Indian Institute of Technology, Kanpur

Proposal for a New Course

1. Course number: CE 7XX 719

2. Course title: Hydrometeorology

3. Per week: Lectures – 3(L), Tutorial – 0(T), Laboratory – 0(P), Additional hours: 0(A)

Credits: 3-0-0-0 (9)

Duration of course: Full semester

4. Proposing department/IDP: Civil Engineering

Other Departments/IDPs which may be interested in the proposed course: Earth Sciences, School of Sustainability

Other faculty members interested in teaching the proposed course: None

5. Proposing instructor: Tushar Apurv

6. Course description: PG course/department elective

A. Objectives

The objective of this course is to provide a conceptual understanding of the physical processes involved in the transfer of water and energy between the land surface and the lower atmosphere. The course will focus on fundamental concepts such as laws of thermodynamics and mass, momentum, and energy conservation principles to explain hydrometeorological processes such as rainfall, cloud formation, evapotranspiration, winds and development of pressure systems. The understanding of these processes will further be applied to explain hydrometeorological phenomena such as extreme rainfall, thunderstorms, floods, droughts and heatwaves.

B. Contents

S. No.	Broad title	Topics	No. of lectures
1.	Introduction	Overview of the field of hydrometeorology and its applications	1
2.	Water vapor and its properties	Specific humidity, saturation vapor pressure, dew point temperature, wet and dry bulb temperature, relative humidity, adiabatic lapse rate of moist air	2
3.	Precipitation	Thermodynamic diagrams, lifting of dry and saturated air, static and dynamic stability, parcel method for stability analysis, cloud formation and precipitation, types of storms	4
4.	Weather maps	Symbols used in weather maps and their interpretation	2
5.	Atmospheric forces and winds	Forces acting on air: pressure gradients, centrifugal force, Coriolis force, drag force, equations of motion, types of winds: geostrophic winds, gradient winds,	6

		atmospheric boundary layer wind, cyclostrophic winds	
6.	General circulation	Global radiation budget, Hadley cells, thermal winds, circulation in low-, mid- and high-latitudes, monsoon, jet streams, Rossby waves	6
7.	Fronts and airmasses	Warm and cold air masses, surface fronts, occluded fronts, mid-tropospheric fronts, upper-tropospheric fronts, extratropical cyclones	6
8.	Thunderstorms	Conditions for thunderstorm formation, Convective Available Potential Energy, wind shear, convective inhibition and triggers	5
9.	Atmospheric boundary layer	Temperature and wind profiles, diurnal variations, turbulence, mixing length theory	3
10.	Evapotranspiration	Surface layer scaling, aerodynamic resistance, canopy resistance, estimation of evapotranspiration	5
Total			**40**

C. Pre-requisites: (CE361 and CE261) or (CE610 and CE611)

D. Short summary for including in the Courses of Study Booklet: Energy and water budget of land surface and lower atmosphere, properties of water vapor, atmospheric stability, cloud formation and precipitation, weather maps, atmospheric forces, geostrophic winds, gradient winds, general circulation of atmosphere, monsoons, jet-streams, Rossby waves, warm and cold fronts, thunderstorms, atmospheric boundary layer, aerodynamic and canopy resistance, evapotranspiration.

7. Recommended books:

Reference books:

Ahrens, C. D., & Henson, R. (2018). Essentials of meteorology: An invitation to the atmosphere.

Stull, R. B. (2015). Practical meteorology: an algebra-based survey of atmospheric science. University of British Columbia.

Shuttleworth, W. J. (2012). Terrestrial hydrometeorology. John Wiley & Sons.

8. Any other remarks: none

Proposer: Tushar Apurv
Dated: 05-04-2024

DPGC convener:
Dated:

The course is approved/not approved.
Chairperson, SPGC
Dated:

CE

Scan/532
06/06/24

INDIAN INSTITUTE OF TECHNOLOGY KANPUR
POSTGRADUATE OFFICE

No. A(P)/IITK/course approval/
June 5, 2024

The Convener, DPGC
Departments of CE/SEE/PHY
IIT Kanpur

I am directed to communicate the concurrence of the SPGC (2023-24) in its 9th meeting held on 28/05/2024 for the approval of new PG course proposal. After detailed discussion the following courses were approved.

