

Mining and Ore Geology

Megascopic study of structures and fabrics of different ores and their associations. Exercises on mine sampling and determination of tenor, cut-off grades and ore reserves.

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| EAS C211 | Igneous And Metamorphic Petrology | C | 3 | - | - | 3 | PROF.V.Ram MOHAN |
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Igneous Petrology

Unit I: Basic concepts of Igneous Petrology – Classifications – Mode of Occurrence – Structures and Textures. Nature of Magmas – Generation of magmas. Factors affecting their evolution and their relation to plate tectonics– Magmatic differentiation and Assimilation. Variation diagrams

Unit II: Experimental Petrology - Phase equilibrium of binary and ternary silicate systems and its petrological implications – Effect of Pressure on silicate systems – Trace elements in magmatic crystallization – Trace element modeling.

Unit III : Petrogenesis of major igneous rocks with Indian occurrences – Basalts, Mafic–Ultramafic associations – Anorthosites – Granite – Alkaline rocks – Carbonatites – Lamprophyres and Kimberlite.

Metamorphic Petrology

UnitIV: Basic Concepts of Metamorphic Petrology – Types of metamorphism – agents of metamorphism Zones and grades. Facies concept of metamorphism. Graphical Representation of metamorphic paragenesis – Schreinmaker’s rule and construction of petrogenetic grid.

Unit V : Petrogenesis of important metamorphic rocks – charnockite – eclogite – amphibolite –and migmatites – Khondalites – metamorphic belts

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| EASC212 | Sedimentology And Sedimentary Petrology | C | 3 | - | - | 3 | PROF.S.Ramasamy |
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- Unit I: Earth Surface System: Liberation and flux of sediments, Processes of transport and generation of sedimentary structures, Control on the sedimentary record, Cyclic Sediments, Seismic and Sequence Stratigraphy – Classification of sedimentary rocks – Definition, measurements and interpretation of grain size.
- Unit II: Evolution Of Sedimentary Basins: Classification and definition of Sedimentary basins, Tectonics and Sedimentation – Plate tectonic concepts – Sedimentary basins of India – Paleocurrent and Basin analysis – Provenance and Diagenesis of sediments – Sedimentation in dams and reservoirs.
- Unit III: Sedimentary environments and facies, Continental alluvial – fluvial, lacustrine, desert – Eolian and Glacial sedimentary systems; Shallow Coastal Facies, Marine and Continental Evaporates; Shallow water Carbonates; Deep sea basins; Volcanoclastic on land and marine – Facies modelling.
- Unit IV: Petrography of rocks of Clastic, Chemical and Biochemical origin, Clastic Petrofacies, Paleoclimate and Paleoenvironment analyses; Application of trace elements, Rare-earth elements and Stable isotope geochemistry to sedimentological problems.
- Unit V: Field and Laboratory techniques in Sedimentology; Recording of sedimentary structures – Preparation of lithologs, rock and thin section staining, Cathodoluminescence, use of Counter, diagenesis and Fluid flow, Diagenesis of Mudstone, Sandstone and Carbonate rocks; Changes in Mineralogy, Fabric and Chemistry

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| EAS C213 | Geochemistry And engineering Geology | C | 3 | - | - | 3 | DR.S.M.Hussain DR.M.Suresh Gandhi |
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Geochemistry

- Unit I: Earth in relation to solar system and universe, cosmic abundance of elements, composition of the planets and meteorites. Structure and composition of earth and distribution of elements. Trace elements. Elementary crystal chemistry and thermodynamics.
- Unit II: Rock weathering and soil formation. Elemental mobility in surface environment. Introduction to isotope Geochemistry, Geochemistry of Hydrosphere, biosphere and atmosphere. Geochemical cycle and principles of geochemical prospecting.

Engineering Geology

- Unit III: Role of engineering geology in civil construction and mining industry. Various stages of engineering geological investigation for civil engineering projects, Engineering properties of rocks, rock discontinuities. Physical characters of building stones. Metal and concrete aggregates,
- Unit IV: Geological consideration for evaluation of dams and reservoir sites. Dam foundation rock problem. Geotechnical evaluation of tunnel alignments and transportation routes, methods of tunneling, classification of ground for tunneling purposes, various types of support.
- Unit V: Mass movements with special emphasis on landslides and causes of hill slope instability. Earthquakes and seismicity, seismic zones of India. Aseismic design of building. Influence of geological conditions on foundation and design buildings.

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| EAS C214 | Remote Sensing and Geographical Information System | E - III | 3 | - | - | 3 | PROF.V.Ram Mohan DR.S.M.Hussain |
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Remote Sensing

- Unit I: Principals of remote sensing: General idea about electromagnetic spectrum, aerial photographs and their geometry, photogrammetry: recent advances and applications. Satellite remote sensing.
- Unit II: Global and Indian space missions. Different satellite exploration programmes and their characteristics: LANDSAT, METEOSAT, SEASAT, SPOT, IRS. Image interpretation and digital processing techniques
- Unit III: Geological studies: Image characters and their relation with ground objects based on tone, texture and pattern; Principles of terrain analysis, evaluation of ground water potential, rock type identification; and interpretation of topographic and tectonic features.

Geographical Information System

- Unit IV: Components, data presentation, vector and raster methods, input and output devices, software and definition of equipments.
- Unit V: Database design and structure. Data analysis and cartographic modeling. Digital elevation model. Data representation and techniques of data interpretation.

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| EAS C215 | Petrology, Remote Sensing and Gis Practicals | C | - | - | 3 | 3 | PROF.V.Ram Mohan PROF.S.Ramasamy |
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Igneous and Metamorphic Petrology

Megasopic and microscopic study of igneous lithotypes. Calculation of CIPW Norms, Preparation of variation diagrams. Megasopic and microscopic study of metamorphic rocks of different facies. Graphic construction of ACF, AKF and AFM diagrams.

Sedimentology and Sedimentary Petrology

Study of primary, secondary and biogenic sedimentary structures in hand specimens, in photographic atlases, field photographs and wherever possible in outcrops; exercise related to paleocurrent data from different environments. Tilt correction of paleocurrent data, exercise related to analysis and interpretation of sedimentary environments using actual case histories from the Indian sedimentary records – Determination of porosity in clastic and carbonate rocks – staining and mineral identification in carbonate rocks – petrography of clastic and chemical sedimentary rocks – Detailed studies of diagenetic features in thin sections – microscopic and geochemical data plots for environmental interpretation.

Remote Sensing and GIS

Study of nature of aerial photographs: resolution, mosaics, symbols, gully pattern and drainage analysis. Exercises on MSS, TM, FCC, IR, Radar and SPOT images for geological and geomorphological mapping and in (georesources) vegetation, water and mineral resource evaluation. Exercises on digital image processing. Study of environmental hazard maps.

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| EAS C217 | Micropaleontology | C | 3 | - | - | 3 | DR.S.M.Hussain |
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- Unit I: Introduction to microfossils and micropaleontology, Historical development of micropaleontological studies world-wide in general and India in particular, Applications of microfossils viz., biostratigraphical, paleoecological, paleobiogeographical and economical (hydrocarbon and coal) uses. Divisions of the marine environment and their characteristic fauna and flora.
- Unit II: Surface and sub-surface sampling methods, processing of samples, preparation of thin sections of larger foraminifera, Sampling techniques for ecological studies living microforms. Scanning Electron Microscope photographic techniques.
- Unit III: Test morphology, wall structure, dimorphism, classification, evolution and ecology/paleoecology of Foraminifera, Biometrics of important larger foraminifera, Stratigraphy of foraminifera with emphasis on Indian stratigraphic horizons.
- Unit IV: Carapace morphology, Ecdysis, Scatter diagrams (Ontogenic studies), classification, evolution and ecology/paleoecology of Ostracoda. Applications of functional morphological characteristics in environmental studies, Carapace/valve ratio, adult/juvenile ratio, predation and pyritisation of carapace to interpret paleoecology and hydrocarbon potential, Morphology, mineralogy and geological distribution of nannofossils.
- Unit V: Skeletal morphology, wall structure, classification, paleoecology and paleoceanography of Radiolaria - Morphology and classification of Conodonts, Bryozoa, Diatoms and Pteropods. Palynological techniques, Morphology, distinguishing characteristics of spores and pollen and their uses in oil industry.

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| EAS C218 | Geological Oceanography | C | 3 | - | - | 3 | PROF.S.Ramasamy |
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- Unit I: Ocean morphology, deep ocean floor and various topographic features, ridges, seamounts, coral reefs, continental shelf, slope, benches and canyons. Hydrothermal vents and seawater - basalt interaction.
- Unit II: Oceanic circulation, waves, currents and tides – Nearshore geological processes, sea level changes with special emphasis on Quaternary-Oceanic sediments and distribution of marine microfossils – Stratigraphy and geochemistry of deep-sea deposits.
- Unit III: Tectonic history of the oceans – Global tectonics and seafloor spreading-Chemical properties of sea water- Chemistry of oceanic rocks - marine instrumentation on navigation with special mention on geological studies such as dredges, grabs, water samplers, underwater cameras, etc.
- Unit IV: Mineral resources of the oceans – Diagenetic changes in oxic and anoxic environments – Mobility of redox metals – Isotope geochemistry and paleoceanography- Sedimentary markers (biological and chemical) of palaeoenvironmental conditions.
- Unit V: Ocean laws and management- Marine pollution-Deep-sea drilling projects and modern research in marine geology – Marine geology of Antarctic sea and other cold seas/oceans.

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| EAS C219 | Environmental Geology | C | 3 | - | - | 3 | PROF.S.P.Mohan PROF.V.Ram Mohan DR.M.Suresh gandhi |
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- Unit I: Time scale of global changes in the ecosystems and climate. Impact of circulations in atmosphere and oceans on climate, rainfall and agriculture.
- Unit II: Carbon di-oxide in atmosphere, limestone deposits in the geological sequences, records of paleotemperatures in ice cores of glaciers. Global warming caused by CO₂ increase in present atmosphere due to indiscrete exploitation of fossil fuels, volcanic eruption and afforestation
- Unit III: Cenozoic climate extremes - evolution of life - impact on human evolution.
- Unit IV: Impact assessment of degradation and contamination of surface water and groundwater quality due to industrialization and urbanization. Waterlogging problems due to the indiscrete construction of canals,

reservoirs and dams. Soil profiles and soil quality degradation due to irrigation, use of fertilizers and pesticides.

Unit V: Influence of neotectonics in seismic hazard assessment. Preparation of seismic hazard maps. Distribution, magnitude and intensity of earthquakes.

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| EAS C220 | Micropaleontology and geochemistry Practicals | C | - | - | 3 | 3 | DR.S.M.Hussain DR.M.Suresh Gandhi |
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Micropaleontology

Study of morphological characters and taxonomy of selected Foraminifera and Ostracoda.

Geochemistry

Rock/soil/sediments/water analysis. Calculation of weathering indices in soil and sediments.

