

Global Initiative of Academic Network

Course Title: Numerical Modeling of Air Pollution through State-of- the-Art Modeling Systems

Broad Area: Earth & Environment Sciences (Air Quality)

Overview :

Air pollution is an emerging serious issue in India. The World Health Organization has recently ranked several cities in India including the capital city New Delhi to be amongst the worst polluted cities in the world. Numerical models have played a significant role in the U.S. to manage air pollution, and have led to a significant improvement in ambient air quality to protect public health since the 1970's, despite making rapid strides in economic growth. This course will present an overview of the typical air quality management cycle followed in the U.S., the different components involved and how it might apply for India. It will provide the students with an understanding of the atmospheric processes involved in air pollution, and the use of numerical modeling tools to quantify and manage air pollution. The course will provide a basic introduction to the air quality management cycle and then expand in detail on the combined tools meteorological, emissions and air quality models used to study regional to local scales of air pollution.

Objectives:

The objectives of this course are to:

- Provide the students with a basic understanding of the atmospheric processes involved in air pollution, the air quality management approach, and the tools used as part of that process to study and address air pollution.
- Provide an introduction to and hands on experience using a widely used regional scale air quality model. Students will learn how to set up, create inputs and perform regional scale simulations of gas phase and aerosol species for a multi scale modeling domain.

Course details:

Numerical Modeling of Air Pollution through State-of- the-Art Modeling Systems

28/11/2016 Monday

Lecture 1: 9.30 AM to 11.00AM

Introduction and Course Objectives Overview of Air Pollution and Atmospheric Chemistry, Air pollutants, Sources and transformation, Ozone photochemistry, PM chemistry, Physical and chemical processes

Lecture 2: 11.45 AM to 1.15AN

Overview of Air Quality Management (AQM) using Models and Measurements, Air quality management process

Lecture 3: 2.00PM to 4.00PM

Components of AQM, Accountability and review

29/11/2016 Tuesday

Lecture 4: 9.30 AM to 11.00AM

Meteorological modeling using the Weather Research Forecast (WRF) model and Emissions modeling using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system

Lecture 5: 11.45 AM to 1.15AN

Introduction to C-TOOLS, community-scale tools for modeling near- source impacts of air pollution, from roadway sources

Tutorial 1: 2.00PM to 4.00PM

Hands- on lab for applying C-TOOLS to stucy traffic-related air pollution in large citys

30/11/2016 Wednesday

Lecture 6: 9.30 AM to 11.00AM

CMAQ Overview, Introduction to Hands on Lab, Prepare meteorological inputs

Lecture 7: 11.45 AM to 1.15AN

Preparing Initial and Boundary Conditions- CMAQ

Tutorial 2: 2.00PM to 4.00PM

Excersises-Preparing Initial and Boundary Conditions-CMAQ

01/12/2016 Thursday

Lecture 8: 9.30 AM to 11.00AM

Discussion about the modeling errors and trouble shooting problems

Lecture 9: 11.45 AM to 1.15AN

Hands on Nesting lab; and Multiday/Restart lab

Tutorial 3: 2.00PM to 4.00PM

Hands on CCTM lab

02/12/2016 Friday

Lecture 10: 9.30 AM to 11.00AM

Air Quality Management using data from models and measurements, Design value concept and analysis

Lecture 11: 11.45 AM to 1.15AN

Advanced CMAQ topics Lecture [Probing Tools and Model Evaluation], Accountability analysis,

Tutorial 4: 2.00PM to 4.00PM

Summary review and final discussion

Prerequisites:

Basic Knowledge of Atmospheric Chemistry

Numerical Methods

Basic knowledge of UNIX

Teaching Faculty

Dr. Arunachalam: a Research Associate Professor with the UNC Institute for the Environment and Adjunct Associate Professor at the UNC Department of Environmental Sciences and Engineering has over 20 years of experience in providing scientific and program support for regulatory emissions and air quality modeling activities. Over the past 16 years, he has served as the PI or technical

lead on several projects for various state/regional agencies (CenSARA, NESCAUM, OTC, SESARM, NC, TX, VA) as well as for various offices of the EPA (OAQPS, ORD, several Regional offices) and other Federal agencies, including DOJ, NASA, NSF, and FAA, and the National Academies' Transportation Research Board. Most of his research during this period has focused on modeling and analyses that support air quality modeling activities for regulatory policy development.

