Report on Short Term Training Programme

on

"ORDINARY AND PARTIAL DIFFERENTIAL EQUATION: ANALYSIS AND APPLICATIONS"

(Co-sponsored by TEQIP II), 27-31 May, 2014

1. Title of the course: ORDINARY AND PARTIAL DIFFERENTIAL EQUATION: ANALYSIS AND APPLICATIONS

2. Department: Mathematics & Computer Applications

3. Details of the programme: This course was intended for beginners and those looking for research and development. During the above mentioned five days, intensive training was imparted in different application of ODE and PDE using Mathematica and MATLAB with lectures, laboratory experiences and software exposures.

Day wise report is as follows:

Day 1: The course started with formal inauguration ceremony. The faculties from NIT, Allahabad, ISM Dhandbad and from MANIT, Bhopal delivered lectures on the following topics,

- Introduction of Partial and Differential Equation
- Introduction of FDM
- Application of ODE and PDE using Mathematica
- Introduction of MATLAB Programming

On day 1 participants were introduced to Mathematica & MATLAB software and were taught of basics programming. Laboratory experience on Application of Mathematics & MATLAB programming were also done to make the participant acquainted with programming.

Day 2: The faculties from NIT, Allahabad, ISM Dhandbad and from MANIT, Bhopal delivered lectures on the following topics,

- Introduction and Application of FVM , FEM
- Different application and programming in Mathematica
- Higher level MATLAB Programming and its application in real world problems

On day 2 participants were introduced to broad area of FVM & FEM and its application. Different application approaches to solve real world problem using Mathematica and MATLAB. Laboratory experience on Mathematica and MATLAB were done to make the participant acquainted with mathematical modeling.

Day 3: The faculties from Banasthali University Jaipur and NITTTR Bhopal delivered lectures on the following topics,

- Mathematical Modeling using Mathematica
- Modeling and Simulation using MATLAB
- FEM

On day 3 participants were introduced to mathematical modeling on biological problem using Mathematica, Modeling and Simulation using MATLAB and FEM. Discussions were made regarding the advantages and capabilities of ODE & PDE to analyze biological problems. Participants were taught to write ODE & PDE programme in Mathematica & MATLAB. Modeling and Simulation and FEM were also discussed in various engineering applications. Laboratory experience on Mathematica & MATLAB with respect to example were also done to make the participant acquainted with programming.

On Day 4: The faculties from MANIT, Bhopal delivered lectures on the following topics,

- A Family of 3rd & 4th order iterative method for solving non-linear equation
- Application of Finite Element in Mechanical Engineering
- Mathematical Modeling of Green House Dryer
- Ordinary and partial differential equation implemented in RTI & Corruption

On day 4 participants were taught with methods to solve linear equations, different application of finite element in mechanical engineering, mathematical modeling of green house dryer and finally implementation of ordinary and partial differential equation in RTI & Corruption.

On Day 5: The faculties from South Asian University, New Delhi and MANIT, Bhopal delivered lectures on the following topics, i.e.

- Numerical Methods for solving differential equations
- Weak Formulation of Boundary value problems

On day 5 participants were taught with the numerical methods for solving differential equations and weak formulation of boundary value problems.

The course formally ends with valedictory function and distribution of certificates. Participants gave their valuable feedbacks which includes the organizing of more workshops like this in future.

4. Experts/Guest lecture: Internal faculties of NIT Allahabad, ISM Dhandbad, Banasthali University Jaipur, MANIT and NITTTR, Bhopal /30 Lectures.

5. No. of participants and their places: “42” participants from , Mathura (Uttar Pradesh), Nagpur, Kopali ,Wardha (Maharashtra), Ahmadabad (Gujarat), Krukshetra (Haryana), Bilaspur (Chattisgarh), Rewa (Madhya Pradesh), Bhopal (Madhya Pradesh)

6. Photos: Attached

7. Course Coordinators:

- Dr. Usha Chouhan
- Dr. J.P. Jaiswal

GALLERY


Maulana Azad National Institute of Technology
Bhopal, M.P.
Short Term Training Programme
on
Ordinary and Partial Differential Equation: Analysis & Applications
(Co-sponsored by TEQIP-II)
May 27 - 31, 2014
Organised by :
Department of Mathematics & Computer Applications