ELECTIVE COURSES

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| EAS E201 | Stratigraphy And Paleontology | E - I | 3 | - | - | 3 | I SEMESTER | PROF.S.P.Mohandr. SM.Hussain |
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Unit I: Principles of Stratigraphy – Stratigraphic Classification and nomenclature – Lithostratigraphic Units – Biostratigraphic Units – Chronostratigraphic Units – Correlation – Physical and Paleontologic evidences – Homotaxis

Unit II: Lithology, Distribution, tectonics and economic importance of Dharwar Supergroup, Sargur Supergroup –Cuddapah and Vindhyan Basins – Paleogeography, Climatic conditions and Coal-bearing formations of Gondwana

Unit III: Triassic of Spiti –Jurassic of Kutch – Trichinopoly Cretaceous – Deccan traps – Classification and age – Siwalik Supergroup

Unit IV: Origin and evolution of life – Phylogenetic and Ontogenic Analysis – Species Concept – Types of Fossils and Types of Species – Palingensis – Coenogenesis - Thanatocoenosis – Biocoenosis, Biomineralisation and Trace Fossils – Fossils and their uses – Major events in the history of Precambrian and Phanerozoic life, Functional morphology, Classification and evolution of Brachiopoda, Pelecypoda, Gastropoda, Cephalopoda.

Unit V: Functional morphology, classification and evolution of Trilobita and Graptolites, Morphology and significance of Plant Fossils- evolution of Fishes, Horse, Elephant and Man - Dinosaurs and their extinction.

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| EAS E 202 | Petroleum and Coal Geology | E - II | 3 | - | - | 3 | II SEMESTER | PROF.S.Ramasamy DR.S.M.Hussain |
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Unit I: Definition and origin of kerogen and coal, Sedimentology of coal bearing strata, Rank, grade and type of coal, Indian and International classifications, chemical characterization, Macroscopic ingredients and microscopic constituents, concept of macerals and microlithotypes.

Unit II: Coal petrology, Application of coal petrology in hydrocarbon exploration, solving industrial and geological problems, Maturation of coal and generation of methane in coal beds, Coal forming epochs in the geological past, Geological and geographical distribution of coal deposits in India, Detailed geology of few important coal fields of India.

Unit III: Composition and different fractions of petroleum, Origin, nature and migration of oil and gas, Environment of formation, Porosity and permeability bearing on the migration and formation of petroleum, Reservoir rock, source rock and cap rock, Characteristics of various Traps- Structural and Stratigraphic, Reservoir fluids- water, oil and gas occurrence.

Unit IV: Elements of Geological, geophysical and geochemical methods of exploration. Elements of well drilling, Cable tool drilling, Rotary drilling, Various types of onshore and off-shore drilling units, Casings, Fishing, Blow-outs.

Unit V: Different types of Well logging procedures. Well completion techniques, Primary, Secondary and Enhanced Oil Recovery methods, Oil bearing basins of India and the world, Geology of the productive oil fields of India.

M.Sc. APPLIED GEOLOGY

| Sem | Course Code | Course Title | C/ E | L | T | P | C | Course Faculty |
|-----|-------------|---|---------|---|---|---|---|---|
| I | EAS C301 | Geotectonics | C | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar |
| I | EAS C302 | Mineralogy | C | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao |
| I | EAS C303 | Advanced Igneous Petrology | C | 2 | 0 | 0 | 2 | Dr.M.Jayaprakash |
| I | EAS C304 | Metamorphic Petrology | C | 2 | 0 | 0 | 2 | Prof.P.N.Ballukraya |
| I | EAS C305 | Sedimentary Petrology and Sedimentology | C | 2 | 0 | 0 | 2 | Dr.N.Rajeshwara Rao |
| I | EAS C306 | Geotectonics & Paleontology Practicals | C | 0 | 0 | 2 | 2 | Dr.S.G.D.Sridhar |
| I | EAS C307 | Mineralogy & Petrology Practicals | C | 0 | 0 | 2 | 2 | Dr.N.Rajeshwara Rao |
| I | | Elective I (Other Dept.) | E | 3 | 0 | 0 | 3 | |
| II | EAS C308 | Economic Geology | C | 3 | 0 | 0 | 3 | Prof.P.Periakali Dr.M.Jayaprakash |
| II | EAS C309 | Remote Sensing and GIS – Fundamentals & Applications | C | 3 | 0 | 0 | 3 | Dr.R.Krishnamurthy |
| II | EAS C310 | Advanced Geomorphology | C | 3 | 0 | 0 | 3 | Prof.P.N.Ballukraya |
| II | EAS C311 | Field Mapping | C | 0 | 0 | 2 | 2 | All Faculty |
| II | EAS C312 | Remote Sensing & Geostatistics and Computer Applications Practicals | C | 0 | 0 | 2 | 2 | Dr.R.Krishnamurthy Prof.K.K.Sharma |
| II | | Elective II (Parent Dept.) | E | 3 | 0 | 0 | 3 | |
| II | | Elective III (Other Dept.) | E | 3 | 0 | 0 | 3 | |
| Sem | Course Code | Course Title | C/ E | L | T | P | C | Course Faculty |
| III | EAS C313 | Exploration Geophysics | C | 3 | 0 | 0 | 3 | Prof.K.K.Sharma |
| III | EAS C314 | Exploration Geochemistry | C | 3 | 0 | 0 | 3 | Prof.P.Periakali |
| III | EAS C315 | Geohydrology | C | 3 | 0 | 0 | 3 | Prof.P.N.Ballukraya |
| III | EAS C316 | Engineering Geology | C | 2 | 0 | 0 | 2 | Dr.M.Jayaprakash |
| III | EAS C317 | Mining Geology | C | 2 | 0 | 0 | 2 | Dr.N.Rajeshwara Rao |
| III | EAS C318 | Geophysics & Geohydrology Practicals | C | 0 | 0 | 2 | 2 | Prof.K.K.Sharma Prof.P.N.Ballukraya |
| III | EAS C319 | Geochemistry & Engineering and Mining Geology Practicals | C | 0 | 0 | 2 | 2 | Prof.P.Periakali Dr.N.Rajeshwara Rao |
| III | | Elective IV (Parent Dept) | E | 3 | 0 | 0 | 3 | |
| IV | EAS C320 | Geological Field Tour | C | 0 | 0 | 2 | 2 | All Faculty Members |
| IV | EAS C321 | Dissertation and Viva-voce | C | 0 | 0 | 0 | 4 | All Faculty Members |
| IV | EAS C322 | Industrial Training | C | 0 | 0 | 2 | 2 | Students' Advisor |

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| IV | | Elective V (Parent Dept) | E | 3 | 0 | 0 | 3 | |
| IV | | Elective VI (Parent Dept) | E | 3 | 0 | 0 | 3 | |

ELECTIVE COURSES OFFERED BY OUR DEPARTMENT

| SECOND SEMESTER | | | | | | | | |
|------------------------|--|---|---|---|---|---|---|--|
| Course Code | Course Title | E | L | T | P | C | Course Faculty | |
| EAS E301 | Geostatistics & Computer Applications in Geology | E | 3 | 0 | 0 | 3 | Prof.K.K.Sharma | |
| THIRD SEMESTER | | | | | | | | |
| Course Code | Course Title | E | L | T | P | C | Course Faculty | |
| EAS E302 | Introduction to Oceanography | E | 3 | 0 | 0 | 3 | Dr.N.Rajeshwara Rao Dr.M.Jayaprakash | |
| EAS E303 | Integrated Coastal Zone Management | E | 3 | 0 | 0 | 3 | Dr.R.Krishnamoorthy | |
| FOURTH SEMESTER | | | | | | | | |
| Course Code | Course Title | E | L | T | P | C | Course Faculty | |
| EAS E304 | Environmental Geosciences | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao | |
| EAS E305 | Nuclear Geology | E | 3 | 0 | 0 | 3 | Prof.P.Periakali | |
| EAS E306 | Rainwater Harvesting | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar | |

ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS

| FIRST SEMESTER | | | | | | | | |
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| Course Code | Course Title | Elect/ | L | T | P | C | Course Faculty | |
| EAS E307 | Environmental Earth Science | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao | |
| EAS E308 | Geophysics | E | 2 | 0 | 1 | 3 | Prof.K.K.Sharma | |
| EAS E309 | Introduction to Oceanography | E | 3 | 0 | 0 | 3 | Dr.N.Rajeshwara Rao Dr.M.Jayaprakash | |
| SECOND SEMESTER | | | | | | | | |
| Course Code | Course Title | E | L | T | P | C | Course Faculty | |
| EAS E310 | Basic Hydrogeology | E | 2 | 0 | 1 | 3 | Prof.P.N.Ballukraya | |
| EAS E311 | Basics of Remote Sensing & GIS Techniques | E | 2 | 0 | 1 | 3 | Dr.R.Krishnamoorthy | |
| EAS E312 | Rainwater Harvesting | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar | |

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| EAS E313 | Nuances of Scientific Writing | E | 3 | 0 | 0 | 3 | Dr.N.Rajeshwara Rao | | |
| THIRD SEMESTER | | | | | | | | | |
| Course Code | Course Title | Elect/S upp | L | T | P | C | Course Faculty | | |
| EAS E314 | Integrated Coastal Zone Management (ICZM) – Principles, Tools, Strategies & Practices | E | 2 | 0 | 1 | 3 | Dr.R.Krishnamoorthy | | |
| FOURTH SEMESTER | | | | | | | | | |
| EAS E315 | Environmental Geosciences | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao | | |
| EAS E316 | Nuclear Geology | E | 3 | 0 | 0 | 3 | Prof.P.Periakali | | |
| EAS E317 | Rainwater Harvesting | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar | | |
| EAS C301 | Geotectonics | | | C | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar |

Prerequisite: Basic degree in Geology or Applied Geology.

Course Objective:

Seldom, rocks are devoid of structures. It is important to study different structures and their origin, because structures help us to know the stability and strength of an area. Geotectonics helps us in knowing about different structures, especially their origin.

