ADIKAVI NANNAYA UNIVERSITY:: RAJAHMUNDRY
DEPARTMENT OF GEOLOGY
Pre-PhD Course work syllabus: 2019
Paper-II COAL GEOLOGY AND REMOTE SENSING

UNIT I: COAL GEOLOGY
Introduction, sedimentation of coal and coal bearing sequence, structural effects on coal, coalification, classification of coal. Importance of remote sensing in coal exploration,coal distribution in India.

UNIT II: COAL QUALITY SAMPLING AND ANALYSIS
Chemical properties of coal, combustion properties of coal, physical properties of coal, coal oxidation, coal sampling, coal analysis, coal uses, hydrogeological characteristics of coal and coal bearing sequence. Groundwater inflow in mines.

UNIT III: CONCEPTS OF REMOTE SENSING
Introduction, Energy sources, Electromagnetic spectrum, Energy interactions in the atmosphere, Energy interactions with the Earth's surface, spectral reflectance of vegetation, soil, water; Resolutions: Spatial, Spectral, Radiometric and Temporal; applications of Remote Sensing, GPS, GIS

UNIT IV: DIGITAL IMAGE PROCESSING
Introduction, Image rectification and restoration, image enhancement, multi image manipulation, elements of image interpretation, image classification, supervised classification and unsupervised classification, hyperspectral Image analysis, edge detection and boundary extraction, data merging and GIS integration.

UNIT V: APLICATION TRENDS
Applications of Remote sensing for Earth Resources Management: Agriculture, Land Use/Land cover, Soil Mapping, Crop Inventory, Hydrology, Forest/Vegetation, Geology, coastal zone management, Marine Fisheries.

REFERENCES:

1. Coal Geology by Larry Thomas, 2012
2. A Text book of Geology by G.B.Mahapatra, 2017
3. Remote sensing and Image interpretation, Thomas M. Lillesand Ralph W.Kiefer. 4th edition, 2000.
4. Fundamentals of Digital Image processing Anil K.Jain, 2007
5. Fundamental of Remote Sensing, George joseph, 2007
6. Digital Remote Sensing, Prithvish Nag, M.kudrat, 1998.
7. Physical Principles of Remote Sensing-W.G. Rees, Cambridge University Press, 2nd edition, 2001
8. Remote sensing models & methods for image processing, Robert Shcowebgerdt III edition, 2004
9. Digital Image Processing (3rd Edition) Rafael C. Gonzalez , Richard E. Woods Prentice Hall, 2007
10. Introductory Digital Image Processing: A Remote Sensing Perspective, John R. Jensen, 2nd Edition, 1995

ADIKAVI NANNAYA UNIVERSITY:: RAJAHMUNDRY
DEPARTMENT OF GEOLOGY
Pre-PhD course work syllabus:: 2019
Paper-II: Groundwater management and its sustainability (N. Sunanda)

Unit 1: Groundwater Occurrence and movement of groundwater, types of aquifers – groundwater levels – Types of wells – wells in hard rock terrain – Methods of artificial groundwater recharge – Site selection for artificial recharge - Groundwater assessment and balancing – Seawater intrusion in coastal aquifers – Land subsidence – Optimal groundwater development – Indian GEC norms.

Unit 2: Aquifer parameters – Determining aquifer parameters for unconfined, leaky and non-leaky aquifers steady and transient conditions - Slug test – Locating hydro geological boundaries – Determination of well characteristics and specific capacity of wells.

Investigation and evaluation of Groundwater: geophysical methods – Electrical Resistivity method – GPR techniques – surveying procedure and Interpretation of data – Subsurface investigations – Test drilling – Resistivity logging. Groundwater Quality studies - pollution in groundwater – Quality of groundwater for agriculture, drinking and industrial purposes.

Unit 3: Geomorphology & Morphometry: Fluvial geomorphology: Fluvial processes – Fluvial landforms – types – evolution of fluvial landforms – Morphometric analysis of Drainage pattern. Watershed delineation and codification – watershed characteristics.

Topography, hydrological, geological, geomorphological and Hydrogeological conditions in East and West Godavari districts: Godavari river basin and its tributaries. Groundwater problems in East and West Godavari districts.

Unit 4: Applications of Remote Sensing and GIS in groundwater studies – Groundwater prospective mapping methodology – Case studies: Identification of groundwater potential zones, delineation of groundwater polluted zones, identification of suitable locations for rainwater harvesting structures.