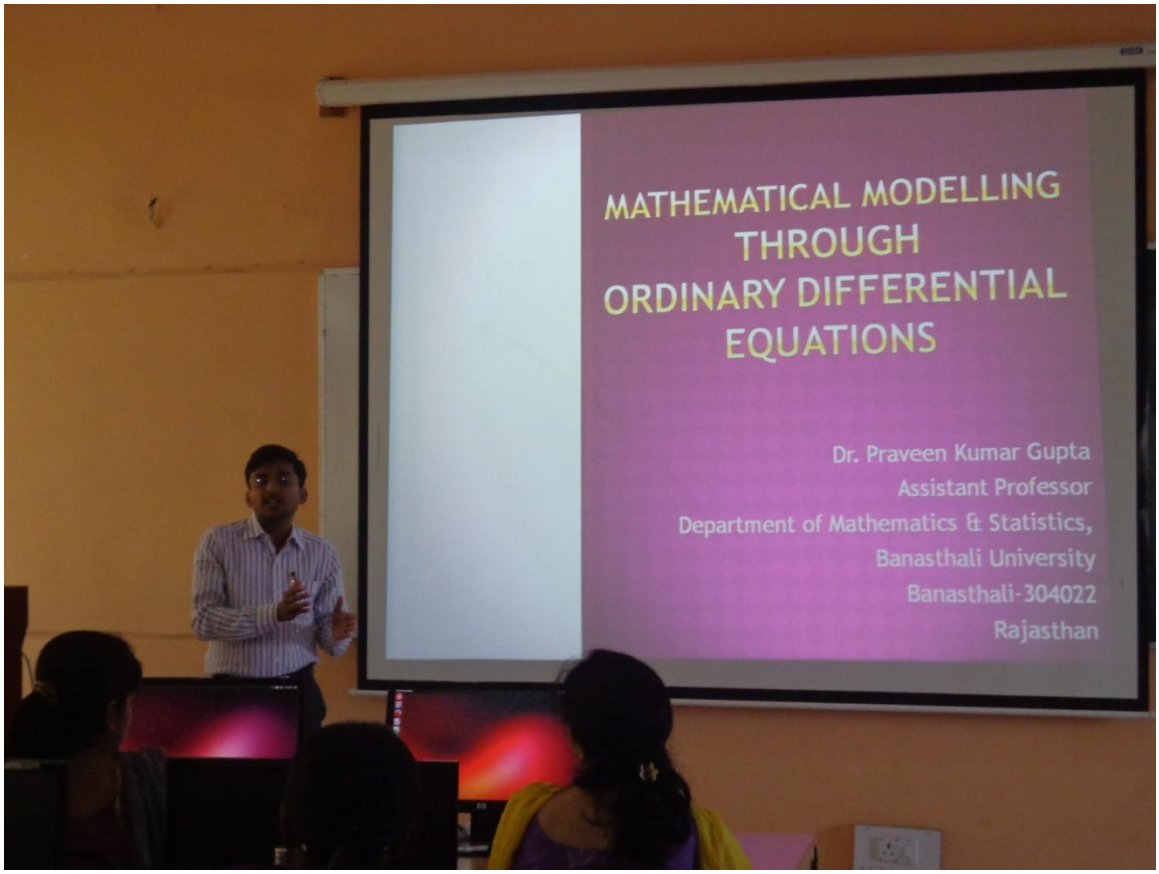





FDM (continued)
• Suppose U is function of two variable t and x, we use Taylor's formula and formulate:
• First order forward difference approximation:
$U_x(t_i, x_i) \approx \frac{U(t_i, x_{i+1}) - U(t_i, x_i)}{\Delta x}$
• First order backward difference approximation:
$U_x(t_i, x_i) \approx \frac{U(t_i, x_i) - U(t_i, x_{i-1})}{\Delta x}$
• Second order central difference approximation:
$U_{xx}(t_i, x_i) \approx \frac{U(t_i, x_{i+1}) - 2U(t_i, x_i) + U(t_i, x_{i-1})}{(\Delta x)^2}$