- Unit I: Mechanical principles of rock deformation - Stress and strain diagrams - Factors controlling behavior of rocks - Secondary structural forms: Distortion - Large downwarps and upwarps - Synclises and anticlises - Synclinoria and anticlinoria - Impact structures - Penecontemporaneous sedimentary deformational structures - Dynamics and mechanics of folding - Relation of stress and strain to rupture - Mechanics of faulting: thrust fault, strike-slip fault and normal fault.
- Unit II: Unruptured overthrust sheet: size of the fault block, coefficient of friction, dip of fault plane – Petrofabric analysis: field and laboratory techniques and preparation of petrofabric diagrams of quartz, calcite and biotite - Symmetry of fabric and movement: axial, orthorhombic, monoclinic and triclinic - Differential movement in rocks using rotated minerals: Post-, pre- and syn-kinematic – Structural complexes: Historical, regional and mechanical combination.
- Unit III: Oscillatory movements: Definition, characteristics, evidences - Folding movements: continuous and intermediate folds, characteristics, causes and associated structures merits and demerits of the following - Geotectonic hypotheses: contraction, isostatic, pulsation, radioactive, continental drift, convection current, gravity-folding, wave, asthenolith and radio migration - Orogeny: Definition, structural profile, geophysical characteristics, orogenic cycles and time, Phanerozoic mountain belts, orogeny of Precambrian times, mechanism of orogeny, Cordillerian type - Irian type, Zagros- Himalayan type - Ultimate causes.
- Unit IV: Tectonic design of Himalaya: position, major tectonic subdivision, Indus-Tsango suture zone, design of Great Himalaya and the main central thrust, lesser Himalayan nappes and their roots, MBT and Siwalik structural layout, Himalayan frontal fault and the Sindhu-Ganga basin, transform lateral margins of the Himalayan arc - Evolution of Himalaya: pre-Himalayan sedimentation, convergence of continents, rotation of continental blocks, phases of deformation - Progressive shifting of basins of deposition, vertical tectonics, seismicity of southern Tibet and Himalayan belts, neighbors of Himalaya.
- Unit V: Determination of Attitude of beds: Geometrical method, Graphical method, Trigonometrical method, Projection method, Tabular method and Nomograph. Reconstruction of Fault, Parallel folds. Structure Contour Maps, Isopach. Reconstruction of Vertical and Perpendicular section of a Plunging fold – Geochronology - Pi and Beta diagrams - Structural complex - Determination of true thickness and depth to strata - Interpretation of geological maps involving normally dipping beds, bore-well data, symmetrical and asymmetrical folds, isoclinal fold, recumbent fold, plunging fold, inlier, outlier, strike fault, step fault.

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| EAS C302 | Mineralogy | C | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao |
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Prerequisite:

Basic degree in Geology or Applied Geology.

Course Objective:

Minerals are vital for the industrial growth of any country. This core course is, therefore, indispensable for gaining sound knowledge on identifying them, how they crystallize, their genesis, their physical, chemical and optical properties, and their distribution and industrial uses.

Unit I: Symmetry in crystals: Geometrical operation - Periodic repetition - Permissible angular intervals – Basic rotational symmetry - Decomposition of rotational axes - Limitation by translation periodicity Permissible combination of rotation axes - Euler’s construction - Permissible intersection angles - IIP rule - Effect of two reflections, reflection and inversion.

Unit II: Derivation of thirty-two classes of crystal: Operation of the first sort - Mono axial classes - Poly axial classes - Operation of the second sort - Mono axial classes - Form theory of crystals with respect to Orthorhombic system - Principles of X-ray diffraction - Bragg’s law - X-ray powder method.

Unit III: Immersion method of refractive index - Measurements - Relief - Becke line method - Central and oblique illumination methods - Uniaxial crystals in plane polarized light and convergent polarised light - Uniaxial indicatrix - Optical accessories: quartz-wedge, gypsum plate, mica plate - Biaxial crystals in plane polarized light and convergent polarized light - Biaxial indicatrix - Dispersion in minerals - Optic sign - Optic axial angle - Extinction angle - Birefringence - Berek compensator – Dichroism and pleochroism.

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| EAS C303 | Advanced Igneous Petrology | C | 2 | 0 | 0 | 2 | Dr.M.Jayaprakash |
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Prerequisite: Basic degree in Geology or Applied Geology.

Course Objective:

To impart intensive training in identification of igneous rocks in the field, laboratory and under the microscope, and facilitate thorough understanding of various processes of rock formation, resulting composition and alterations.

Unit I: *Igneous Petrology*: Magmas: Nature – Generation – Composition – Constitution – Magmatism and plate tectonics- Magma generation in different tectonic settings

Unit II: Crystallization of magma – Single component system – Binary systems: Diopside-anorthite – Albite-anorthite – Forsterite-silica – Ternary systems: Diopside-albite-anorthite – Diopside-forsterite-silica – Crystallization of basaltic magma under various pressures –

Unit III: Igneous rocks: Classification – Textures – Mode of occurrence – Structures of igneous rocks.

Unit IV: Magmatic differentiation – Reaction principle – Assimilation and mixing of magmas

Unit V: Description, occurrence and petrogenesis of basalts, granites and alkaline rocks – Brief note on ultramafic rocks, anorthosites, kimberlites and carbonatites.

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| EAS C304 | Metamorphic Petrology | C | 2 | 0 | 0 | 2 | Prof.P.N.Ballukraya |
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Course Objective:

To impart intensive training in identification of metamorphic rocks in the field, laboratory and under the microscope, and facilitate thorough understanding of various processes of rock formation, resulting composition and alterations.

Unit I: *Metamorphic Petrology*: Types of metamorphism – Agents of metamorphism – Metamorphic grades and facies – Winkler’s concept of metamorphic grades

Unit II: Metamorphic textures – Influence of original composition – Progressive metamorphism of impure calcareous, pelitic and basic rocks – Associated mineralogical changes – Role of fluids in metasomatism –

Unit III: Metamorphic differentiation – Granitization – Migmatization – ACF and AKF diagrams.

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| EAS C305 | Sedimentary Petrology and Sedimentology | C | 2 | 0 | 0 | 2 | Dr.N.Rajeshwara Rao |
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Course Objective:

To impart intensive training in identification of sedimentary rocks in the field, laboratory and under the microscope, and facilitate thorough understanding of various processes of rock formation, resulting composition and alterations.

- Unit I: Sedimentary Petrology and Sedimentology: Introduction – Formation of sedimentary rocks – Structures of sedimentary rocks – Textures of sedimentary rocks –
- Unit II: Limestones and dolomites – Siliceous deposits – Ferruginous deposits – Carbonaceous deposits – Phosphatic deposits – Evaporites – Volcanic clastics.
- Unit III: Agents of sediment transport – Depositional environments: Glacial – Fluvio-glacial – Fluvial – Aeolian – Coastal marine – Lacustrine – Minerals and mineral stability across stratigraphic sequences – Uses in environmental analysis
- Unit IV: Sedimentary basins and their classification – Tectonics and sedimentation – General outline of Indian Sedimentary basins – Paleocurrents and basin analysis.

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| EAS C306 | Geotectonics & Paleontology Practicals | C | 0 | 0 | 2 | 2 | Dr.S.G.D.Sridhar |
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- Unit I: Crystal projections: Spherical, stereographic and gnomonic – Zones, zonal symbols and zonal relations - Equation of the normal – Tangent-relations - Napier’s theorem - Sine or anharmonic ratio – Cotangent formula - Axial ratios - Determination of structural formulae: Ortho-and clino-pyroxenes, amphiboles, garnets - Determination of optic sign - Sign of elongation - Extinction angle - Dichroic and Pleochroic schemes - Birefringence using Berek compensator - Order of interference colors.
- Unit II: Identification and description of morphological characters of coelenterates, brachiopods, pelecypods, gastropods, cephalopods, echinoderms, trilobites and graptolites. Preservation, separation and staining techniques of microfossils - Identification and description of morphological characters of foraminifers and ostracods.

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| EAS C307 | Mineralogy & Petrology Practicals | C | 0 | 0 | 2 | 2 | Dr.N.Rajeshwara Rao |
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- Unit I: Structural classification of minerals - Systematic study of the following rock forming mineral groups, structures, physical and optical properties, chemistry, distinguishing characters, alteration products, paragenesis and uses: feldspar, feldspathoid, pyroxene, amphibole and quartz, garnet, olivine, scapolite, epidote, mica, chlorite, zeolite, and clay minerals - Zircon, carbonates, spinel, rhodonite, wollastonite, cordierite, andalusite, sillimanite, kyanite, topaz, beryl, tourmaline, staurolite, talc, titanite, ilmenite and monazite.
- Unit II: Variation diagrams – Trilinear coordinate diagrams – Normative calculations – Megascopic and microscopic identification of igneous, metamorphic and sedimentary rocks – Grain size analysis – Environmentally sensitive statistical parameters - Interpretation of grain size data – Gravel analysis and data interpretation – Staining and peeling techniques – X-ray diffraction – Scanning electron microscopy.

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| | Elective II (Parent Dept.) | E | 3 | 0 | 0 | 3 | |
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| EAS C308 | Economic Geology | C | 3 | 0 | 0 | 3 | Prof.P.Periakali Dr.M.Jayaprakash |
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Prerequisite: Basic degree in Geology.

Objectives:

Economic geology deals with the occurrence, distribution, uses of minerals and ore resources. Knowledge in the process of ore formation, classification of ore type, composition and migration is very essential to know about the genesis and uses. Exploration and exploitation of metallic, non-metallic and oil and natural gas resources are very vital for the overall development of mankind and sustainable development of our country.

Unit I: Development of economic geology – Processes of ore formation – Classification of deposits – Ore and gangue minerals – Tenor of ore – Ore-bearing fluids, their types, composition and migration – Mode of occurrence, association, genesis, uses and distribution in India of the following metallic ores: gold, silver, copper, lead, zinc, iron, manganese, chromium, nickel, cobalt, aluminium, beryllium, magnesium, atomic minerals, tungsten and molybdenum.

Unit II: Mode of occurrence, association, genesis, uses and distribution in India of the following non-metallic ores: mica, vermiculite, asbestos, barites, ochre, graphite, gypsum, precious and semi-precious minerals, abrasives, minerals for glass, fertilizers, cement, paint and pigment industries, and building stones.

Unit III: Mode of occurrence, association, genesis and distribution in India of clay minerals, and their uses in various industries – Origin and mode of occurrence of coal – Its physical properties, chemical composition, classification, rank and grade – Occurrence and distribution in India – Uses – Coal petrography - Uses – Geologic and geographic distribution of oil and natural gas in India.

Unit IV: Significance of minerals in national economy –Conservation and national mineral policy – India’s status in mineral production.

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| EAS C309 | Remote Sensing and GIS – Fundamentals & Applications | C | 3 | 0 | 0 | 3 | Dr.R.Krishnamurthy |
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Prerequisite: Basic degree in any branch of Science.

Course Objective:

To provide in-depth knowledge and exposure to Remote Sensing and GIS technology tools with particular reference to Geological Applications.