Unit 5: Ground water sustainability: Groundwater resource sustainability indicators, the conceptual approach for Groundwater indicators, the social and economic aspects for ground water indicators, future development of ground water indicators. Case studies: method of calculation of the renewable gw resources per capital indicator, GW sustainability indicators testing with Finnish data and implementation of GW indicators in the Republic of South Africa.

Text books:

1. P.S.Roy, R.S.Diwedi and D.Vijayan, 2010, Remote sensing applications, NRSC, Hyderabad
2. Applied Hydrology, Mc Graw, New York, Chow V.T., Maidment D.R., Mays L.W., 1995.
3. Hydrology, Wiley Eastern Ltd., New Delhi, Ragunath H.M., 1994.
4. Hand book of Hydrology, McGraw Hill Publications, New York, Ven Te Chow, 1995.
5. Groundwater geophysics – A tool for hydrogeology, Reinhard Kirsch, Springer verlag, 2006
6. Groundwater Resources Sustainability, Management and Restoration, McGraw Hill, NY, Neven Kresic, 2008.
7. GW resources sustainability indicator, Jaroslav Vrba and Annukka Lipponen (Editors),IHP-VI series on GW No. 14, UNESCO 2007, 43pp

Model Question Paper

ADIKAVI NANNAYA UNIVERSITY:: RAJAHMUNDRY
DEPARTMENT OF GEOLOGY
Pre-PhD Examination::2019
Paper-II: Groundwater management and its sustainability (N. Sunanda)

Time: 3Hrs Max. Marks: 100

Answer all the questions

1. Give a detail note on Occurrence and movement of groundwater ?

OR

2. Discuss the seawater intrusion in coastal zones ?

3. Explain the aquifer parameters determination methods for various aquifers ?

OR

4. Write an essay on Groundwater quality studies ?

5. Discuss the fluvial processes and fluvial landforms ?

OR

6. Give a detail note on morphometric analysis of drainage pattern in a river basin ?

7. Discuss the applications of remote sensing and GIS in groundwater studies ?

OR

8. Explain the methodology used in identification of suitable sites for rainwater harvesting structures ?

9. Discuss the usage of sustainable indicators in groundwater studies ?

OR

10. How the sustainability indicators have been used for testing the groundwater resource using Finnish data ?

ADIKAVI NANNAYA UNIVERSITY:: RAJAHMUNDRY
DEPARTMENT OF GEOLOGY
Pre-PhD course work syllabus:: 2019
Paper-II: Paleoclimate (A. Durga Prasad)

Unit-1: Fundamentals of Remote Sensing: Sensors: Types of platform; Types of orbits; Scanning Systems: Types of Sensors; Data collection. Visual Image Interpretation. Digital image processing. Introduction to Global Positioning System (GPS); Satellite remote sensing: Types of Satellites.

Unit 2: Thermal Infra-red and microwave remote sensing in geological studies; Applications of remote sensing - identification of rocks, mineral explorations, geological surveys; surficial deposit / bedrock mapping; lithological mapping; structural mapping; Applications of RS & GIS in geomorphological mapping and its case studies

Unit-3: Geomorphology: Principles and fundamental concepts of Geomorphology, Geomorphic materials and Processes. Endogenic and Exogenic processes. Formation of Geomorphic Landforms. Fluvial Processes and landforms. Marine Processes and landforms, Aeolian Processes and land forms and Glacial Processes and land forms. Karst Topography, Structural landforms (Related to Small and Large Scale Tectonics). Paleo-Geomorphology, Applied Geomorphology. Geology and geomorphology of kutch area

Unit-4: Paleoclimate: Sources of Paleoclimatic Information, Geomorphological evidences, Paleoclimate Strategies. Drivers and Physics of Climate Change, The Climate System, Feedback Mechanisms. Energy Balance of the Earth and Its Atmosphere. Timescales of Climatic Variation, Variations of the Earth's Orbital Parameters, Solar Forcing, Volcanic Forcing. Proxies for paleoclimate study. Mean sea-level changes in time, Eustatic Sea Level Change. Application of Isotopes in paleoclimate study.

