**BIONANOTECHNOLOGY CREDIT HOURS 2+1**

**LEARNING OUTCOMES:**

**Students will be able to**:

1. Know about the biomaterials, approaches and applications of nanotechnology in living systems

**COURSE CONTENTS:**

Biomaterials: 1st, 2nd and 3rd generation biomaterials: their historical overview and current directions; nanobiotechnology, nanoscience and nanotechnology; top down and bottom up approaches to analyze nanoscopic properties; nanoparticals and nanoscale materials; cellular nanoand microstructures; nanocarbon tubes, abalone shells; nanomanipulation via different types of microminipulators; nanoprobes and probe array; DNA nanotechnology and DNA-modified surfaces;applications of nanobiotechnology in living systems.

**PRACTICALS:**

1. Construction of silver nanoparticals.
2. Construction of Zinc quantum dots.
3. Study of antimicrobial activity of nanoparticles
4. Biofilm formation and bioluminous determination.
5. Quorum sensing in biofilms in the presence of nanoparticles

**RECOMMENDED BOOKS:**

1. [Greco](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Ralph+S%2E+Greco), R. S., [Prinz](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Friedrich+B%2E+Prinz), F. B., [Smith](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=R%2E+Lane+Smith), R. I. and [Prinz](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Fritz+B%2E+Prinz), F. B. 2004. Nanoscale Technology in Biological Systems,CRC Press, Boca Raton.
2. [Hormes](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Josef+Hormes), J., [Challa, S. S. R.](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Kumar+Challa+S%2E+S%2E+R%2E) K. and [Leuschner](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Carola+Leuschner), C. 2005. Nanofabrication Towards Biomedical Applications: Techniques, Tools, Applications, and Impact, John Willey and Sons, N.Y.
3. [Kelsall](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Robert+Kelsall), R., [Hamley](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Ian+W%2E+Hamley), I. W. and [Geoghegan](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Mark+Geoghegan), M., 2005. Nanoscale Science and Technology,John Willey and Sons, N.Y.
4. Kumar, N., & Kumbhat, S. 2016. Essentials in nanoscience and nanotechnology. New Jersey : Wiley
5. [Mansoori](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=G%2E+Ali+Mansoori), G. A. 2005. Principles of Nanotechnology: Molecular-Based Study of Condensed Matter in Small Systems,World Scientific Publishing Company, N.J.
6. Nanobiotechnology for sensing applications: From lab to field. (2016). Place of publication not identified: Apple Academic Press.
7. [Scherge](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Matthias+Scherge), M., [Gorb](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Stanislav+N%2E+Gorb), S. N. and [Stanislav, S. N.](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Gorb+Stanislav+S%2E+N%2E) G. 2001. Biological Micro- and Nanotribology,Springer-Verlag, N.Y.
8. [Sipper](http://search.barnesandnoble.com/booksearch/results.asp?z=y&ath=Moshe+Sipper), M. 2002. Machine Nature: The Coming Age of Bio-Inspired Computing, McGraw-Hill Companies, N.Y.

Slingerland, J. 2016. Nanotechnology. Essential Library, an imprint of Abdo Publishing.