Dr. Arunachalam is an expert modeler with extensive experience in developing modeling applications for regulatory support using both existing and evolving regional air quality models (including CMAQ) for various applications both within the U.S. and around the world. He has expertise using air quality models for addressing nonattainment issues, and has assisted EPA and states in evaluating modeling guidance for regulatory applications. Since 2006 he has directed research activities for the FAA sponsored U.S. DOT's PARTNER Center of Excellence at UNC to investigate incremental impacts of aviation emissions on ambient air quality from plume through global scales using an integrated measurement and model based approach, and more recently for the U.S. DOT's Center of Excellence for Alternative Jet Fuels and the Environment (ASCENT) at UNC. His recent research interests include exploring methodologies for developing new modeling techniques for characterizing exposure estimates due to traffic emissions in the near road environment, and the use of satellite data products for model evaluation. Under sponsorship from the National Academies' Airport Cooperative Research Program (ACRP), he has developed guidance documents for using models such as CMAQ and AERMOD in performing airport related air quality assessments. Dr. Arunachalam has served as the Software Development Coordinator for UNC's Community Modeling and Analysis System (CMAS) Center since 2003, and develops and offers CMAQ and BenMAP training to an U.S. as well as worldwide audience, including countries such as Brazil, Canada, Colombia, India and South Korea. He serves as the Principal Investigator on a large multi-year multi-institution contract since 2007 that provides emissions, meteorological, and modeling support to the EPA's regulatory and research needs. Dr. Arunachalam has provided consultancy services to the U.S. DOJ, NC DOJ, and a state Public Utility Commission on air quality related issues.

Name of Faculty: Prof. Sarav Arunachalam

Affiliation: University of North Carolina at Chapel Hill

Address: Institute for the Environment, 100 Europa Drive, Suite 490, Chapel Hill,
NC 27517, USA.

001-919-966-2126

Email: sarav@email.unc.edu

Who can attend:

- Executives, engineers and researchers from manufacturing, service and government organizations including NGOs and R&D laboratories.
- Student students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.

Modules	Numerical Modeling of Air Pollution through State-of- the-Art Modeling Systems Duration: 28-11-2016 to 02-12-2016 Number of participants for the course will be limited to fifty.
You Should Attend If you are an	<ul style="list-style-type: none">• Executive, engineer and researcher from manufacturing, service and government organizations including NGOs and R&D laboratories.• Student at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.
Fees	The participation fees for taking the course is as follows: Participants from abroad(For both the modules) : US \$500 Industry/ Research Organizations: Rs. 10000/- Academic Institutions: Rs. 5000/- Students of Constituent Units of JNTUH: Rs. 1000/- SC/ST students Rs. 500/- The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility, Tea, Snacks, Lunch. The participants will be provided with accommodation on payment basis.

Course Coordinator:

Dr.V.Himabindu

Phone: 919849692838

E-mail: drvhimabindu@gmail.com

Local Coordinator:

Dr.G.Krishna Mohana Rao

919866123121

E-Mail: kmrgurram@jntuh.ac.in

For registration of GIAN portal and Course you may follow the link given below:

<http://www.gian.iitkgp.ac.in/GREGN>

Dr. V Himabindu is presently working as an Associate Professor in the center for Environment, Institute of Science and Technology, JNT University Hyderabad. She is also coordinating the center for alternative energy options. She received her doctoral degree in Chemistry in the year 1998. She published more than 100 technical papers in various national/international journals/conferences. 12 students were awarded Ph.D. degrees under her supervision and two more are continuing. She is currently working on 12 research projects funded by national

and international organizations like BARC, APPCB, DRDO, DST, UGC, SEDA- Sweden, MNRE, DBT in the areas like Pollution monitoring and control technologies, reuse and Recovery of materials from waste, Remediation of contaminated lakes, Biofuels, Carbon nano materials, Energy materials, Hydrogen production and storage etc.

Evaluation and Grading

There will be evaluation at the end of each module on the understanding of the concepts by the participant made during the course. Based on the evaluations finally a letter grade will be awarded to the participant. A completion certificate shall also be issued.