

# MS IN BIOTECHNOLOGY WITH SPECIALIZATION IN STEM CELL BIOLOGY (MSBOCC)

2 years, full-time and residential



## FOCUS AREAS

- ▶ Molecular Biology
- ▶ Recombinant DNA technology
- ▶ Recombinant protein expression
- ▶ Genomics and proteomics
- ▶ Systems biology

With the discovery and development of new techniques in Genomics and Proteomics, it is now possible to do the gene and protein expression profiling of healthy versus diseased cells or tissues. It is predicted that in 10-15 years time, we may have a patient specific molecular medicine regimen after looking at the gene and protein expression status of that patient. Besides, when we understand the molecular mechanisms of disease development it is possible to design a small molecule drug which specifically inhibits the disease or cancer causing proteins. The successful example of this approach is the drug Gleevec (STI571) which is a kinase inhibitor and is used in the treatment of Chronic Myeloid Leukemia.

A new field of regenerative medicine is emerging, where stem cells are being tested for potential therapy in all types of cancers, neurodegenerative disorders like Alzheimer's and Parkinson's etc. Induced Pluripotent Stem (iPS) cells have been generated from adult skin cells; these stem cells have the potential to become any type of cells from our body. That will be the future of medicine, in 10-15 years time, we may be able to produce any type of cells or tissues just by using a few of your skin cells, convert them to stem cells and replace any bad cells from our body with the new healthy cells generated by stem cell technology. Stem cells will be used for drug target discovery and development and for testing the toxicity or side effects of drugs.

The objective of this program is to provide the training in the emerging field of Stem Cell Biology and prepare the human resources that will be needed to carry out research and development work, for experiments on stem cells to discover new drugs, for supporting the medical staff in generating patient specific stems cells and tissues for therapeutic purposes. This unique program will provide the students an opportunity to work in specialized labs in government as well as private institutes and industries, for manufacturing the stem cells, in clinical research and trials after successfully completing the program. This program will expose the students to basic and applied aspects of various types of stem cells, application of stem cells, and the allied subjects like Molecular Biology and Immunology and bring them to a level of understanding, whereby they realize the importance of learning to a scientific application. To attain this goal, we will use a combined approach involving lectures, journal club discussions, oral presentations and exposure to research work in the laboratory.

## ELIGIBILITY

Bachelors or Masters Degree in Biotechnology and Bioinformatics, in any branch of Life Sciences, Medical Sciences, Pharmaceutical Sciences, Chemical Sciences, Physical Sciences, Engineering and Technology or equivalent (with minimum 55 percent marks or equivalent grades).

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## COURSE STRUCTURE

| SEMESTER             | CODE     | COURSE NAME  | CREDITS    |
|----------------------|----------|--|------------|
| <b>SEMESTER I</b>    |          |  |            |
|                      | MBOI-001 | Molecular and Cell Biology                             | 6          |
|                      | MBOI-002 | Developmental Biology                                  | 6          |
|                      | MBOI-003 | Introduction to Systems Biology                        | 6          |
|                      | MBO-001  | Overview of Stem Cells                                 | 6          |
|                      | MBOI-004 | Applications of Genomics and Proteomics                | 6          |
|                      | MBOI-005 | Immunology and Vaccines                                | 6          |
|                      | MBO-005  | Seminar  | 4          |
|                      | MIN-001  | Life Skills Development I                              | 6          |
|                      |          | <b>Total</b>   | <b>46</b>  |
| <b>SEMESTER II</b>   |          |  |            |
|                      | MBOI-006 | Computational Molecular Biology                        | 6          |
|                      | MNOI-024 | Hematopoietic Stem Cells                               | 6          |
|                      | MBOI-007 | Embryonic Stem Cells                                   | 6          |
|                      | MBOI-025 | Applications and Protocols in Embryonic Stem Cells     | 6          |
|                      | MBOI-026 | Applications and Protocols in Hematopoietic Stem Cells | 6          |
|                      | MBOI-008 | Hematopoietic Cancers                                  | 6          |
|                      | MIN-002  | Life Skills Development II                             | 6          |
|                      |          | <b>Total</b>   | <b>42</b>  |
| <b>SEMESTER III</b>  |          |  |            |
|                      | MBOP-007 | Research Project Phase I                               | 36         |
| <b>SEMESTER IV</b>   |          |  |            |
|                      | MBOP-008 | Research Project Phase II                              | 48         |
| <b>Total Credits</b> |          |  | <b>172</b> |