Unit-5: Quaternary geology: Stratigraphy of Quaternary. Quaternary Paleoclimate, Neotectonics. Active Tectonics. Morphometry studies for active tectonic observations. Paleo-seismology. Geological Markers. Quaternary Dating methods. the last interglacial - glacial cycle. Quaternary dating methods. optically stimulated dating, Scanning Electron Microscope (SEM). XRF (X-ray fluorescence). Thin section analysis and paleo-environmental studies

References:

1. Introduction to Remote Sensing (5th Edition) by James Campbell.
2. Introduction to geographic information systems by Chang, Kang-Taung 2002, Tata McGraw-Hill, USA
3. Remote Sensing Geology by Gupta, R.P., 1990, Springer Verlag.
4. Fundamentals of Geomorphology (2nd Edition) by Richard John Hugget.
5. Principles of Geomorphology by William D . Thornbury
6. Paleoclimatology: Reconstructing climates of the Quaternary by Raymond S Bradley..
7. Reconstructing Quaternary Environments by JJ Lowe
8. Paleoclimates understanding climate change past and present by Thomas M cronin
9. Quaternary Geology: A Stratigraphic Framework for Multidisciplinary Work by D Q Bowen
10. Quaternary Geology(Indian perspective) by U.B Mathur

ADIKAVI NANNAYA UNIVERSITY:: RAJAHMUNDRY
DEPARTMENT OF GEOLOGY
Pre-PhD Examination::2019
Paper-II: Paleoclimate (A. Durga Prasad)

Time: 3Hrs

Max. Marks: 100

Answer all the questions

1. Give a detail note on fundamental concepts of Remote sensing ?

OR

2. Discuss the visual interpretation techniques in remote sensing ?

3. Explain the applications of thermal infra-red in geological studies ?

OR

4. Write an essay on lithological mapping methods applied using remote sensing studies ?

5. Discuss the fluvial processes and fluvial landforms ?

OR

6. Give a detail note on paleo-geomorphology ?

7. Discuss the sources of paleoclimatic information and geomorphological evidences ?

OR

8. Explain the application of isotopes in paleoclimate study ?

9. Discuss the quaternary stratigraphy and its paleoclimate ?

OR

10. Give in detail note on thin section analysis and paleo-environmental studies ?

19/12

ADIKAVI NANNAYA UNIVERSITY:: RAJAHMUNDRY
DEPARTMENT OF GEOLOGY
Pre-PhD course work syllabus:: 2019

Paper-II: Groundwater in delta areas emphasizing on paleo-channels (T. Rajababu)

Unit 1: Groundwater Occurrence and movement of groundwater, types of aquifers – groundwater levels – Types of wells – wells in hard rock terrain – Methods of artificial groundwater recharge – Site selection for artificial recharge - Groundwater assessment and balancing – Seawater intrusion in coastal aquifers – Land subsidence – Optimal groundwater development – Indian GEC norms.

Unit 2: Aquifer parameters – Determining aquifer parameters for unconfined, leaky and non-leaky aquifers – steady and transient conditions – Slug test – Locating hydro geological boundaries – Determination of well characteristics and specific capacity of wells.

Investigation and evaluation of Groundwater: geophysical methods – Electrical Resistivity method – GPR techniques – surveying procedure and Interpretation of data – Subsurface investigations – Test drilling – Resistivity logging. Groundwater Quality studies - pollution in groundwater – Quality of groundwater for agriculture, drinking and industrial purposes.

Unit 3: Geomorphology & Morphometry: Fluvial geomorphology: Fluvial processes – Fluvial landforms – types – evolution of fluvial landforms – Morphometric analysis of Drainage pattern: Watershed delineation and codification – watershed characteristics.

Topography, hydrological, geological, geomorphological and Hydrogeological conditions in East and West Godavari districts: Godavari river basin and its tributaries. Groundwater problems in East and West Godavari districts. Groundwater Management. Delta areas of India and special emphasis on Godavari and Krishna delta area.

Unit 4: Applications of Remote Sensing and GIS in groundwater studies – Groundwater prospective mapping methodology – Case studies: Identification of groundwater potential zones, delineation of groundwater polluted zones, identification of suitable locations for rainwater harvesting structures.

Unit 5: Application of geophysical, geochemical and isotope studies in evaluating the paleochannels – Groundwater problems in coastal zones and delta areas. Groundwater prospective mapping methodology – Case studies: Identification of groundwater potential zones, delineation of groundwater polluted zones. Deltas in times of climate change, Green water defense, GREEN Water Defense examples and practices. Best practices from the Netherlands and USA. Guidance for Green Water defense.

