

Bachelor of Science in Earth Science with Hydrology Option

Minimum credit hours required: 130

In addition to the General Education Core Curriculum Requirements, (page 7) the following courses are required:

- ☐ ☐ A 100-level EARTH course and associated lab (4)
- ☐ ☐ Earth Science core [ERTH 200 (4), EARTH 201 (4), EARTH 202 (4), EARTH 203 (3), EARTH 204 (4), EARTH 205 (1), EARTH 325 (3), EARTH 340 (3), EARTH 390 (3)]
- ☐ ☐ EARTH ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ EARTH 440 (3) and 440L (1), EARTH 441 (1), EARTH 442 (1), EARTH 443 (1), EARTH 483 (2), EARTH 484 (2)
- ☐ ☐ Math 231 (4), Math 283 (3), Math 335 (3)
- ☐ ☐ Earth science electives, minimum 11 credit hours in courses numbered 300 and above
- ☐ ☐ CHEM 311 & 311L (4), ENVS 412 (3), CSE 113 & 113L (4)
- ☐ ☐ Electives to complete 130 credit hours

ERTH 441, 441D, Hydrogeology, 1 cr, 1 cl hr~~Prerequisite: EARTH 440~~~~Offered spring semester~~

— Hydrogeologic controls on the occurrence, movement, and chemical and isotopic composition of groundwater. Hydrogeologic properties. Groundwater recharge and stream/aquifer interaction. Groundwater in different geological, climate, and physiographic regimes.

ERTH 442, 442D, Vadose Zone Processes, 1 cr, 1 cl hr

~~Prerequisite: EARTH 440~~~~Offered spring semester~~

— Physics of unsaturated flow in porous media, multi-phase flow, potentials and water retention, unsaturated hydraulic conductivity, transient flow problems.

ERTH 443, 443D, Atmospheric Dynamics and Rainfall and Evaporation Processes, 1 cr, 1 cl hr

~~Prerequisite: EARTH 440~~

~~Offered spring semester~~

— Principles of atmospheric processes with an emphasis on rainfall generation and evaporation at the Earth's surface. Warm and cloud convection, orographic controls on precipitation, cyclogenesis and frontal storms. Particular attention paid to the measurement and assessment of rainfall and evaporation in space and time.

New Version

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- ☐ A 100-level EARTH course and associated lab (4)
- ☐ Earth Science core [ERTH 200 (4), ERTH 201 (4), ERTH 202 (4), ERTH 203 (3), ERTH 204 (4), ERTH 205 (1), ERTH 325 (3), ERTH 340 (3), ERTH 390 (3)]
- ☐ ERTH [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] ERTH 440 (3) and 440L (1), ERTH 483 (2), ERTH 484 (2), ERTH 486 (2)
- ☐ One of the following: ERTH 411 (3), ERTH 413 (3), or ERTH 414 (3)
- ☐ Math 231 (4), Math 283 (3), Math 335 (3)
- ☐ Earth science electives, minimum 9 credit hours in courses numbered 300 and above
- ☐ CHEM 311 & 311L (4), ENVS 412 (3), CSE 107 & 107L (4)

ERTH 411, 411D, Groundwater Hydrology, 3 cr, 3 cl hrs

Prerequisite: EARTH 440

Offered alternate spring semesters

Study of the occurrence, movement, and chemical and isotopic composition of groundwater. Hydrogeologic properties. Groundwater recharge and stream/aquifer interaction, flow net and hydrograph analysis. Groundwater exploration using geologic and geophysical methods. Groundwater in different geological, climate, and physiographic regimes. Characterization of groundwater using stable isotopes and major ion analysis. Physics of flow to wells, steady- state and transient solutions to well hydraulics equations, image well theory, responses of aquifers to perturbations. Role of groundwater in contaminant migration and heat transfer. Shares lecture with HYD 511.

ERTH 413, 413D, Watershed Dynamics & Ecohydrology, 3 cr, 3 cl hrs

Prerequisite: EARTH 440

Offered alternate spring semesters

Processes governing hydrological flow rates and pathways through watershed systems: hillslope runoff production and in-channel flood routing. Emphasis on physical mechanisms and their treatment in models, as well as observations made in the field. Interactions between terrestrial plants and water, nutrients, and light resources in semiarid ecosystems and riparian zones. Vegetation induced flow roughness, ecohydrological processes and dynamics, and simple numerical models. Shares lecture with HYD 513.

ERTH 414, 414D, Vadose Zone Hydrology, 3 cr, 3 cl hrs

Prerequisite: ERTH 440

Offered alternate fall semesters

Physics of unsaturated flow in porous media, multiphase flow, potentials and water retention, unsaturated hydraulic conductivity, transient flow problems. Mathematical modeling of variable-density flow. Analysis of slope stability, drainage through mine tailings and rock piles, hazardous waste migration, soil moisture controls on evapotranspiration and vegetation growth. Shares lecture with HYD 514.

ERTH 486, Field Methods in Hydrology, 2 cr

Prerequisite: ERTH 440 and one of ERTH 411, ERTH 413 or ERTH 414, or consent of instructor

Offered Summers (2 weeks); NMT students should register for this course in the spring semester.

Instrumentation and methodologies used in hydrological investigations in a field setting. Course topics may range across a variety of physical and chemical hydrological techniques in vadose, groundwater and surface hydrology. Examples of potential topical areas include, but are not limited to, aquifer, lake and stream sample collection, storage and analysis; aquifer and watershed characterization; discharge measurements and tracer tests; land surface-atmosphere flux; groundwater geophysics measurements; and hydrologic field campaigns.