- Uniy I: Aerial Photography: Functioning of a simple camera, aerial photographic camera, geometry of aerial photographs, vertical and oblique photographs, photoscale, image displacement due to relief, parallax in aerial photographs – absolute and differential parallax, measurement of parallax, parallax formula, stereometer. Vertical exaggeration in photographs, photographic & stereographic variables. Rectification of aerial photographs. Aerial photographic procedures, camera & flight requirement, flight planning, filters, compensation. Stereoscopy and stereoscopes. Photo mosaics – controlled & uncontrolled mosaics. Photographical studies – photo recognition elements & keys, interpretation of thology, structures and landforms from aerial photographs.
- Unit II: Fundamentals of Remote Sensing: History of remote sensing technology, remote sensing system, electromagnetic radiation, spectral properties of earth objects, analysis of spectral reflectance cures. Types of satellites, image acquisition, multispectral scanners, remote sensing resolutions. Introduction to thermal remote sensing. Introduction to microwave remote sensing and new satellite sensors.
- Unit III: Image processing in Remote Sensing: Digital data recording - Introduction to digital image processing – preprocessing techniques, image classification methods, image enhancement techniques.
- Unit IV: Applications of Remote Sensing: Visual interpretation different sensors data and image interpretation key elements. Exercises on mapping of geology, land use/land cover and geomorphology based on visual method - preparation of base maps and transformation of thematic maps. Hands on practices in digital analysis functions using the UNESCO-Bilko computer based learning module. Validation of remote sensing analysis output by ground truth – accuracy estimation and introduction to GPS technology.
- Unit V: Fundamentals and Applications of GIS: Concept of GIS, types, data storage, retrieval and analysis. GIS database organization and development. Combined use of remote sensing and GIS. Preparation of spatial decision-support system (SDSS). Highlights on different applications using GIS tool with particular reference to applied geosciences.

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| EAS C310 | Advanced Geomorphology | C | 3 | 0 | 0 | 3 | Prof.P.N.Ballukraya |
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Prerequisite: Basic degree in Geology, Applied Geology or Geography.

Course Objective:

To provide in-depth knowledge on different types of landforms and the applications of geomorphological knowledge in applied geosciences.

- Unit I: Geodynamic energy and landform evolution; role of solar energy, gravitational energy and internal heat energy. Geomorphic concepts - introduction to exogenetic and endogenetic forces – volcanism and tectonism.
- Unit II: Exogenetic processes – types of physical weathering and their products; chemical weathering and their products; Geomorphic system and its components; various geomorphic agents, processes and products. Fluvial processes – development of valley, processes and stages of development, drainage basin as a geomorphic unit, basin and stream characteristics and various quantitative parameters, drainage types and patterns, erosional activity of running water and erosional processes, erosional landforms, transportation of sediment load by rivers, depositional landforms. Aeolean processes, erosion by wind, erosional landforms, types of dunes and their development. Glacial processes and erosion by ice, erosional and depositional landforms.
- Unit III: Coastal geomorphology – classification of coasts. Coastal ocean dynamics – waves, currents and tides. Topographic features resulting from coastal accretion – beaches, sand spit, barrier islands, cusate forelands, tombolos, salt marshes, mudflats, coral reefs. Topographic features resulting from coastal accretion – sea cliffs, wave cut terraces. Conditioning factors for marine erosion and accretion – sources for coastal sediments. Shoreline development - beach profile, tidal landforms, types of estuaries and estuarine mixing processes.
- Unit IV: Applied geomorphology – importance of geomorphological investigations in economic geology, engineering geology, urban geology, climatic geomorphology and coastal zone management.
- Unit V: Analytical geomorphology – impact of geomorphological changes on land use/land cover, nvironments, socio-economic development. Space observations on regional geomorphology – geomorphological modeling.

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| EAS C311 | Field Mapping | C | 0 | 0 | 2 | 2 | All Faculty |
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| EAS C312 | Remote Sensing & Geostatistics and Computer Applications Practicals | C | 0 | 0 | 2 | 2 | Dr.R.Krishnamurthy Prof.K.K.Sharma |
| | Elective II (Parent Dept.) | E | 3 | 0 | 0 | 3 | |
| | Elective III (Other Dept.) | E | 3 | 0 | 0 | 3 | |

- Unit I: Applications of Remote Sensing: Visual interpretation different sensors data and image interpretation key elements. Exercises on mapping of geology, land use/land cover and geomorphology based on visual method - preparation of base maps and transformation of thematic maps. Hands on practices in digital analysis functions using the UNESCO-Bilko computer based learning module. Validation of remote sensing analysis output by ground truth – accuracy estimation and introduction to GPS technology.
- Unit II: Preparation of spatial decision-support system (SDSS). Highlights on different applications using GIS tool with particular reference to applied geosciences.
- UnitIII: Analysis of geological data for the statistical parameters – Use of EXCEL sheet to depict the data in pictorial formats – Writing FORTRAN programs for simple statistical calculations – Using the canned programs for presentation of geological data – Acquaintance with statistical packages etc

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| | Elective II (Parent Dept.) | E | 3 | 0 | 0 | 3 | |
| | Elective III (Other Dept.) | E | 3 | 0 | 0 | 3 | |

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| EAS C313 | Exploration Geophysics | C | 3 | 0 | 0 | 3 | Prof.K.K.Sharma |
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Prerequisite:

Basic degree in Geology, Applied Geology or Physics.

Course Objective:

To provide a comprehensive background on the principles of various geophysical exploration techniques used for exploring hidden ore mineral and oil and natural gas resources, their relative advantages and disadvantages.

- Unit I: Introduction: Physical basis of geophysical exploration – Various surface and sub-surface methods and their classification – Physical properties of rocks and minerals exploited in exploration and factors that control them – Geophysical anomalies. Gravity Prospecting: Principles – Earth’s gravitational field and units – Variations in the gravitational field – Newton’s law – Geoid, spheroid and normal gravity field – Figure of earth – Order of anomalies produced by geological discontinuities – Absolute and relative measurement of gravity – Gravimeters and their field operation – Field procedure – Reduction and correction of gravity field data – Separation of regional and residuals – Upward and downward continuation – Interpretation of gravity data obtained over spherical and cylindrical objects – Applications of gravity methods.
- Unit II: Magnetic Prospecting: Definitions – Basic theory – Magnetic field – Main field, external field and local anomalies – Rock susceptibilities – Natural remnant magnetism – Paleomagnetism – Principles of magnetic prospecting – Magnetic elements and magnetic anomalies – Magnetometers – Fluxgate and proton precession magnetometers – Field procedure for ground magnetic surveys – Smoothing and interpretation of data – Qualitative and quantitative interpretation of filed data over simple geometric structures – Applications of magnetic prospecting methods- Radiometric Prospecting: Fundamentals of radioactivity – Rate of radioactive decay – Successive disintegration and radioactive equilibrium – Natural radioactive elements – Radioactive series – Nature of radioactive emission – Alpha and beta particles – Gamma rays – Artificial radioactivity – Radioactivity of rocks, minerals and ores – Radiation measuring devices – Ionization chambers – Gas-filled (Geiger Muller) counters – Scintillation counters – Radiometers and gamma ray spectrometers – Field radiometric methods – Airborne surveys – Automobile surveys – Foot surveys – Gamma testing and logging – Processing and interpretation of field data – Applicaions of radiometric methods.
- Unit III: Electrical Methods: Electrical properties of earth materials – Conduction in rocks and water-bearing rocks – Description of a geoelectric section – Classification of electrical methods – Resistivity method – Ohm’s law – Resistivity – Effect of homogeneous earth – Various configurations for resistivity methods

– Configuration factor – Response over a layered earth – AC and DC type resistivity meters – Field procedure for electrical profiling and sounding – Logarithmic curve matching – Advantages of plotting of data logarithmically on graphs – Interpretation of profiling and sounding field data – Use of modeling in electrical methods – Introduction to electromagnetic methods – Self potential method – Induced polarization method – Charged body method.

Unit IV: *Seismic methods*: Fundamentals of elasticity – Young’s modulus – Bulk modulus – Poisson’s ratio – Elastic waves – Laws of reflection and refraction – Huygen’s principle – Fermat’s principle – Principle of superposition – Seismic wave theory – Body and surface waves – Primary and secondary waves – Raleigh and love waves – Seismic instruments – Seismic channel – Details of geophones and amplifier – Reproducible and non-reproducible recording – Seismic timer field lay out – Arc shooting, fan shooting and profile shooting – Data processing – Simple interpretation of field data – Applications of seismic methods. Well Logging: Introduction to well logging techniques – Well conditions – SP and resistivity logging – Qualitative interpretation of SP and resistivity logs – Applications.

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| III | EAS C314 | Exploration Geochemistry | C | 3 | 0 | 0 | 3 | Prof.P.Periakali |
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Prerequisite

Basic degree in Geology or Applied Geology.

Objective:

Geochemistry is a science concerned with the chemistry of the earth. Basic principles of geochemistry are applied for prospecting mineral, water and oil and natural gas resources. Geochemical exploration is a modern technique of resource identification and exploration. This branch of science indirectly helps for starting mineral and chemical-based industries leading to sustainable development of our country.

Unit I: Earth in relation to universe - Nature, age and composition of universe - Nature, age and composition of Sun - Composition of planets and meteorites – Basic principles of geochemistry - Geochemical environment - Geochemical dispersion - Geochemical mobility - Mineral stability -Trace elements in stable minerals - Hypogene mobility - Supergene mobility – Goldschmidt’s classification – Geochemical tracers - Cosmic abundance of elements - Pattern of Geochemical distribution - Normal background value - Geochemical anomaly - Primary geochemical differentiation of the Earth.

Unit II: Principles of trace element analysis: Preparation, decomposition and separation of samples – Estimation of trace elements in samples – Gravimetry – Colorimetry – Turbidity and Nephelometry – Spot tests – Paper chromatography – Visible fluorescence – Flame spectrometry – Emission spectrometry – X-ray spectrometry – Radiometric methods – Electrical measurements; Primary dispersion: Syngenetic pattern – Geochemical provinces – Local syngenetic pattern – Wall rock anomalies - Leakage anomalies – Pressure-temperature effects in epigenetic minerals – Mineral reconstitution – Gaseous dispersion pattern – Hydrocarbon anomaly – Radiogenic anomaly – Mercury anomaly.

Unit III: Secondary dispersion: Chemical and biochemical factors – Hydrogen ion concentration – Redox potential – Stability of secondary minerals – Mode of occurrence of solute – Sorptive capacity of solids – Stability of colloidal dispersion – Metallo-organic compounds – Effects of vegetation – Effects of micro-organisms – Mechanical factors – Simple gravity movement – Dispersion in groundwater – Dispersion of surface water – Dispersion by surface runoff – Dispersion in stream water – Dispersion in quiet environment – Influence of environment on dispersion; Anomalies in residual overburden: Anomalies in leached ore outcrops and gossans – Anomalies in residual soils – Mode of occurrence in elements – Contrast of the anomaly – Anomaly width and intensity – Distortion of anomalies – Homogeneity of anomaly – Hydromorphic anomaly – Anomalies in transported overburden – Common features of anomalies in transported overburden – Syngenetic pattern – Epigenetic pattern – Glacial overburden – Colluvium and alluvium – Organic deposits – Lake and marine sediments.

Unit IV: Anomalies in natural waters: Mode of occurrence of elements – Persistence of anomaly – Contrast at source – Decay by dilution – Decay on precipitation – Groundwater, seawater and lake water anomalies; Geochemical soil surveys: Orientation survey – Residual soil – Transported soil – Contamination – Sampling patterns and procedures – Sample preparation – Preparation of geochemical maps; Biogeochemical surveying techniques: Orientation survey – Choice of sampling medium – Collection and processing of samples – Choice of analytical methods – Interpretation of data – Geobotanical survey – Indication of saline deposits – Indication of ore deposits; Role of geochemistry in exploration – System scale of operation – Regional appraisal – Reconnaissance survey – Detailed survey – Supervision.