Course No	Title	Credits	Instructor	SPGC /Decision
CE716	Project Management and Control	3-0-0-0-9	Dr. Chirag Kothari	Approved
CE718	Water resources systems analysis	3-0-0-0-9	Dr. Tushar Apurv	Approved
CE719	Hydrometeorology	3-0-0-0-9	Dr. Tushar Apurv	Approved
SEE631	Sustainable Forest Management	3-0-0-0-9	Dr. Ashish Garg	Approved
PHY685	Introduction To Quantum Field Theory	3-0-0-0-11	Dr. Arjun Bagchi	Approved

Joint Registrar
Academic Affairs

CC: OARS (DOAA Office) For necessary action

MINUTES
FOR THE 9th MEETING OF THE SENATE POSTGRADUATE COMMITTEE (2023-24) TO BE HELD ON May 28, 2024 (TUESDAY) AT 02:00P.M.
DOAA CONFERENCE ROOM (208), ACADEMIC AFFAIRS BUILDING

Members present:

Prof(s): P M Mohite (AE), Vishal Agarwal (CHE), Chinmoy Koley (CE), Ark Verma (CGS), Abheejeet Mohapatra (EE), T H Syed (ES), Feroz Hassan (HSS), Amit Shukla (DoMS), Santanu De (ME), Niraj Chawake in place of Sudhanshu S Singh (MSE), Subhajit Dutta (MATH), Laltu Chandra (SEE), Sagar Chakrabarty (PHY), Sharvari Nadkarni Ghosh (SPASE), Piyush Rai (CSE).

Members Absent: Prof(s), Suresh Kumar (BSBE), Ashis Kumar Patra (CHM), J Ramkumar (DES), Shilpi Gupta (PSE), Vasudha Jain (ECO), Sri Sivakumar (MSP), Pankaj Wahi (NET)

Student representative:

Parthadhwaj Konduparty (22106009), Shivam Nigam (19112264), Harsha Prasad (21106270), Kartik Rout(20218267),

Item requiring SPGC Approval:

a) **Conversion from MSR/MTech to PhD Program:**

S.No	Roll No	Name	Dept	Prog	Supervisor and DPGC Recommendation	SPGC Recommendation/Decision
01-	22101403	Anil S Karthik	AE	MSR	Recommended	Approved to be reported to Senate
02-	22104065	Nilesh Pandey	EE	MTech	Recommended	Approved to be reported to Senate
03-	22118003	Aditya Gautam	BSBE	MTech	Recommended	Approved to be reported to Senate
04-	22101058	Sai Rohith Thaviti	AE	MTech	Recommended	Approved to be reported to Senate

*Students has completed course and CPI requirement as per clause 4.6 of PG Manual

b) **New course approval:-**

Course No	Title	Credits	Instructor	SPGC /Decision
CE716	Project Management and Control	3-0-0-0-9	Dr. Chirag Kothari	Approved
CE718	Water resources systems analysis	3-0-0-0-9	Dr. Tushar Apurv	Approved
CE719	Hydrometeorology	3-0-0-0-9	Dr. Tushar Apurv	Approved
SEE631	Sustainable Forest Management	3-0-0-0-9	Dr. Ashish Garg	Approved
PHY685	Introduction To Quantum Field Theory	3-0-0-0-11	Dr. Arjun Bagchi	Approved

Items requiring SPGC recommendation for Senate considerations:

a) **Conversion Programme Full Time to Part Time-recommended**

S.No	Roll No	Name	Dept	Prog	Supervisor and DPGC Recommendation	SPGC Recommendation /Decision
1	20227263	Soumyajit Bhunia	ECO	PhD	Recommended	Recommended
2	19104275	Rahul Bapusaheb Kodag	EE	PhD	Recommended	Recommended
3	17214263	Sanjeev Newar	DoMS	PhD	Recommended	Recommended subject to submission of a proper thesis plan by student, duly approved by the thesis supervisor and DPGC

Abheejeet Mohapatra 31/5/24