Text books:

1. P.S.Roy, R.S.Diwedi and D.Vijayan, 2010. Remote sensing applications, NRSC, Hyderabad
2. Chow V.T., Maidment D.R., Mays L.W., Applied Hydrology, Mc Graw Hill Publications, New York, 1995.
3. Ragunath H.M., Hydrology, Wiley Eastern Ltd., New Delhi, 1994.
4. Ven Te Chow, Hand book of Hydrology, McGraw Hill Publications, New York, 1995.
5. Groundwater geophysics – A tool for hydrogeology, Reinhard Kirsch, Springer verlag, 2006
6. Adaptive water management for delta regions: towards green water defense in east Asia, Deltares publication, M. Marchand, TrinhThi Long, Sawarendro – 2012

Model Question Paper

ADIKAVI NANNAYA UNIVERSITY:: RAJAHMUNDRY
DEPARTMENT OF GEOLOGY
Pre-PhD Examination::2019
Paper-II: Groundwater in delta areas emphasizing on paleo-channels (T. Rajababu)

Time: 3Hrs Max. Marks: 100

Answer all the questions

1. Give a detail note on Occurrence and movement of groundwater ?

OR

2. Discuss the seawater intrusion in coastal zones ?

3. Explain the aquifer parameters determination methods for various aquifers ?

OR

4. Write an essay on Groundwater quality studies ?

5. Discuss the fluvial processes and fluvial landforms ?

OR

6. Give a detail note on morphometric analysis of drainage pattern in a river basin ?

7. Discuss the applications of remote sensing and GIS in groundwater studies ?

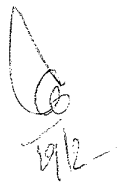
OR

8. Explain the methodology used in identification of suitable sites for rainwater harvesting structures ?

9. Discuss geochemical application in evaluating the paleochannels ?

OR

10. Give a detail note on deltas in times of climate change ?



ADIKAVI NANNAYA UNIVERSITY: RAJAHMUNDRY
DEPARTMENT OF GEOLOGY
Pre-PhD course work syllabus: 2019
Paper-II: Neotectonics and Paleoseismology (Raj Sunil Kandregula)
(Area of Research and methodology)

Unit-1: Processes and types of Weathering; Geological agents; Classification of Rocks (Igneous, Sedimentary, Metamorphic) and their important features, Sedimentary environments (Aeolian, Fluvial, Coastal, Deltaic, Shallow and Deep Marine) and typical landforms associated with particular environment; Physiographic Divisions of India -- history and process of their evolution.

Unit-2:Remote Sensing: Definition, Key Concepts of Remote Sensing, Visual Image Interpretation and Digital image processing; Digital Elevation Model, Geological applications of DEM; Applications of remote sensing to Earth Sciences, Geomorphology- Landform (Tectonic, Volcanic, Fluvial, Coastal, Deltaic, Aeolian and Glacial) Identification, Structures (Folds, Faults, Lineaments, Unconformity, Strata, Intrusive and Circular Features) Identification, Indicators for Ground water on Remote Sensing Images; Neotectonics, Seismic Hazard and Damage assessment; Environmental Applications.

Unit-3: Geomorphology: Landforms and their formation: Fluvial, marine, aeolian and glacial processes and landforms, Landscape evolution, Thresholds, Complex response; Landforms associated with Strike-Slip faulting, Normal Faulting and Reverse Faulting; Pleistocene and Holocene chronology.

Unit-4: Tectonics: General Concepts of plate tectonics and active Tectonics, Earthquakes and related phenomena. Intensity and Magnitude of Earthquakes, Effects of Earthquakes, Neoctectonics; Active Fault zones; Slip rates and recurrence intervals; Estimation of Seismic risk;; Tectonic creep; Geomorphic Indices of Active Tectonics; Rivers: Drainage networks and Drainage Patterns, River Terraces: Types, Surface faulting on terraces, Warping and Tilting of Terraces.

Unit-5: Paleoseismology: Definition, scope and Objectives, identifying prehistoric earthquakes, prehistoric earthquake recurrence, estimating the magnitude of prehistoric earthquakes, dating of prehistoric earthquakes; Paleoseismology of Compressive, Extensional and Strike-Slip Environments; trenching techniques; Dating Paleo earthquakes; Geomorphic and stratigraphic evidences of paleo earthquakes; Use of Paleoseismic Data in Deterministic and Probabilistic Seismic Hazard Analyses; Site Studies for Surface Rupture; Paleoseismic Data Applied to Neotectonic Research; Current Issues and Future Prospects in Paleoseismology.

References:

1. Introduction to Remote Sensing (5th Edition) by James Campbell.
2. Fundamentals of Geomorphology (2nd Edition) by Richard John Hugget.
3. Principles of Geomorphology by William D. Thornbury.
4. Active Tectonics by Pinter and Keller
5. Paleoseismology, 2nd Edition by James McCalpin.
6. Remote Sensing Geology by Ravi P Gupta, 3rd Edition, Springer Publications.

18/11/19

20/11/19