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| III | EAS C315 | Geohydrology | C | 3 | 0 | 0 | 3 | Prof.P.N.Ballukraya |
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Prerequisite

Basic degree in Geology.

Course Objective:

To provide sound understanding of the groundwater resource, and to impart training in all aspects of groundwater geology to facilitate the practical utility of the subject. The chapters covered will help in gaining knowledge in exploration, exploitation and management of groundwater on a scientific basis.

- Unit I: Scope and importance of geohydrological studies as an applied subject – Groundwater as a natural resource – Role of groundwater in the hydrological cycle – Factors involved, such as precipitation, surface runoff, infiltration, evapotranspiration and groundwater movement and their estimation – Geological controls in the occurrence and movement of groundwater – Water-bearing properties of rock formations: porosity – various types and controlling factors, specific yield and specific retention; permeability, Darcy’s experiment, hydraulic conductivity and transmissivity, laboratory determination of hydraulic conductivity, fluid potential and hydraulic head, aquifer compressibility and storativity; barometric and tidal efficiency of aquifers.
- Unit II: Classification of rocks based on porosity and permeability – Types and properties of aquifers – Types of groundwater flows, equation of flow for steady and transient states – Well hydraulics – Cone of depression, drawdown, specific capacity and factors controlling them – Steady state flow to a well – Theim’s equation – Transient confined flow to a well – Theis’ and Cooper-Jacob’s equations – Semi-confined and unconfined flow, partial penetration and multiple well conditions, flow under bounded conditions – Estimation of aquifer parameters – Pumping tests: methodology, time-drawdown curves, graphical procedures of analyses – Theis’, Cooper-Jacob’s and Chow’s methods, distance drawdown graphs, recovery tests and data analyses – Step drawdown tests and well loss determination – Tracer tests – Groundwater balance studies: concept of groundwater basin, groundwater levels and water level maps, secular and seasonal variations, water level fluctuations – Groundwater balance equation and estimation – Safe yield and conjunctive uses – Artificial recharge of groundwater – Need and methods adopted.
- Unit III: Water wells: types of wells – dug wells, shallow and deep borewells, horizontal wells and tunnels – Construction of wells – Auger well, driven well and jetted well – Mud-rotary drillings, mud circulation, drilling bits, maintenance of strata logs and time logs, geophysical logging – Reverse rotary drilling – Cable tool drilling and DTH drilling – Well design: determining the well diameter, depth, screen length, size of slots, size of gravel and thickness of gravel pack – Development of borewells – Water washing, block surging, air surging, chemical wash and over pumping – Completion of wells – Collector wells and infiltration galleries – Types of pumps: variable and constant displacement pumps, centrifugal turbine, submersible, ejector and air lift pumps – Chemical quality of groundwater: sources of dissolved materials, units of measurement, TDS, major, minor, trace and gaseous constituents, physical and chemical properties of groundwater, groundwater quality standards, graphical procedures of presenting groundwater quality.
- Unit IV: Pollution of groundwater: natural pollution, contamination due to urban, agricultural and industrial activities, remedial measures – Seawater intrusion studies: causes, hydrodynamic balance along coast, Ghyben-Herzberg principle, estimation of depth to fresh water-saline water interface, up-coning and preventive measures against seawater intrusion – Exploration for groundwater: geological methods, geomorphological and remote sensing inputs – geophysical methods: gravity, magnetic and seismic techniques – electrical resistivity prospecting: field procedure, data interpretation and site selection – Electromagnetic methods – Usefulness of S.P. methods in groundwater studies – Basics of groundwater modeling: scope and purpose – Physical, analog and mathematical models – RC network model and finite difference model – Model structure and calibration – Basics of contaminant transport models.

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|-----|----------|---------------------|---|---|---|---|---|------------------|
| III | EAS C316 | Engineering Geology | C | 2 | 0 | 0 | 2 | Dr.M.Jayaprakash |
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Prerequisite: Basic degree in Geology or Applied Geology.

Course Objective:

Engineering Geology and Mining Geology are important components of applied aspects of geology. It is imperative that the student is well trained in the former order to comprehend the significance of geological investigations necessary before construction of engineering structures like dams, tunnels etc.

Unit I: Engineering geology: Engineering properties of rocks, soft sediments and soils - Materials of construction - Building stones - Types of earth movements - Landslides and their classification - Conditions favouring landslides - Prevention and checking of landslides - Land subsidence and its causes - Case histories of earth movements.

unit II: Geological investigations pertaining to the foundation of bridges, buildings, dams, highways and airfields - Types of reservoirs - Geological investigation of reservoir sites - Problems pertaining to tunnelling in hard and soft grounds - Geological investigations preceding tunnelling - Geological investigations pertaining to harbours, docks, coastal erosion.

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| III | EAS C317 | Mining Geology | C | 2 | 0 | 0 | 2 | Dr.N.Rajeshwara Rao |
|-----|----------|----------------|---|---|---|---|---|---------------------|

Prerequisite: Basic degree in Geology or Applied Geology.

Course Objective:

Mining Geology is important component of applied aspects of geology. It is imperative that the student is well trained in the former order to comprehend the significance of geological investigations necessary before start the mining operations. It is important as it aids in better understanding of the processes that invariably follow exploration of economically important mineral and ore deposits, various mining methods adopted and estimation of actual reserves of each of them.

Unit I: Mining geology: Terminology used in metal mines – Terminology used in coal mines - Prospecting and exploration - Sampling of ores - Alluvial mining - Opencast mining – Quarrying – Mine supports – Mine atmosphere - Mine ventilation – Common explosives - Haulage – Drilling: Percussion drilling – Rotary drilling – Diamond drilling.

Unit II: Methods of underground metal mining: Methods without use of artificial supports – Methods with use of artificial supports – Shrinkage mining – Caving methods of mining – Block caving - Coal mining methods: Longwall advancing and retreating – Board and Pillar method – Depillaring methods – Horizon mining.

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|----------|---|---|---|---|---|---|--|
| EAS C318 | Geophysics & Geohydrology Practicals | C | 0 | 0 | 2 | 2 | Prof.K.K.Sharma Prof.P.N.Ballukraya |
|----------|---|---|---|---|---|---|--|

Unit I: Computation of gravity response over sphere – Exercise on drift correction – Separation of regional and residual of gravity data – Contouring of gravity data – Calibration of a magnetometer – Interpretation of field magnetic data over a dyke – Interpretation of seismic refraction data obtained over two-layered earth – Computation of configuration constant – Interpretation of vertical electrical sounding data obtained over two- and three-layered earth using the S-line, curve matching and auxiliary point chart methods – Field demonstration of resistivity, seismic, SP and magnetic prospecting techniques.

Unit II: Practical problems in groundwater flow, specific yield, hydraulic conductivity, transmissivity and storativity – Construction of Thiessen polygons, isohyet maps and estimation of mean basin rainfall and groundwater recharge – Estimation of drawdown using Theis' and Cooper-Jacob's equations for simple, multiple pumping wells and bounded aquifer conditions – Pumping test data analyses for confined, semi-confined and unconfined aquifers – Estimation of well loss and well efficiency from step drawdown tests – Exercises in groundwater quality and plotting of hydrogeochemical data – Determination of depth to fresh water-saline water interface.

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| EAS C319 | Geochemistry & Engineering and Mining Geology Practical | C | 0 | 0 | 2 | 2 | Prof.P.Periakali Dr.N.Rajeshwara Rao |
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Unit I: Geochemistry practicals: Analysis of rock mineral ores – Analysis of water – Element analysis – Flame spectrophotometer – Nephelometer; Analysis of trace elements: Ni, Fe and Cu by paper chromatography technique.

Unit II: Assaying: Determination of average grade – Uniform sampling – Variable sampling – Influence of interval - Statistical calculations - Drilling: Core and sludge recovery – Estimation of ore reserves – Determination of pillar size in Board and Pillar method – Shaft location: Funicular diagram.

Unit III: Estimation of: Specific gravity – Void ratio – Moisture content – Degree of saturation – Atterberg limits – Unit weights – Granulometric curves – Uniformity co-efficient – Dry and wet density curves – Mohr's stress circles – Ultimate and safe bearing capacity of cohesive and non-cohesive soils.

SYLLABUS FOR ELECTIVE COURSES OFFERED BY OUR DEPARTMENT

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|----------|---|---|---|---|---|---|-----------------|
| EAS E301 | Geostatistics & Computer Applications in Geology | E | 3 | 0 | 0 | 3 | Prof.K.K.Sharma |
|----------|---|---|---|---|---|---|-----------------|

Prerequisite:

Basic degree in Geology or Applied Geology.

Course Objective:

To provide in-depth knowledge on the usefulness of statistical and computer applications in various branches of geology.

Unit I: Introduction – Various schemes of classifying and tabulating data – Representation of data as diagrams and graphs – Simple and sub-divided bar diagrams – Pie charts – Graphs on natural and logarithmic scales – Histograms – Frequency polygon – Ogives – Measures of central tendency – Arithmetic mean, median and mode for ungrouped data, discrete series and grouped data – Quartiles – Measures of dispersion – Range, mean deviation, standard deviation and quartile deviation for ungrouped discrete series and grouped data – Moments, skewness and kurtosis – Linear regression – Correlation coefficient – Rank correlation – Ratio of variations – Regression lines and equations – Methods of least squares.

Unit II: Geological population – Numerical data in geology – Sampling techniques – Simple, random, stratified and cluster sampling – Sampling distribution – Level of significance – Standard error of mean, median

and standard deviation – Difference between sample means – Degrees of freedom – Sample tests based on chi-squared and F-distributions – Probability concept – Addition and multiplication theorems in probability – Theoretical distribution – Binomial distribution – Poisson's distribution and normal distribution.

Unit III: Concepts of computers – Outline of digital computer – Computer languages – Flow charts – Programming in FORTRAN: Basic principles, variables, library functions – Control statements – IF, DO and FORMAT statements – Input and output statements – Arithmetic statement function – Sub-programs – COMMON and EQUOVALENCE statements.

Unitiv: Computer programs for basic operations – Fortran program for arithmetic mean, standard deviation, arrangement of numbers in ascending and descending order – Least squares curve fitting – Acquaintance with some canned programs used for geological purposes.

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|----------|------------------------------|---|---|---|---|---|---|
| EAS E302 | Introduction to Oceanography | E | 3 | 0 | 0 | 3 | Dr.N.Rajeshwara Rao Dr.M.Jayaprakash |
|----------|------------------------------|---|---|---|---|---|---|

Prerequisite:

Basic degree in Geology, Applied Geology, Geography, Applied Geography or Zoology.

