Graduate Evening Courses in Chemistry, Spring 2021:

BIOMATERIALS • POLYMER • INORGANIC
PHYSICAL • COMPUTATIONAL

- The Chemistry Department at Rutgers Newark (http://chemistry.rutgers.edu/) will offer Graduate Courses in Biomaterials, Polymer, Inorganic, Physical and Computational Chemistry in Spring 2021.
- **When/where:** All courses will be held remotely once a week from 6:00 PM to 9:00 PM
- Register HERE or scan the code

Biomolecular Design and Nanotechnology (26:160:591)

MONDAYS 6:00 - 9:00 PM **Taught Remotely**

Instructor: Prof. Fei Zhang FEI.ZHANG@NEWARK.RUTGERS.EDU

This course introduces the principles of biomolecular design for self-assembly of nanomaterials, focusing on nucleic acids, peptides, and proteins. Fundamental knowledge, practical applications, and state-of-the-art research topics will be reviewed. The course will begin with an overview of the structures, properties, and cellular functions of the four major classes of biomolecules. The main content of the course will focus on the development of structural nucleic acid nanotechnology, including design and modelling of programmable biomaterials, DNA computing and molecular programming, and DNA/RNA/Protein-based nanomachines and devices. Upon successful completion of this course, students will acquire the knowledge of biomolecular self-assembly, learn to use 3D graphics software, and have a holistic view of research at the interface between biochemistry, materials, computation, and nanotechnology.

Polymer Chemistry (26:160:514)

TUESDAYS 6:00 - 9:00 PM **Taught Remotely**

Instructor: Prof. Frieder Jäkle FJAEKLE@NEWARK.RUTGERS.EDU

This course provides an introduction to polymer science for chemists. Special emphasis will be given to the discussion of different synthetic methods for the preparation of polymeric materials and to the evaluation of the unique properties of polymers. Prior knowledge of polymer chemistry is not required. Several special topics of current interest such as the development of living polymerization techniques, the synthesis and assembly of polymers with defined sequence, the advent of conjugated polymers as (semi)conducting materials, and the intriguing field of inorganic and organometallic polymers will be covered in more depth.

Special Topics in Physical Chemistry (26:160:529): *"Computational & Quantum Chemistry"*

WEDNESDAYS 6:00 - 9:00 PM **Taught Remotely**

Instructor: Prof. Michele Pavanello M.PAVANELLO@NEWARK.RUTGERS.EDU

In this computational and theoretical chemistry class, students will learn how to operate the Rutgers supercomputer "Amarel" to run computational chemistry and material science applications. We will also review basic Quantum Mechanics from undergraduate PChem and go further venturing to periodic systems (Block theorem), many-electron wavefunctions (Hartree-Fock, Configuration interaction and perturbation theories) and density-functional theory (DFT). The object will be molecules and materials. The final exam will be a report on a research project agreed upon with the student's research advisor.

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Special Topics in Inorganic Chemistry (26:160:579): *"Coord. Chemistry Applied to Catalysis"*

THURSDAYS 6:00 - 9:00 PM **Taught Remotely**

Instructor: Prof. Demyan Prokopchuk DEMYAN.PROKOPCHUK@RUTGERS.EDU

This course will cover classical and modern aspects of coordination chemistry to transition metals and its impact on catalysis. Fundamental ligand design principles such as coordination number, binding mode, charge, and sterics will be presented. The coordination of different ligand classes to transition metals will be correlated with reactivity trends and catalytic activity. Students are expected to develop a rational approach in assessing the reactivity of metals/ligands using electronic structure and thermodynamic arguments. Particular emphasis will be placed on hydrogenation, small molecule activation, "non-innocent" ligands, and electrocatalysis.

Quantum Mechanics (26:160:561)

THURSDAYS 6:00 - 9:00 PM **Taught Remotely**

Instructor: Prof. Neepa Maitra NM169@NEWARK.RUTGERS.EDU

Graduate Quantum Mechanics covers fundamental concepts, techniques, and applications of quantum mechanics, including formalism, angular momentum, symmetries, semiclassical methods, and perturbation theory. The class covers the first 5 chapters of Sakurai and Napolitano's Modern Quantum Mechanics book and will review the mathematical tools needed to successfully tackle the subject. An undergraduate course in quantum mechanics, or physical chemistry 2 or equivalent, and a good background in undergraduate linear algebra, are strongly recommended as pre-requisite.