

**INSTITUTE OF GEOLOGY, UNIVERSITY OF THE PUNJAB
LAHORE**

**COURSES AND SYLLABI
FOR
PhD APPLIED GEOLOGY (HYDROGEOLOGY)**

COURSE WORK: 18 Credit Hrs

Course Code:	Course Title	Credit hrs
GEOL: 795	APPLIED HYDROGEOLOGY	03
GEOL: 776	GROUND WATER ENGINEERING	03
GEOL: 777	ENVIRONMENTAL HYDROLOGY	03
GEOL: 778	GIS APPLICATIONS TO HYDROGEOLOGY	03
GEOL: 779	ADVANCE QUANTITATIVE HYDROLOGY	03
GEOL: 780	GROUND WATER MODELING	03
GEOL: 781	WATERSHED HYDROLOGY	03
GEOL: 782	WATER RESOURCE MANAGEMENT	03

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COURSES & SYLLABI

FOR

PhD APPLIED GEOLOGY (HYDROGEOLOGY)

GEOL: 775 APPLIED HYDROGEOLOGY (03 Credit hrs)

Quantitative evaluation of ground water systems, aquifer testing, well design, Integration of ground and surface water systems, an introduction to geophysical and geochemical methods of exploration and their applications to the regional water resource investigations. Stream flow measurement and hydrograph analysis

Books Recommended:

1. Groundwater Hydrology by Todd, D.K., 1995, John Wiley & Sons.
2. Field Hydrogeology by Brassington, R., 1988, John Wiley & Sons.
3. Introduction to Groundwater by Michael P., 1985, George Allen & Unwin.
4. Applied Hydrogeology by Fetter, C.W., 1994, MacMillan Pub. Co. Atlas of WAPDA
5. Hydrology and Groundwater Resources of NWFP by Kruseman, G.P., 1988, WAPDA
6. Geophysical method in Geology by Sherma, P.V., 1986 Elsevier, New York, Amsterdam and London, 442p.

GEOL: 776 GROUND WATER ENGINEERING (03 Credit hrs)

Important Hydraulic properties of earth materials and ground water, ground water quality, transport mechanisms of dissolved contaminants, ground water flow and transport processes, flow nets, general infiltration model, Algebraic infiltration equations, well hydraulics and aquifer tests, well design, ground water monitoring.

Books Recommended

1. Engineering Hydrology by Wilson, E.M., 1991, MacMillan Education Ltd.
2. Field Hydrogeology by Brassington R. 1988, John Wiley and Sons.
3. Groundwater by Freeze, R.A., & Cherry, J.A., 1979, A Simon and Sechuster Company.
4. Groundwater Hydrology by Bouwer, H., 1988, McGraw Hill.
5. Groundwater by Rangunath, H.M., 1992, Wiley Eastern Ltd.
6. Groundwater Hydrology by Todd, D.K., 1995, John Wiley & Sons.
7. Groundwater Resource Evaluation by Walton, W.C., latest Ed., McGraw Hill.

GEOL: 777 ENVIRONMENTAL HYDROLOGY (03 Credit hrs)

Possible effects of climate change on ground water flow, Environmental information systems (EIS), ground water contamination and remediation, environmental hazards, hydrological systems and environment, Environmental impact assessment, Environmental Risk management, statistical applications to environmental management.

Books Recommended

1. Principles of Hydrology by Ward, R.C. & Robinson, M., 1990, McGraw-Hill Book Company.
2. Physical and Chemical Hydrogeology by Domenico and Schwartz, 1996, John Willey and Sons.

3. Groundwater by Freeze, R-A. & Cherry, J.A., 1979, A. Simo and Schusfer Company.
4. Principles of Hydrology by Ward, R.C. & Robinson, M., 1990, McGraw-Hill Book Company.
5. Physical and Chemical Hydrogeology by Domenico and Schwartz, 1996, John Willey and Sons.
6. Domestic Water Treatment by Lehr, J.H., Grass, T.E. Pettyjohn. W.A. & Marie, J. De., 1988, National Water Well Association Ohio.
7. Ground Water and Wells by Driscoll, F.G., 1989, Johnson Filtration System Inc. St. Paul.
8. Study and Interpretation of the Chemical Characteristics of Natural Water by Hem, J.D, 1992, US Geological Survey Water.
9. The Global Water Cycle by Berner, F.K., & Bernes, R.A., 1987, Prentice Hall.
10. Environmental Geology by Keller, E.A., latest Ed., Chales E. Merril Publishing Co.
11. Environmental Geology by Montgomery, C.W., 2005, McGraw Hill.