Course Objective:

To facilitate understanding of the fundamental principles of Oceanography that would be extremely useful for geological, geographical or biological applications.

Unit I: *Marine Geology*: Morphological and tectonic domains of the ocean floor - Mid-oceanic ridge systems – Modes and rates of sedimentation in oceans – Diagenetic changes in oxic and anoxic environments – Paleoenvironmental conditions – Mineral resources of oceans and factors controlling their distribution.

Unit II: *Physical Oceanography*: Equation to state of water – Current systems, including under current and theories – Oceanic fronts and waves – Classification and origin of tides – Tidal currents.

Unit III: *Chemical Oceanography*: Major and minor constituents of seawater – Processes controlling composition of seawater – Dissolved gases in seawater – The carbon cycle – Trace metals in seawater – Marine pollution.

Unit IV: *Coastal Oceanography*: Factors influencing coastal processes – Transformation of waves in shallow water – Breaks and surf – Littoral currents – Wave action on sediments, including winnowing – Classification and formation of beaches – Pollution in marginal marine environments.

Unit V: *Estuarine Oceanography*: Classification and nomenclature of estuaries – Tides in estuaries – Estuarine circulation and mixing – Sedimentation in estuaries – Coastal pollution.

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|----------|------------------------------------|---|---|---|---|---|---------------------|
| EAS E303 | Integrated Coastal Zone Management | E | 3 | 0 | 0 | 3 | Dr.R.Krishnamoorthy |
|----------|------------------------------------|---|---|---|---|---|---------------------|

Prerequisite: Basic degree in any field of Science or Arts.

Course objectives:

To train students in coastal zone management interdisciplinary research based on interactive lecturing and group activities and at the end students will have:

- (i) an understanding of the components of ICZM and their interactions,
- (ii) improved skills to identify the issues, problems and appropriate solutions to ICZM and
- (iii) improved skills in preparation of ICZM strategies and plan for new interdisciplinary research.

Unit I: Introduction: Interactive lecturing on global coastal zone importance and characteristics. Demonstrations on interconnectedness of physical, biological and social components of coastal zone management – need of integrated approaches for Integrated Coastal Zone Management. Gaining experiences in prioritization of coastal issues/problems and linkages between various components.

Unit II: Group activities: Discussions and presentations on coastal issues/problems based on video and CD presentations. Exposures on coastal ecosystems, aquatic resources, biodiversity and the impact of global change on coastal zone.

Unit III: Demonstrations: Introduction to decision-support and management tools for ICZM - remote sensing, GIS, Information Technology and EIA. Presentations on various ICZM models, case studies and to engage students by means of Internet, dialog among themselves and also with outside experts. Introduction to coastal ocean regulations - group activities on ICZM strategy preparations and field visits/institutional visits.

Unit IV: Group activities: Participatory approaches for coastal zone management – familiarization on importance of people's participation, stakeholders analysis and management.

Unit V: Transboundary issues in coastal management - group discussions and presentations to develop skills individually and collaboratively for implementing knowledge-building process as an approach for coastal zone management.

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|----------|---------------------------|---|---|---|---|---|---|
| EAS E304 | Environmental Geosciences | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao |
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Prerequisite:

Basic degree in Geology or Chemistry.

Objective:

To create awareness about the environment, pollution of soil, air, coastal and groundwater, and other natural hazards.

Unit I: Geological, chemical and physical environments – Mass movements – Hazards – Prevention measures – Volcanoes and related hazards – Earthquakes and related hazards – Prediction, control and awareness.

Unit II: Soils: Erosion and formation – Impacts of urbanization on soil erosion – Strategies for reducing erosion – Soil pollution – Industrial contaminants – Adsorption in soils; Alternative energy sources: nuclear power – radioactive wastes and their disposal – solar energy – geothermal energy – Environmental considerations.

UnitIII: Atmosphere: Environmental segments of atmosphere – Earth radiation balance – Meteorology – Particles in the atmosphere – Chemical and photochemical reactions in the atmosphere – Reactions of atmospheric oxygen, carbon di oxide, nitrogen and sulphur.

UnitIV: Air pollution from chemical industries – Acid rain – Photochemical smog – Greenhouse effect – Ozone layer – Air pollution control.

Unit V: Water pollution – Classification – Physico-chemical speciation – Marine pollution – Oil pollution – Industrial effluents – Pesticide pollutants – Groundwater pollution – Control of water pollution.

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|----------|-----------------|---|---|---|---|---|------------------|
| EAS E305 | Nuclear Geology | E | 3 | 0 | 0 | 3 | Prof.P.Periakali |
|----------|-----------------|---|---|---|---|---|------------------|

Prerequisite:

Basic degree in Geology, Applied Geology, Physics or Chemistry.

Course Objective:

The fundamental nuclear properties of elements and other nuclear characteristics are very useful to unravel atomic mineral deposits. Radioactive properties of minerals are extremely helpful in the dating of rocks and minerals. These properties also provide enormous scope for identification of locations of petroleum reservoirs in different rock formations.

Unit I: Fundamental considerations of nuclear geology - Theory of relativity - Quantum theory of radiation - State of an electron - Electron volt - Binding energy of the nucleus - Atomic magnetism - Unit of energy and mass - Constitution of nuclei - Symbolic representation of nucleus - Isotopes - Isobars - Isotones - Isomers - Their abundance - Size of nucleus - Nuclear cross section - Nuclear angular momentum - Nuclear magnetism - Electric quadrupole moments - Parity of nucleus - Nuclear forces - Models of nucleus - Shell models: liquid drop model, collective model.

Unit II: Radioactivity: definition, history, demonstration of alpha, beta and gamma radiations – Properties of different radiations – Types of radioactivity – Natural and artificial radioactivity – Half-life period – Derivation of half-life period and its experimental determination – Radioactive disintegration process - Conservation laws.

UnitIII: Radioactive elements and their daughter products - Nuclear fission and fusion reactions - Interaction of radiation with matter - Effect of alpha interaction with matter - Effect of beta interaction with matter - Effect of gamma interaction with matter.

UnitIV: Cosmic rays – Production of new fundamental particles - Radiation damage – Its use in age determination - Hydrocarbons formed by the effect of radioactivity - Their role in origin of petroleum.

UnitV: Determination of absolute age of rocks - Common Pb, K-Ar, Rb-Sr, ¹⁴C and tritium dating - Thermoluminescence in age determination - Common minerals of radioactive elements, their characteristics, distribution and mode of occurrence - Radiometric method of prospecting.

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|----------|----------------------|---|---|---|---|---|------------------|
| EAS E306 | Rainwater Harvesting | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar |
|----------|----------------------|---|---|---|---|---|------------------|

Prerequisite:

Basic degree in Science or Arts.

Course Objective:

Water is a renewable source of finite reserves. Only 3% of the world's water resources are fresh, of which one-third is inaccessible. Over the years, rising population, growing industrialization and urbanization have increased the demand for water. So, we need to promote the concept of rainwater harvesting.

- Unit I: Groundwater – Historical background – Utilization – Hydrologic cycle – Occurrence of groundwater.
 Unit II: Rock properties affecting groundwater – Geologic formations as aquifers – Groundwater in permafrost regions.
 Unit III: Rainwater harvesting (RWH) in urban areas – Artificial recharge for sub-surface storage in hard rock terrains.
 Unit IV: RWH in river basins for recharging groundwater to domestic water supply – Methods – Legislation for water – Groundwater Act – Water management in rural areas.
 Unit V: Seawater intrusion – Water pollution by industries – Community participation – Traditional indigenous RWH for sustainable water supply.

SYLLABUS FOR ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS

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|----------|------------------------------|---|---|---|---|---|---|
| EAS E307 | Environmental Earth Sciences | E | 3 | 0 | 0 | 3 | Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao |
|----------|------------------------------|---|---|---|---|---|---|

Prerequisite: Basic degree in Geology or Chemistry.

Objective:

To create awareness about the environment, pollution of soil, air, coastal and groundwater, and other natural hazards.

- Unit I: Geological, chemical and physical environments – Mass movements – Hazards – Prevention measures – Volcanoes and related hazards – Earthquakes and related hazards – Prediction, control and awareness.
 Unit II: Soils: Erosion and formation – Impacts of urbanization on soil erosion – Strategies for reducing erosion – Soil pollution – Industrial contaminants – Adsorption in soils; Alternative energy sources: nuclear power – radioactive wastes and their disposal – solar energy – geothermal energy – Environmental considerations.
 Unit III: Atmosphere: Environmental segments of atmosphere – Earth radiation balance – Meteorology – Particles in the atmosphere – Chemical and photochemical reactions in the atmosphere – Reactions of atmospheric oxygen, carbon di oxide, nitrogen and sulphur.
 Unit IV: Air pollution from chemical industries – Acid rain – Photochemical smog – Greenhouse effect – Ozone layer – Air pollution control.
 Unit V: Water pollution – Classification – Physico-chemical speciation – Marine pollution – Oil pollution – Industrial effluents – Pesticide pollutants – Groundwater pollution – Control of water pollution.

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|----------|-------------|---|---|---|---|---|-----------------|
| EAS E308 | Geo Physics | E | 3 | 0 | 0 | 3 | Prof.K.K.Sharma |
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Prerequisite: Basic degree in Geology.

Course Objective:

To impart adequate knowledge in the principles of geophysics and its applications in exploration of ore and mineral deposits.

- Unit I: Variation of gravity over the earth's surface - Principles of gravimeters - Gravity field surveys - Various types of corrections applied to gravity data - Preparation of gravity anomaly maps and their interpretation in terms of size, shape and depth.
 Unit II: Geomagnetic fields of the earth - Magnetic properties of rocks - Working principles of total field magnetometers - Field survey and data reductions - Preparation of magnetic anomaly maps and their quantitative interpretation - Introduction to aeromagnetic survey.

- Unit III: Resistivity method: basic principles - Various types of electrode configurations -Field procedure: Profiling and sounding - Application of electrical methods in groundwater prospecting and civil engineering problems.
- Unit IV: Seismic methods: Fundamentals and principles of wave propagation, refraction and reflection surveys for single interface, horizontal and dipping cases - Concept of seismic channel and multi-channel recording of seismic data - End-on split spread shooting techniques - Interpretation of seismic data.
- Unit V: Application of geophysical methods in mineral and petroleum exploration -Description of borehole environment - Brief outline of various well-logging techniques - Principles of electrical logging and its applications in petroleum, groundwater and mineral exploration.

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|----------|------------------------------|---|---|---|---|---|---|
| EAS E309 | Introduction to Oceanography | E | 3 | 0 | 0 | 3 | Dr.N.Rajeshwara Rao Dr.M.Jayaprakash |
|----------|------------------------------|---|---|---|---|---|---|

Prerequisite: Basic degree in Geology, Applied Geology, Geography, Applied Geography or Zoology.
Course Objective:

To facilitate understanding of the fundamental principles of Oceanography that would be extremely useful for geological, geographical or biological applications.

