**STEM CELL AND GENE THERAPY CREDIT HOURS 2 +1**

**LEARNING OUTCOMES**

**The students will be able to:**

1. Learn about properties of different stem cell populations, stem cell renewal and differentiation.
2. Describe the principles of underpinning stem cell and gene therapies with particular emphasis on current clinical strategies.

**COURSE CONTENTS:**

Foundations of Biomedical Sciences, Understanding and scientific basis of Molecular Aspects of Cell and Gene Therapy, Biology of stem cells and gene delivery and the scientific basis of cell and gene therapy, Causes and genetic basis of diseases that can be treated by stem cells and gene therapy. Techniques and methods involved in the research and application of cell and gene therapy such as basic aspects of Aseptic technique, Cell culture, Cytometric analysis and sorting, Immunocytochemistry, fluorescence and confocal microscopy. Understanding of the basic mechanisms of development, Model organisms, Embryology, Cell fate determination, Differentiation, Pattern formation, Polarity, Cell migration, and cell interactions. Engineering approaches to cell-related phenomena important to cell/tissue engineering, Receptor/ligand binding. Trafficking/signaling processes. Application to cell proliferation, adhesion and motility.Cell-matrix interactions. An awareness of ethical and regulatory aspects, historical, current and future clinical trials of cell and gene therapy.

**PRACTICALS:**

1. Laboratory Methods in Biomedical Science
2. Critical review and evaluation of scientific literature.
3. Formulate, design, execute and appraise a research plan.
4. Analysis of research results and data.
5. Students attend Stem Cell research Institute/conference/workshop/ online presentations. Critical analysis and written summaries of the conferences and oral presentation.

**RECOMMENDED BOOKS:**

1. [Barranger](http://r1.us.rmi.yahoo.com/rmi/http:/shop.barnesandnoble.com/booksearch/results.asp/rmivars?target=_top?userid=5GSYPRKEDD&mscssid=Q0CPA1W7PCP48LLFA60VG66MN7V3ER2D&sourceid=00033868505138550046&bfdate=03%2D04%2D2002+02%3A17%3A46&author_last=Barranger&author_first=John+A%2E&match=exact&options=and), J. A. and [Strauss](http://r1.us.rmi.yahoo.com/rmi/http:/shop.barnesandnoble.com/booksearch/results.asp/rmivars?target=_top?userid=5GSYPRKEDD&mscssid=Q0CPA1W7PCP48LLFA60VG66MN7V3ER2D&sourceid=00033868505138550046&bfdate=03%2D04%2D2002+02%3A17%3A46&author_last=Strauss&author_first=Michael&match=exact&options=and), M., 1997. Concepts in Gene Therapy, Walter de Gruyter, N.Y.
2. [Burdette](http://r1.us.rmi.yahoo.com/rmi/http:/shop.barnesandnoble.com/booksearch/results.asp/rmivars?target=_top?userid=5GSYPRKEDD&mscssid=Q0CPA1W7PCP48LLFA60VG66MN7V3ER2D&sourceid=00033868505138550046&bfdate=03%2D04%2D2002+02%3A17%3A46&author_last=Burdette&author_first=Walter+J%2E&match=exact&options=and), W. J. 2001. Basis for Gene Therapy, Charles C Thomas Publisher Limited, I.L.
3. Curiel, D. T. and Douglas, J. T. 2002. [Adenoviral Vectors for Gene Therapy](http://www.apcatalog.com/cgi-bin/AP?ISBN=0121995046&LOCATION=US&FORM=FORM2), Academic Press Inc., U.S.A.
4. Curiel, D. T. and Douglas, J. T., 2004. Cancer Gene Therapy. Humana Press.
5. Lanza, R. and Atala, A., 2014. Essentials of Stem Cell biology. 3rd Edition. Elsevier.
6. Marshak, D. R., Gardner, R. L. and Gottleb, D., 2001. Stem Cell Biology. Cold Springer Harbor New York.
7. Templeton, N. S. and Lasic, D.D., 2000. Gene Therapy: Therapeutics Mechanisms and Strategies. Marcel Dekker, Inc.
8. Templeton, N.S., 2015. Gene and Cell Therapy: Therapeutic Mechanisms and Strategies. 4th Edition. CRC Press.
9. [Vile](http://r1.us.rmi.yahoo.com/rmi/http:/shop.barnesandnoble.com/booksearch/results.asp/rmivars?target=_top?userid=5GSYPRKEDD&mscssid=Q0CPA1W7PCP48LLFA60VG66MN7V3ER2D&sourceid=00033868505138550046&bfdate=03%2D04%2D2002+02%3A17%3A46&author_last=Vile&author_first=R%2E+G%2E&match=exact&options=and), R. G. and [Lemoine](http://r1.us.rmi.yahoo.com/rmi/http:/shop.barnesandnoble.com/booksearch/results.asp/rmivars?target=_top?userid=5GSYPRKEDD&mscssid=Q0CPA1W7PCP48LLFA60VG66MN7V3ER2D&sourceid=00033868505138550046&bfdate=03%2D04%2D2002+02%3A17%3A46&author_last=Lemoine&author_first=Nicholas+R%2E&match=exact&options=and), N. R. 2002. Understanding Gene Therapy, Springer-Verlag, N.Y.
10. Turksen, K. 2016. Embryonic stem cell protocols. Humana Press. New York

Cathomen, T., Hirsch, M., &Porteus, M. H. 2016. Genome editing: The next step in gene therapy.Springer.