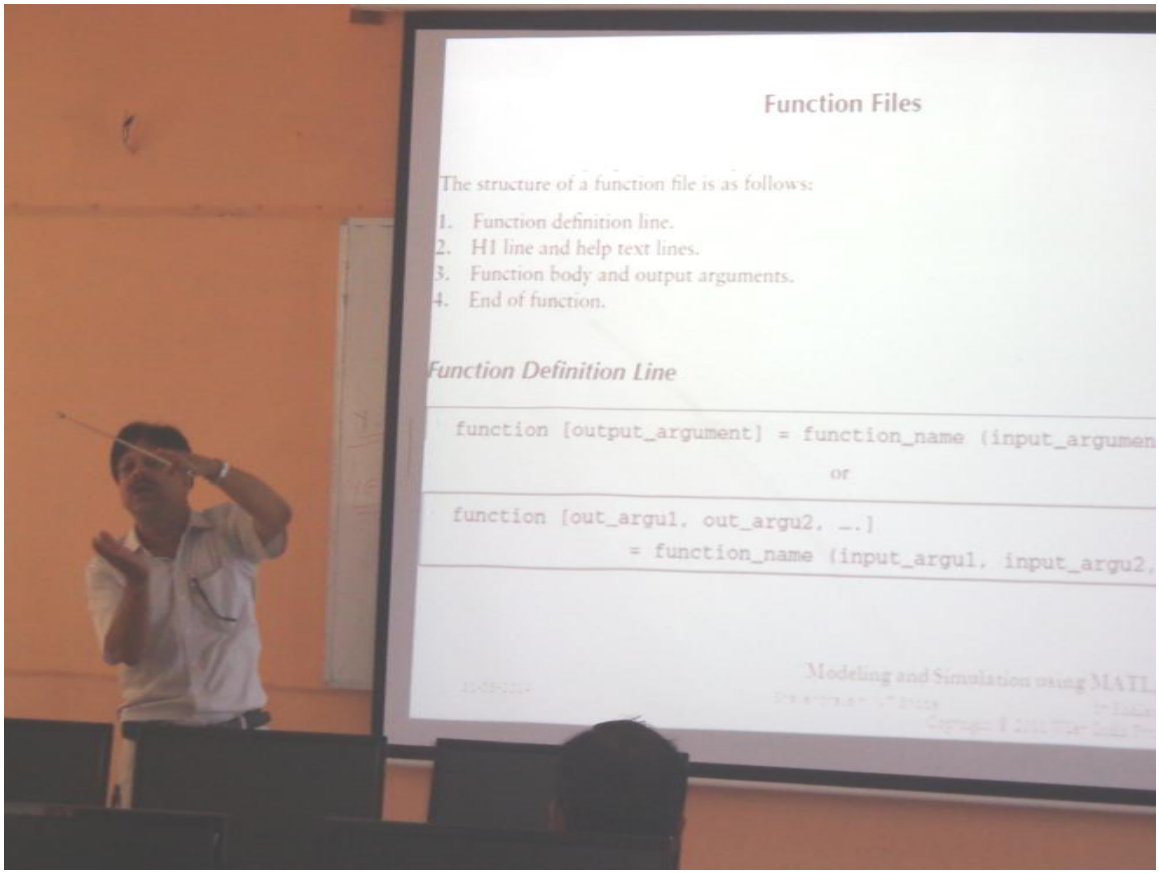

MATLAB PROGRAMMING
By
Sujoy Das

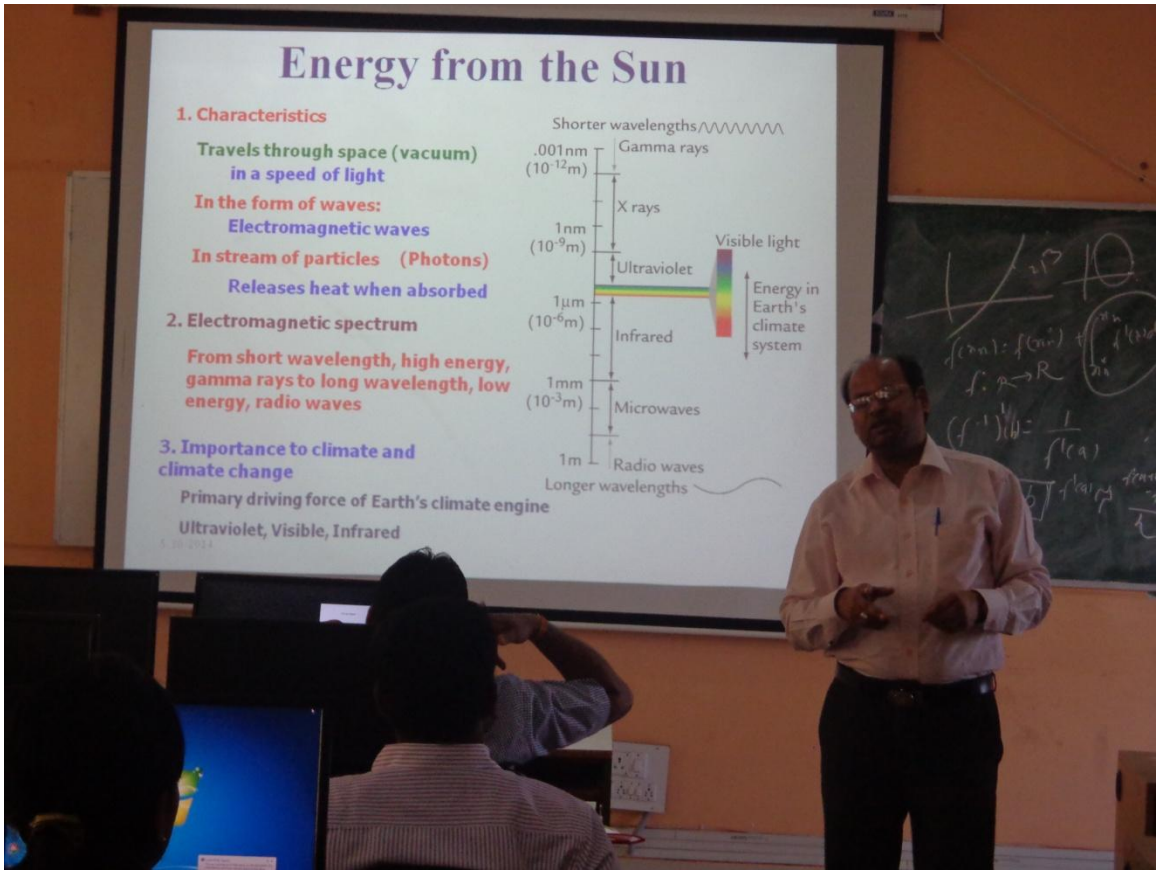

MATHEMATICAL MODELLING
THROUGH
ORDINARY DIFFERENTIAL
EQUATIONS
Dr. Praveen Kumar Gupta
Assistant Professor
Department of Mathematics & Statistics,
Banasthali University
Banasthali-304022
Rajasthan




A Family of Third-and Fourth-Order Iterative Methods for Solving Nonlinear Equations
Dr. J. P. Jaiswal
Department of Mathematics
MANIT, Bhopal
May 30, 2014




Function Files
The structure of a function file is as follows:
1. Function definition line.
2. H1 line and help text lines.
3. Function body and output arguments.
4. End of function.
Function Definition Line
function [output_argument] = function_name (input_argumen
or
function [out_argu1, out_argu2, ...]
= function_name (input_argu1, input_argu2,
Modeling and Simulation using MATL


Energy from the Sun
1. Characteristics
Travels through space (vacuum)
in a speed of light
In the form of waves:
Electromagnetic waves
In stream of particles (Photons)
Releases heat when absorbed
2. Electromagnetic spectrum
From short wavelength, high energy, gamma rays to long wavelength, low energy, radio waves
3. Importance to climate and climate change
Primary driving force of Earth's climate engine
Ultraviolet, Visible, Infrared
Shorter wavelengths
.001nm (10-12m)
Gamma rays
X rays
1nm (10-9m)
Visible light
Ultraviolet
Energy in Earth's climate system
1μm (10-6m)
Infrared
1mm (10-3m)
Microwaves
1m
Radio waves
Longer wavelengths


Weak Formulatio
Introduction
Ka
Department of
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