- Unit I: Marine Geology: Morphological and tectonic domains of the ocean floor - Mid-oceanic ridge systems – Modes and rates of sedimentation in oceans – Diagenetic changes in oxic and anoxic environments – Paleoenvironmental conditions – Mineral resources of oceans and factors controlling their distribution.
- Unit II: Physical Oceanography: Equation to state of water – Current systems, including under current and theories – Oceanic fronts and waves – Classification and origin of tides – Tidal currents.
- Unit III: Chemical Oceanography: Major and minor constituents of seawater – Processes controlling composition of seawater – Dissolved gases in seawater – The carbon cycle – Trace metals in seawater – Marine pollution.
- Unit IV: *Coastal Oceanography*: Factors influencing coastal processes – Transformation of waves in shallow water – Breaks and surf – Littoral currents – Wave action on sediments, including winnowing – Classification and formation of beaches – Pollution in marginal marine environments.
- Unit V: *Estuarine Oceanography*: Classification and nomenclature of estuaries – Tides in estuaries – Estuarine circulation and mixing – Sedimentation in estuaries – Coastal pollution.

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|----------|--------------------|---|---|---|---|---|-------------------|
| EASE 310 | Basic Hydrogeology | E | 3 | 0 | 0 | 3 | Dr.P.N.Ballukraya |
|----------|--------------------|---|---|---|---|---|-------------------|

Prerequisite: Basic degree in Geology.
Course Objective:

To provide a basic understanding of the groundwater resource, and to impart training in practical aspects of groundwater geology to facilitate the practical utility of the subject. The chapters covered will help in gaining knowledge in exploration, exploitation and management of groundwater on a scientific basis.

- Unit I: Scope and importance of geohydrological studies as an applied subject – Groundwater as a natural resource – The hydrological cycle – Geological controls in the occurrence and movement of groundwater – Water-bearing properties of rock formations: porosity, permeability, Darcy's experiment - Laboratory determination of hydraulic conductivity, fluid potential and hydraulic head, aquifer compressibility and storativity; barometric and tidal efficiency of aquifers.
- Unit II: Classification of rocks based on porosity and permeability – Types and properties of aquifers – Cone of depression, drawdown, specific capacity and factors controlling them – Steady state flow to a well – Theis' equation – Transient confined flow to a well – Theis' and Cooper-Jacob's equations – Semi-confined and unconfined flow, partial penetration and multiple well conditions, flow under bounded conditions – Estimation of aquifer parameters – Pumping tests, time-drawdown curves, graphical procedures of analyses – Theis', Cooper-Jacob's and Chow's methods, recovery tests and data analyses – Step drawdown tests and well loss determination – Tracer tests – Groundwater balance studies – Safe yield and conjunctive uses – Artificial recharge of groundwater – Need and methods adopted.
- Unit III: Construction of wells – Augur well, driven well and jetted well – Mud-rotary drillings - Reverse rotary drilling – Cable tool drilling and DTH drilling – Well design and development - Completion of wells – Collector wells and infiltration galleries – Types of pumps: centrifugal turbine, submersible, ejecto and air lift pumps – Chemical quality of groundwater: sources of dissolved materials, units of measurement, TDS, major, minor, trace and gaseous constituents, physical and chemical properties of groundwater, groundwater quality standards, graphical procedures of presenting groundwater quality.
- Unit IV: Pollution of groundwater: natural pollution, contamination due to urban, agricultural and industrial activities, remedial measures – Seawater intrusion studies: Ghyben-Herzberg principle, estimation of depth to fresh water-saline water interface, up-coning and preventive measures against seawater

intrusion – Exploration for groundwater: geological methods, geomorphological and remote sensing inputs – Electrical resistivity prospecting – Electromagnetic methods – Usefulness of S.P. methods in groundwater studies – Basics of groundwater modeling.

UnitV: Practical problems in groundwater flow, specific yield, hydraulic conductivity, transmissivity and storativity – Construction of Thiessen polygons, isohyet maps and estimation of mean basin rainfall and groundwater recharge – Estimation of drawdown using Theis' and Cooper-Jacob's equations - Pumping test data analyses for confined aquifers – Estimation of well loss and well efficiency from step drawdown tests – Exercises in groundwater quality and plotting of hydrogeochemical data.

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|----------|---|---|---|---|---|---|--------------------|
| EAS E311 | Basics of Remote Sensing & GIS Techniques | E | 3 | 0 | 0 | 3 | Dr.R.Krishnamurthy |
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Prerequisite: Basic degree in any branch of Science or Arts.

Course Objective:

To provide an overview on basics of Remote Sensing and GIS technology tools with their relative merits and demerits for beginners.

Unit I : Introduction to electromagnetic radiation (EMR) - remote sensing system and platforms – different types of remote sensing sensors.

Unit II : Spectral reflectance properties of earth objects – interpretation satellite data – visual and digital analysis of satellite data.

Unit III: Basics of air photos and photogrammetry - different types and resolutions of remote sensing sensors - scanning mechanisms.

Unit IV: Different applications of remote sensing data – advantages of multitemporal multisensor data in mapping and monitoring, and constraints.

UnitV: Introduction to GIS – database generation and analysis – combined use of remote sensing and GIS.

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|----------|-----------------------|---|---|---|---|---|----------------|
| EAS E312 | Rain Water Harvesting | E | 3 | 0 | 0 | 3 | Dr.S.G.Sridhar |
|----------|-----------------------|---|---|---|---|---|----------------|

Prerequisite: Basic degree in Science or Arts.

Course Objective:

Water is a renewable source of finite reserves. Only 3% of the world's water resources are fresh, of which one-third is inaccessible. Over the years, rising population, growing industrialization and urbanization have increased the demand for water. So, we need to promote the concept of rainwater harvesting.

UnitI: Groundwater – Historical background – Utilization – Hydrologic cycle – Occurrence of groundwater.

UnitII: Rock properties affecting groundwater – Geologic formations as aquifers – Groundwater in permafrost regions.

Unit III: Rainwater harvesting (RWH) in urban areas – Artificial recharge for sub-surface storage in hard rock terrains.

Unit IV: RWH in river basins for recharging groundwater to domestic water supply – Methods – Legislation for water – Groundwater Act – Water management in rural areas.

Unit V: Seawater intrusion – Water pollution by industries – Community participation – Traditional indigenous RWH for sustainable water supply.

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|----------|-------------------------------|---|---|---|---|---|-------------------|
| EASE 313 | Nuances of Scientific writing | E | 3 | 0 | 0 | 3 | N. Rajeshwara Rao |
|----------|-------------------------------|---|---|---|---|---|-------------------|

Prerequisite: Basic degree in any branch of science.

Course Objective:

This supportive course aims at removing the *mental block*, which many of us encounter while writing in English, a result of the language being foreign to most of us. It would facilitate improvement in scientific writing and preparation of technical reports.

Unit I: Introduction – Purpose of writing – Definitions: Scientific paper, Review paper, Conference report, Abstract, Extended abstract – Definition of a technical report – Types of technical reports – Planning of

- scientific paper or report – Structure – Headings – Format – Card indexing – Data assembling - Contents of scientific papers: Parts of a scientific paper – Its basic structure – Preliminaries: Name(s) of authors, Address(es), Affiliation(s) – Text: Abstract, Introduction, Materials and Methods, Results and Conclusions – End material: Acknowledgements, References, Appendices, Footnotes, Index.
- Unit II: Contents of technical reports: Investigations, Proposals, Progress Reports, Information, Feasibility Studies - Illustrations and Tables: Maps – Line drawings – Graphs – Photographs – Current practices on illustrations – Tables: Structure – Caption – Footnotes – Some examples of good and bad abstracts – References: In the text – In the list of references – Checks and cross-checks – Examples of some formats currently used.
- UnitIII: Style and Form: Accuracy of content – Clarity and simplicity of expression – Types of language to be used and avoided – Direct writing – Jargon – Colloquialism – Definition of special terms - Coherence – Conciseness – Logical sequencing – Writing Aids: Grammar and usage – Abbreviations – Compound words – Correct and wrong usage of hyphen – Phrase placement – Italics – Numerical expressions - Units and symbols – Punctuation – Spellings – Writing Practices: Rewriting – Readability – Checklist – Preparation of final manuscript.
- UnitIV: Proof-reading: Requirements – Proof-reading symbols – Publishing: Procedures – Double publishing – Authorship – Copyright – Cataloguing – Guarantees – Reproduction – Royalty – Conference proceedings – Editing: Introduction – Editorial procedures with author – Editorial procedures with printer – Editorial practices – Storage – Alterations.
- UnitV: Oral and Poster Presentations: Preamble – Mode of oral presentation – Oral presentation aids – Structure of poster presentation – Visuals – Sequencing – Captions – Project Proposals: Types of proposals – Strategy to be adopted – Examples of some formats of project proposals – Requirements of a good project proposal: Definition of the problem – Research methodology – Institutional capacity – Examples of favorable and unfavorable evaluations of project proposals.

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|----------|---|---|---|---|---|---|----------------------|
| EASE 314 | Integrated Coastal Zone management (ICZM) Principles, Tools, Strategies & Practices | E | 3 | 0 | 0 | 3 | Dr. R. Krishnamurthy |
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Prerequisite: Basic degree in any field of Science or Arts.

Course objectives:

To train students in coastal zone management interdisciplinary research based on interactive lecturing and group activities and at the end students will have:

- (iv) an understanding of the components of ICZM and their interactions,
- (v) improved skills to identify the issues, problems and appropriate solutions to ICZM and
- (vi) improved skills in preparation of ICZM strategies and plan for new interdisciplinary research.

- UnitI : Introduction: Interactive lecturing on global coastal zone importance and characteristics. Demonstrations on interconnectedness of physical, biological and social components of coastal zone management – need of integrated approaches for Integrated Coastal Zone Management. Gaining experiences in prioritization of coastal issues/problems and linkages between various components.
- Unit II: Group activities: Discussions and presentations on coastal issues/problems based on video and CD presentations. Exposures on coastal ecosystems, aquatic resources, biodiversity and the impact of global change on coastal zone.
- UnitIII: Demonstrations: Introduction to decision-support and management tools for ICZM - remote sensing, GIS, Information Technology and EIA. Presentations on various ICZM models, case studies and to engage students by means of Internet, dialog among themselves and also with outside experts. Introduction to coastal ocean regulations - group activities on ICZM strategy preparations and field visits/institutional visits.
- Unit IV: Group activities: Participatory approaches for coastal zone management – familiarization on importance of people’s participation, stakeholders analysis and management.
- UnitV: Transboundary issues in coastal management - group discussions and presentations to develop skills individually and collaboratively for implementing knowledge-building process as an approach for coastal zone management.

