Biotechnology Skills Development Program

January 2015

RAJIV GANDHI CENTRE FOR BIOTECHNOLOGY

THIRUVANANTHAPURAM – 695 014

INFORMATION BROCHURE

RGCB: **P**ushing the **F**rontiers of **K**nowledge

India's engagement with biotechnology, life sciences and medicine is dynamic and constantly evolving. The Rajiv Gandhi Centre for Biotechnology (RGCB) sees itself a key player in this development process. Our research is focused on understanding disease biology and processing this knowledge for better management and therapeutics. The trademark feature of RGCB is the collaborative and interdisciplinary approach we bring to everything we do. This unique facet and the energetic atmosphere of the institute is our success, also creating by itself an ideal and fertile teaching atmosphere for graduate students and postdoctoral trainees. Over the past 10 years, the ability of RGCB in making major contributions to understanding the fundamental mechanisms of disease has been greatly improved by support for our core facilities and research by the Department of Biotechnology, Government of India. We are also unique among other research institutions in the country, working out of three campuses, one concentrating on discovery, the second, an innovation focused research facility and the third a Bio-Nest for translation of research into applications and products.

Many colleges do their best to teach students theoretical aspects of Biotechnology, and often do this with high success rates. Unfortunately such teaching institutions are not in position to procure, maintain and conduct experiments with state of the art biomedical devices and instruments which are expensive to procure, costly to maintain and not financially viable to run experiments for a large group of students. There are also major limitations such as lack of ongoing research activities, lack of funds, privately run institutes not willing to spend or a combination of all of these. This has led to an unfortunate situation where research institutions and industry get incompletely trained personnel. Ultimately therefore, large parts of the human resource effort in industry and research time in top institutes are spent for hands-on training of new recruits or research scholars.

To address this burning issue and circumvent the problem, RGCB has embarked upon an ambitious BIOTECHNOLOGY SKILLS DEVELOPMENT PROGRAM, where fresh graduates are provided with extensive hands on training on the most widely used state-of-the art research equipments. RGCB Scientists and Technical Officers will provide both theoretical and practical knowledge to graduates and post graduates enrolling in the Skill Development Program. Thus this Skill Development Program is designed as five separate modules to generate a large pool of skilled labour, with a major objective to fulfill the national mandate of generating high-quality skilled and directly employable work force in various niche areas of biotechnology, molecular diagnostics and biomedical instrumentation.

COURSE DETAILS

MODULE I

Molecular Diagnostics

Advances in molecular and cell biology have provided an understanding of the mechanisms of disease at molecular and genetic levels. This understanding can now be translated into diagnostic, prognostic, and therapeutic applications in modern medicine. Abnormal molecules not only provide a signature for the presence of a disease, but may also provide the clues for design of drugs targeting the specific abnormal function.

Course end points and skills acquired

- Defines basic terminology and describes concepts in molecular diagnostics that provide the foundation for implementing and adapting new techniques and assays.
- Summarizes nucleic acid chemistry: replication, transcription, and translation.
- Explains principles of nucleic acid isolation from blood and solid tissues.
- Extracts, purifies, quantifies and stores DNA and RNA for analysis
- Explains principles of polymerase chain reaction (PCR), reverse transcriptase PCR, and other amplification techniques and performs such assays.
- Explains principles of nucleic acid electrophoresis and hybridization including Southern and Northern blots and performs such assays.
- Reviews DNA chip technology and other advanced methods.
- Interprets results in context of other laboratory and clinical data.
- Monitors disease progress and therapeutic efficacy with molecular diagnostic techniques.
- Evaluates commercial kits and systems for molecular diagnosis.
- Compares and selects appropriate molecular diagnostic methods.
- Records and communicates molecular diagnostic results in a professional manner.
- Discusses ethical considerations of molecular test results such as privacy and discrimination.
- Understands Quality Assurance procedures and quality audit.
- Comprehends good laboratory practice and good manufacturing practice.
- Knowledge on marketing strategies and market research.

