C1B: Fundamentals of Environmental Science

Course instructors: Priyanka Jamwal (Coordinator), Shrinivas Badiger (Co-coordinator) Nirmalya Chatterjee, Veena Srinivasan and Jagdish Krishnaswamy.

Credits: 3 credits

Class schedule: Lecture: Mon, Wed (1100-1150); Labs; Wed (1400-1650)

Prerequisites: None

Topics

- Environmental processes at global, regional and local scales;
- Stocks, fluxes and feedback mechanisms in biogeochemical cycles (C, N, water);
- Major environmental challenges (water resources, agriculture, soil degradation, Climate change;
- Sustainability science;

Outcomes

Understanding the processes that govern the flow of contaminants/nutrients through various environmental media, application of climate science, soil science, water chemistry and hydrology in addressing the issues related to water resources management, applying the multidisciplinary approach to address the issue of resource sustainability.

Textbooks

- Biogeochemistry: An Analysis of Global Change. William H. Schlesinger. Academic Press. (2e)
- Chemistry for environmental engineering and science. Sawyer, McCarty and Parkin (5e, Tata McGraw-Hill
- Surface Water Quality Modeling. Stephen C. Chapra. Waveland Press, Inc.
- Principles and Dynamics of the Critical Zone. John Giardino Chris Houser (Eds.) (1e, Elsevier Science)

Grading pattern:

- Class participation : 10%
- Assignments: 30%
- Labs : 20%
- Quizzes : 10%
- Final examination: 30%

Course schedule

Date	DoW	Time	Lecture	Instructor	Readings
12-Aug-2019	Mon	**HOLIDAY**			
13-Aug-2019	Tue	1200-1250	** Competency Test	Madhavi	(optional)
14-Aug-2019	Wed	1100-1150	Introduction to the course, earth as a biogeochemical system	JK	
14-Aug-2019	Wed	1400-1450	Toposheet reading	JK/SB	Lab 1
19-Aug-2019	Mon	1100-1150	Biogeochemical cycles and thermodynamic principles	JK	
21-Aug-2019	Wed	1100-1150	Introduction to composition, evolution and processes of the atmosphere, lithosphere and biosphere	JK	
21-Aug-2019	Wed	1400-1650	Catchment delineation	JK/SB	Lab 2
21-Aug-2019	Mon	1100-1150	Carbon cycle 1	JK	
26-Aug-2019	Mon	1100-1150	Carbon cycle 2	JK	
28-Aug-2019	Wed	1400-1650	STELLA - modeling stocks and flows	SB/VS	Lab 3
28-Aug-2019	Wed	1100-1150	Understanding stocks, flows and feedbacks	VS	
02-Sep-2019	Mon	**HOLIDAY**			
04-Sep-2019	Wed	1100-1150	Water - land surface processes	SB	
04-Sep-2019	Wed	1400-1650	Above ground carbon estimation	SB/JK/NC?	Lab 4
09-Sep-2019	Mon	1100-1150	Chemical kinetics	NC	
11-Sep-2019	Wed	1100-1150	Soil properties and processes	NC	
11-Sep-2019	Wed	1400-1650	Soil properties and water content lab	JK/NC	Lab 5
16-Sep-2019	Mon	1100-1150	Soil erosion and sediment transport	NC	
18-Sep-2019	Wed	1100-1150	Hydrological cycle - overview (assignment 1: BGC and Carbon cycle)	JK	Assignment - 1
18-Sep-2019	Wed	1400-1650	Tank water balance exercise	VS/SB	Lab 6
23-Sep-2019	Mon	1100-1150	Groundwater	VS/SB	
25-Sep-2019	Wed	1100-1150	Catchment hydrology	SB	
25-Sep-2019	Wed	1400-1650	Water quality lab 1: sample collection	PJ	Lab 7A
30-Sep-2019	Mon	1100-1150	Nitrogen Cycle	PJ	
02-Oct-2019	Wed	**GANDHI JAYANTI**			
07-Oct-2019	Mon	**HOLIDAY**			
09-Oct-2019	Wed	1100-1150	The physics and chemistry of air and water pollution	PJ	
09-Oct-2019	Wed	1400-1650	Water quality lab: Analysis	PJ	Lab 7B
14-Oct-2019	Mon	1100-1150	QUIZ-1	PJ	
16-Oct-2019	Wed	1100-1150	The physics and chemistry of air and water pollution (Lecture assignment 2: Carbon and Water Cycle)	PJ	Assignment - 2
16-Oct-2019	Wed	1400-1650	Water Quality Analysis - BOD/DO Analysis, BOD Curve (Lab 8)	PJ	Lab 8
21-Oct-2019	Mon	1100-1150	Overview of water and wastewater treatment	PJ	
23-Oct-2019	Wed	1100-1150	Water quality modelling	PJ	Assignment - 3
23-Oct-2019	Wed	1400-1650	Stream discharge and pollutant flux measurement field trip	PJ	Field 1
28-Oct-2019	Mon	1100-1150	Physics of climate-land-ocean-atmosphere linkages	JK	
30-Oct-2019	Wed	1100-1150	Physics of climate and climate change	JK	
30-Oct-2019	Wed	1400-1650	Documentary screening and discussion	PJ?	Screening 1
04-Nov-2019	Mon	1100-1150	QUIZ-2		
05-Nov-2019	Tue	1200-1250	**TBD**	**TBD**	Guest lecturer?
06-Nov-2019	Wed	1100-1150	Pollution and human health 1 - links and risk assessment	PJ	
06-Nov-2019	Wed	1400-1650	Field visit (Byranmangala)	PJ	Field 2
11-Nov-2019	Mon	1100-1150	Pollution and human health 2 - links and risk assessment	PJ	
12-Nov-2019	Tue	1200-1250	Pollution and human health - links and risk assessment (Lecture assignment 4: Pollution, Health and CC)	PJ	Assignment - 4
13-Nov-2019	Wed	1100-1150	Sustainability in Agriculture - food production and security 1	SB	
13-Nov-2019	Wed	1400-1650	Documentary screening and discussion	SB	Screening 2

15-Nov-2019	Fri	1100-1150	Sustainability in Agriculture - food production and security 2	SB	
18-Nov-2019	Mon	1100-1150	Water resources sustainability - allocation, conflict, use, sustainability	VS	
19-Nov-2019	Tue	1200-1250	Water resources sustainability - allocation, conflict, use, sustainability (Lecture assignment 5: Ag and water security)	VS	Assignment - 5
20-Nov-2019	Wed	1100-1150	Forest Ecosystem: production and sustainability	SL	Guest lecturer?
20-Nov-2019	Wed	1400-1650	Water and carbon foot-print lab	VS	Lab 9
22-Nov-2019	Fri	1100-1150	Climate change impacts on humans	SL	Guest lecturer?
27-Nov-2019	Wed	1400-1650	Lab Viva	Lab	Lab Exam
28-Nov-2019		1000-1200	Final examination		

* Lab classes may involve actual laboratory sessions, field visits or media screening sessions.