GEOL: 778 GIS APPLICATIONS TO HYDROGEOLOGY (03 Credit hrs)

Type of geological and remote sensing data used in GIS Applications of GIS to ground water engineering, modeling of ground water movement, modeling of ground water vulnerability using spatial data, application of remote sensing to landfills, Spatial applications to the drainage basin analysis, use of GIS data to solve environmental analysis.

Books Recommended

1. Geomorphology: Earth Surface Processes and form by Aharma, V.K., 1986, McGraw Hill.
2. Geomorphology by Charley, R.J., 1984, Methuen.
3. Image Interpretation in Geology by Drury, S.A., 1986, Allen & Unwin.
4. Remote Sensing and Image Interpretation by Lilles, T.M. and Kiefer, R.W., 1987, John Wiley & Sons.
5. Monitoring the Earth by Vita-Finzi, C., 2003 Oxford University Press.
6. Fundamentals of Geographic Information Systems by Demers, M.N., 2002, John Wiley & Sons.
7. Remote Sensing and Image Interpretation by Lillesand, T.M., et.al., 2003.
8. Concepts and Techniques of Geographic information system by Yeung, Lo.C.P. & Lal, A.K., 2003, Prentice Hall.
9. Aerial Photography and Image Interpretation, Kiser, J.D., Paine, D.P., 2003, John Wiley & Sons.

GEOL: 779 ADVANCE QUANTITATIVE HYDROLOGY (03 Credit hrs)

Interaction of geology and subsurface ground water flow, Basin hydrology modeling, water budgeting techniques, a general review of physical hydrogeology, pumping test and aquifer evolution, catchment studies, discharge measurement.

Books Recommended:

1. Applied Hydrogeology by Fetter, W, 1988, Merril.
2. Introducing Grounds Water by Price, M., 1995, Alien and Unwin
3. Field Hydrogeology by Braisington, R., 1998, John Wiley and Sons,
4. Groundwater and Wells by Driscoll, F.G., 1989. Johnson Filtration System Inc. St. Paul

GEOL: 780 GROUND WATER MODELING (03 Credit hrs)

Ground water models, Flow and transport processes, governing equations of ground water flow, Numerical methods for flow equations: basics of Finite-Difference methods , Model calibration criteria, and overview of the representative models: MODFLOW, MOC, available ground water models.

Books Recommended

1. Driscoll, F.G., (1989). Groundwater and Wells, Johnson Filtration System Inc. St. Paul.
2. Todd, D.K. (1980). Groundwater Hydrology, John Willey and Sons.
3. R.A. & Cherry, J.A., (1979). Groundwater, Freeze A Simo and Schuster Company.
4. Fetter, W. (1988). Applied Hydrogeology, Merrill.
5. Price, M. (1995), Introducing Grounds water by Allen and Unwin.
6. Geofluids. H. (2003). Introduction to Hydrogeology, Blackwell Synergy.
7. Braisington, R., (1998). Field Hydrogeology, John Wiley and Sons.
8. Walton, W.C. (1970). Groundwater Resources Evaluation., McGraw Hill Ltd.
9. Driscoll, F.G. (1989). Groundwater and Wells, Johnson Filtration System Inc. St. Paul.

GEOL: 781 WATERSHED HYDROLOGY (03 Credit hrs)

Drainage basin characteristics, erosion and sediment yield, sediment yield modeling and its applications, sediment delivery ration method (SDRM), Regression Analysis, stream flow simulation: EBSS (Event-based stream flow simulation), building an EBSS model, continuous stream flow simulation, watershed Representation.

Books Recommended:

1. Measuring Engineering Properties of Soil by Wray, W.K., 1986, Prentice Hall.
2. Engineering Geology by Goodman, R.E., 1993, John Wiley & Sons.
3. Singh, Vijay P. (1992), Elementary Hydrology, Printice Hall Publishers
4. Awan, N.M. (1981), Surface Water Hydrology, National Book Foundation, Islamabad, Pakistan.

GEOL: 782 WATER RESOURCE MANAGEMENT (03 Credit hrs)

Water demand and availability, selection of storage sites, reservoir yield, ground water storage, conjunctive use of water, drainage design, Storm water management model, flood routing: storage and hydraulic and design, catchment response modifications and river basin management.

Books Recommended

1. Groundwater Resource Evaluation by Walton, W.C., latest Ed., McGraw-Hill Kogakusho, Ltd.
2. Chow, Ven TE, (1964). Handbook of Applied Hydrology, McGraw Hill Company
3. Garg, Santosh Kumar, (2002), Hydrology and Water Resources Engineering, Khanna Publishers, India

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Director