M. Phil. APPLIED GEOLOGY

| Code No. | Title of the Course | C/E | Credits | | | | Faculty |
|------------------------------|---|-----|---------|---|---------|----|---|
| | | | L | T | S/ P | C | |
| FIRST SEMESTER | | | | | | | |
| EAS C101 | Research Methodology and Data Processing | C | 4 | 0 | 1 | 5 | Prof.P.Periakali Prof.K.K.Sharma Dr.P.N.Ballukraya Dr.R.Krishnamurthy |
| EAS C102 | Instrumentation Techniques in Earth Sciences | C | 4 | 0 | 1 | 5 | Prof.P.Periakali Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao Dr.M.Jayaprakash |
| <u>Electives</u> EAS E101 | <u>any one of the courses</u> Exploration Geophysics | E | 4 | 0 | 1 | 5 | Prof.K.K.Sharma |
| EAS E102 | Geohydrology | E | 4 | 0 | 1 | 5 | Dr.P.N.Ballukraya |
| EAS E103 | Environmental Geochemistry | E | 4 | 0 | 1 | 5 | Prof.P.Periakali Dr.M.Jayaprakash |
| EAS E104 | Applied Micropaleontology | E | 4 | 0 | 1 | 5 | Dr.S.G.D.Sridhar Dr.N.Rajeshwara Rao |
| EAS E105 | Remote Sensing | E | 4 | 0 | 1 | 5 | Dr.R.Krishnamurthy |
| EAS E106 | Integrated Coastal Zone Management | E | 4 | 0 | 1 | 5 | Dr.R.Krishnamurthy |
| SECOND SEMESTER | | | | | | | |
| EAS C103 | Dissertation and Viva-voce | C | | | | 21 | Supervisor |

M.Phil. GEOLOGY

| Course Code | Title of the Course | C/E | Credits | | | | Faculty |
|------------------------|---|-----|---------|---|---|----|------------------------------------|
| | | | L | T | P | C | |
| First Semester | | | | | | | |
| EAS C001 | Research Methodology in Geology | C | 4 | 1 | 0 | 5 | Dr.S.Srinivasalu |
| EAS C002 | Recent Researches in Geology | C | 4 | 1 | 0 | 5 | Dr.S.M.Hussain |
| EAS E001 | Applied Micropaleontology | E | 4 | 1 | 0 | 5 | Dr..S.P.Mohan Dr.S.M.Hussain |
| EAS E002 | Advanced Igneous and Metamorphic Petrology | E | 4 | 1 | 0 | 5 | Dr.V.Ram Mohan |
| EAS E003 | Applied Sedimentology and Sequence Stratigraphy | E | 4 | 1 | 0 | 5 | S.Ramasamy |
| EAS E004 | Environmental Geosciences | E | 4 | 1 | 0 | 5 | Dr.S.Srinivasalu |
| EAS E005 | Applied Marine Geology | E | 4 | 1 | 0 | 5 | Dr.S.Srinivasalu Dr.S.M.Hussain |
| EAS E006 | Sequence Stratigraphy and Petroleum Geology | E | 4 | 1 | 0 | 5 | S.P.Mohan S.Ramasamy |
| Second Semester | | | | | | | |
| EAS C003 | Dissertation and Viva-Voce | C | - | - | - | 21 | Supervisor |

P.G.DIPLOMA IN GROUNDWATER EXPLORATION AND MANAGEMENT

| Course code | Course title | C / E | Credits | | | | Course faculty |
|-------------|-----------------------------|-------|---------|---|---|----|--|
| | | | L | P | T | C | |
| EAS C376 | Basic Hydrogeology - I | C | 2 | - | 2 | 4 | P.N. Ballukraya/P. Periakali S.G.D. Sridhar/Invited speakers |
| EAS C377 | Basic Hydrogeology – II | C | 2 | - | 2 | 4 | Dr.P.N. Ballukraya/Dr.P. Periakali Dr.S.G.D. Sridhar/Invited speakers |
| EAS C378 | Basic Hydrogeology- III | C | 2 | 2 | - | 4 | Dr.P.N. Ballukraya/Dr.P. Periakali Dr.S.G.D.Sridhar/Invited speakers |
| | II SEMESTER | | | | | | |
| EAS C379 | Exploration Techniques –I | C | 2 | - | 2 | 4 | Dr.P.N.Ballukraya/Dr.K.K.Sharma Invited speakers |
| EAS C380 | Exploration Techniques – II | C | 2 | - | 2 | 4 | Dr.P.N.Ballukraya/Dr.K.K.Sharma Invited speakers |
| EAS C381 | Exploration Techniques-III | C | 2 | 2 | - | 4 | Dr.P.N.Ballukraya/Dr.K.K.Sharma Invited speakers |
| | III SEMESTER | | | | | | |
| EAS C382 | Project Work | C | - | - | - | 12 | Dr.P.N. Ballukraya/Dr.P. Periakali Dr.K.K. Sharma/Dr.S.G.D. Sridhar |

Course Details ;

The entire course is divided in to three papers; - Basics of hydrogeology - Exploration techniques - Project work - Papers 1 and 2 will have adequate built in field and laboratory training while the project work will be entirely related to a field based problem.

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|----------|------------------------|---|---|---|---|---|---|
| EAS C376 | Basic Hydrogeology - I | C | 2 | - | 2 | 4 | P.N. Ballukraya/P. Periakali S.G.D. Sridhar/Invited speakers |
|----------|------------------------|---|---|---|---|---|---|

Water-bearing properties of rocks, groundwater level fluctuations and water level maps, groundwater flow equations, pumping tests and aquifer parameter estimations, design, construction and development of borewells, types of drilling machines, pumping equipments, groundwater contamination, sea water intrusion, artificial recharge of groundwater, mathematical modeling of aquifers and groundwater basins for water resource management, chemical quality of groundwater; field visits for training in (i) hydrogeological mapping and sample collection and (ii) well drilling and laboratory training in chemical analysis of groundwater.

2. Exploration techniques (12 credits)

geological tools in exploration, identification of rock types and their groundwater potential, role of structure and tectonics in hydrogeology, use of toposheets, aerial photographs and satellite imageries in groundwater exploration, hydrogeomorphological studies, gravity and magnetic prospecting, seismic prospecting, electrical Resistivity and self potential methods, field methodology and interpretation of data, electromagnetic methods. Laboratory course in hydrogeomorphological mapping; field training in Resistivity profiling and sounding; data interpretation and well site location identification in hard rock as well as soft rock formations.

3. Project work. (12 credits)

Each candidate will be required to carry out a field-based project work incorporating all aspects of the course content.

DIPLOMA IN RAIN WATER HARVESTING

| Course code | Course title | C/E | Credits | | | | Course faculty |
|-------------|----------------------|-----|---------|---|---|---|---|
| | | | L | P | T | C | |
| EAS C301 | Basic Geohydrology | C | | | | 3 | Dr.P.N. Ballukraya |
| EAS C302 | Rainwater Harvesting | C | | | | 3 | Dr.P.N. Ballukraya/Dr.K.Sahrma / Dr.S.G.D. Sridhar |
| EAS C303 | Practical/Viva-voce | C | | | | 3 | Dr.P.N. Ballukraya/Dr. K.Sahrma Dr.S.G.D.Sridhar |
| EAS C301 | Basic Geohydrology | C | | | | 3 | Dr.P.N. Ballukraya |

UnitI : Hydrogeomorphology: Type of landforms: Fluvial, Aeolian, Glacial landforms and their evolution – hydrogeomorphological characteristics. Rock types : Ineous rocks_ Sedimentary rocks – Metamorphic rocks. Important rock varieties. Rock types of Tamilnadu. Geological structures: types of folds and their origin. Faults: Normal, Reverse, Thrust faults and their identification. Joints: Various types of joints and their origin. Fractures and other important structures.

UnitII: Weathering of rocks: Physical and Chemical weathering : Various types of weathering processes and factors controlling them. Erosion: Erosion by running water, ice and wind – Hydrogeological properties related to weathering. Hydrological cycle: Precipitation – Runoff – Infiltration – Evapotranspiration – Estimation of these parameters and their relationship to water resources. Water bearing properties of rocks: Porosity – Permeability – Hydraulic conductivity: Darcy’s experiment Specific yield – Storativity and their estimation.

UnitIII: Types of aquifers : Confined - Semiconfined – Unconfined and their characteristics. Flow of ground water in rocks formations – Flow into a well – Radius of influence – Basic flow equations and estimation of aquifer parameters: Pumping tests; time-draw down curves and estimation of transmissivity and storativity: Theis, Cooper, Jacob’s and Chow’s method; Well loss and Well efficiency; Tracer tests; Groundwater levels and its monitoring; Groundwater level maps; Specific capacities of Wells.

Unit IV: Quality of Groundwater: Ec. pH, Physical and Chemical properties. Chemical analyses of groundwater. Groundwater pollution: Sources Types – Seawater intrusion – Remedial measures. Water balance studies – Water budgeting - Safe yield Monitoring of water levels – Ground draft.

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|----------|----------------------|---|--|--|--|---|---|
| EAS C302 | Rainwater Harvesting | C | | | | 3 | Dr.P.N. Ballukraya/Dr.K.Sahrma Dr.S.G.D. Sridhar |
|----------|----------------------|---|--|--|--|---|---|

UnitI: Over-exploitation of groundwater. Need for artificial recharge and rain water harvesting. Types of wells – Drilling technology – Design, Construction and Development of water wells: Dugwells and borewells; Direct and Reverse rotary drilling; Cable tool and DTH hammer drilling; Gravel packing and well development procedures.

UnitII: Types of pumps – Various recharge structures: Recharge ponds – Recharge pits Percolation Ponds – Basin spreading – Surface and Subsurface dykes – Recharge wells – Recharge bore wells. Rain water harvesting in Urban areas: RWH structures. Design Construction.

UnitIII: Estimation of probable runoff from an area including from rooftops – Maintenance and monitoring of RWH Structures. Study of benefits - Effects on local groundwater environments – Remedial measures. Recycling of domestic water – Source of water for recharge in urban areas.

UnitIV: Precautions for Source, Construction and establishing RWH structures. Exploration techniques and selection of artificial recharge zones – Electrical resistivity investigations using horizontal profiling and vertical sounding techniques – interpretation of resistivity data in terms of subsurface geology.

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|----------|---------------------|---|--|--|--|---|---|
| EAS C303 | Practical/Viva-voce | C | | | | 3 | Dr.P.N. Ballukraya/Dr. K.Sahrma Dr.S.G.D.Sridhar |
|----------|---------------------|---|--|--|--|---|---|

UnitI : Exercises in estimating rainfall and volume of precipitation. Designing suitable RWH structures. Exercises in ground water flow and aquifer parameters determination.

UnitII: Chemical analyses of groundwater and measurement of pH, EC, DO, Ionic concentration of dissolved solids etc. Field visits to functional RWH structures

UnitIII: Field investigations using geophysical techniques. Field resistivity surveys in profiling and sounding techniques. Interpretation of resistivity data.

Unit IV: Invited talks on RWH and recharge methodology from specialist organizations. Project proposals, presentation and evaluation.