THE OHIO STATE UNIVERSITY

Ohio Supercomputer Center
An OH·TECH Consortium Member

Research based online course:

"Atomic Astrophysics and Spectroscopy" with Computational workshops on SUPERSTRUCTURE and R-matrix Codes

- Prof. Sultana N. Nahar

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• Under the collaboration between Astronomy, The Ohio State University & Quid-i-Azam University - Pakistan, The Hashemite University - Jordan

June 9 - 26, 2021

Support: OSU, OSC

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- Prof. Sultana N. Nahar, Astronomy, The Ohio State University, USA

- Under the collaboration between Ohio State University
- Textbook: "Atomic Astrophysics and Spectroscopy"

-By A.K. Pradhan and S.N. Nahar (Cambridge University Press, 2011)

- Computational Facility: Ohio Supercomputer Center (OSC), USA
- Zoom, OSU, Time: 1 - 3 pm

SYLLABUS: Jun 9 - 20, 2021

Week 1 (Jun 9 - 16, 2021): *Plasma, Atomic Structure, Computational Workshop*

i) Light and Matter, Plasma Sources, Particle and Photon Distributions
ii) Atomic Structure: Hydrogenic & Non-Hydrogenic Spectra
iii) Hartee-Fock, Dirac, Breit-Pauli Approximations
iv) Computational Workshop: SUPERSTRUCTURE

Week 2 (Jun 16-22): *Radiative & Collision processes, Computational Workshop*

i) Atomic Process in Plasmas - Radiative Transitions, Electron-Impact Excitation,
ii) Photoionization, Electron-Ion Recombination, Opacity
iii) Computational Workshop: SUPERSTRUCTURE
iv) Close-Coupling Approximation and R-matrix Method
v) Computational Workshop: R-matrix

Week 3 (Jun 23-26): *X-rays, Computational Workshop*

i) Electron-Impact Excitation
ii) Diagnostic Line Ratios
iii) Application of X-ray spectroscopy: Cancer treatment,
iv) Computational Workshop: R-matrix Calculations