COURSE DETAILS

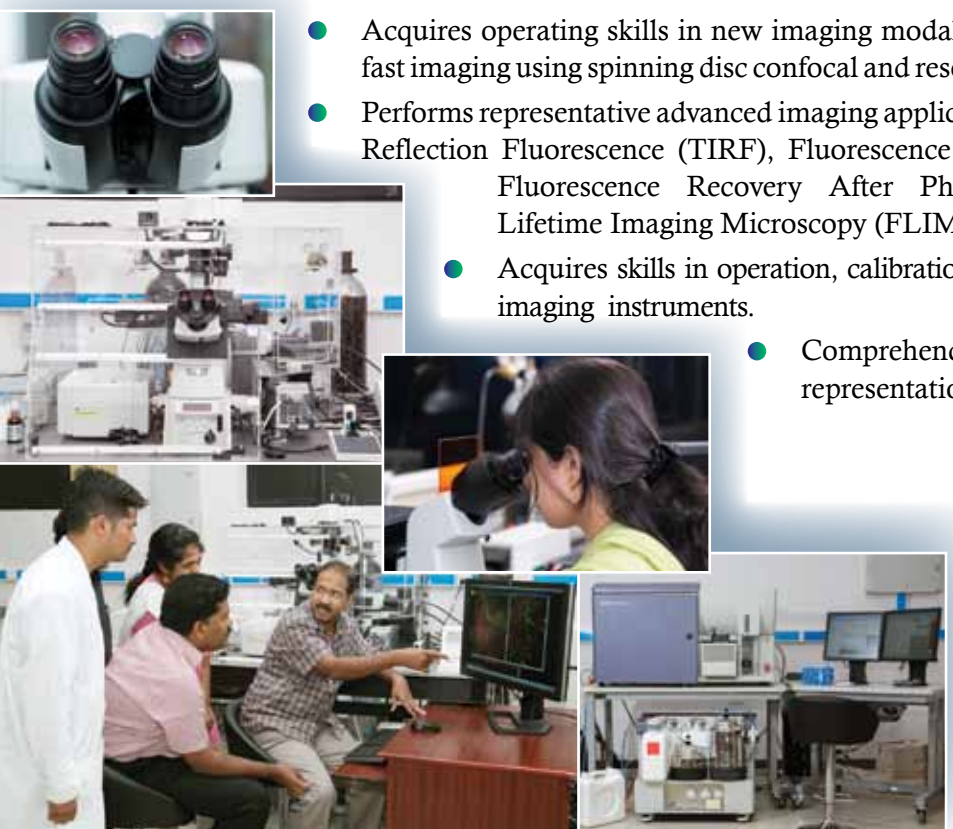
MODULE II

Bio Imaging

Microscopy and optical imaging is a fast growing field that offers diverse platforms with interdisciplinary knowledge space and wider application potential ranging from simple high resolution visualization tools to possibilities of sub cellular molecular interaction studies with high spatio-temporal resolution. The course will cover the principles of Imaging and diverse imaging platforms used in biotechnology research and diagnosis with emphasis on providing practical skills to operate diverse imaging devices. The course includes well planned lectures, laboratory exercises, demonstrations and discussions that will enable the participants to design imaging experiments, interpret microscope images, perform quantitative optical measurements, calibration and essential maintenance of state of the art imaging devices from compound microscope to super resolution microscopes and flow cytometery.

Course end points and skills acquired

- Learns the importance of imaging science, its branches and its applications in diverse areas of biotechnology, cell signalling studies, diagnostic applications, etc.
- Acquires theoretical and practical knowledge in digital and analog images, basic microscopy and its branches such as fluorescence, confocal and Electron Microscopy.
- Explains the principles of diverse commercial imaging workstations and its emerging application in research and development.
- Develop operating skills in conventional microscopy and advanced microscopes such as spinning disc confocal, Laser confocal and Electron Microscopy.
- Learn diverse approaches of sample preparation for imaging, immunocytochemistry, image analysis using softwares, data interpretation and visualization etc.
- Performs advanced imaging applications such as live cell imaging, Differential Interference Contrast imaging (DIC), cell analysis and cell sorting using flow cytometers.
- Acquires operating skills in new imaging modalities such as super resolution imaging, fast imaging using spinning disc confocal and resonance scanners with their applications.
- Performs representative advanced imaging applications in research such as Total Internal Reflection Fluorescence (TIRF), Fluorescence Resonance Energy Transfer (FRET), Fluorescence Recovery After Photobleaching (FRAP), Fluorescence Lifetime Imaging Microscopy (FLIM), Uncaging, Photo activation, etc.
- Acquires skills in operation, calibration, maintenance and trouble shooting of imaging instruments.
- Comprehends good imaging practice, data representation and interpretation.



COURSE DETAILS

MODULE III

Analytical Science

Driven by the rapid development of instrumentation, analysis methods and computation, the design, synthesis and analysis of commercially important complex organic molecules is now a routine process in industries and modern research laboratories. The course exposes students to principles of sample preparation methods, various analytical techniques and includes lectures and seminars from industry-based scientists. A thorough knowledge in these techniques can help the graduate to solve physical structure and physicochemical properties of a wide range of compounds including small molecules, complex organic molecules, oligonucleotides, peptides and proteins.

Course end points and skills acquired

- Explains principles of different analytical techniques such as UV-VIS spectroscopy, Fluorescence spectroscopy, IR spectroscopy and Mass spectrometry.
- Performs tutorial based introduction to UV-VIS, Fluorescence and IR spectroscopy.
- Performs tutorial based introduction to NMR spectroscopy techniques.
- Performs tutorial based introduction to LC-MS/MS (Tandem mass spectrometry) and MALDI-Tof/Tof mass spectrometry.
- Performs sample preparation and analysis of compounds using UV, IR NMR spectroscopy techniques.
- Perform "SDS-polyacrylamide gel electrophoresis" and examines subunit structure of a protein and its susceptibility to proteolytic degradation.
- Performs sample preparation for various Mass spectrometry techniques.
- Performs different purification techniques such as column chromatography, TLC, flash chromatography, reverse phase HPLC.
- Performs the sample analysis in LC-MS/MS and MALDI-Tof/Tof mass spectrometry.
- Performs practicals in organic synthesis and characterization of product.
- Performs interpretation of results obtained from different analysis with help of available software.

COURSE DETAILS

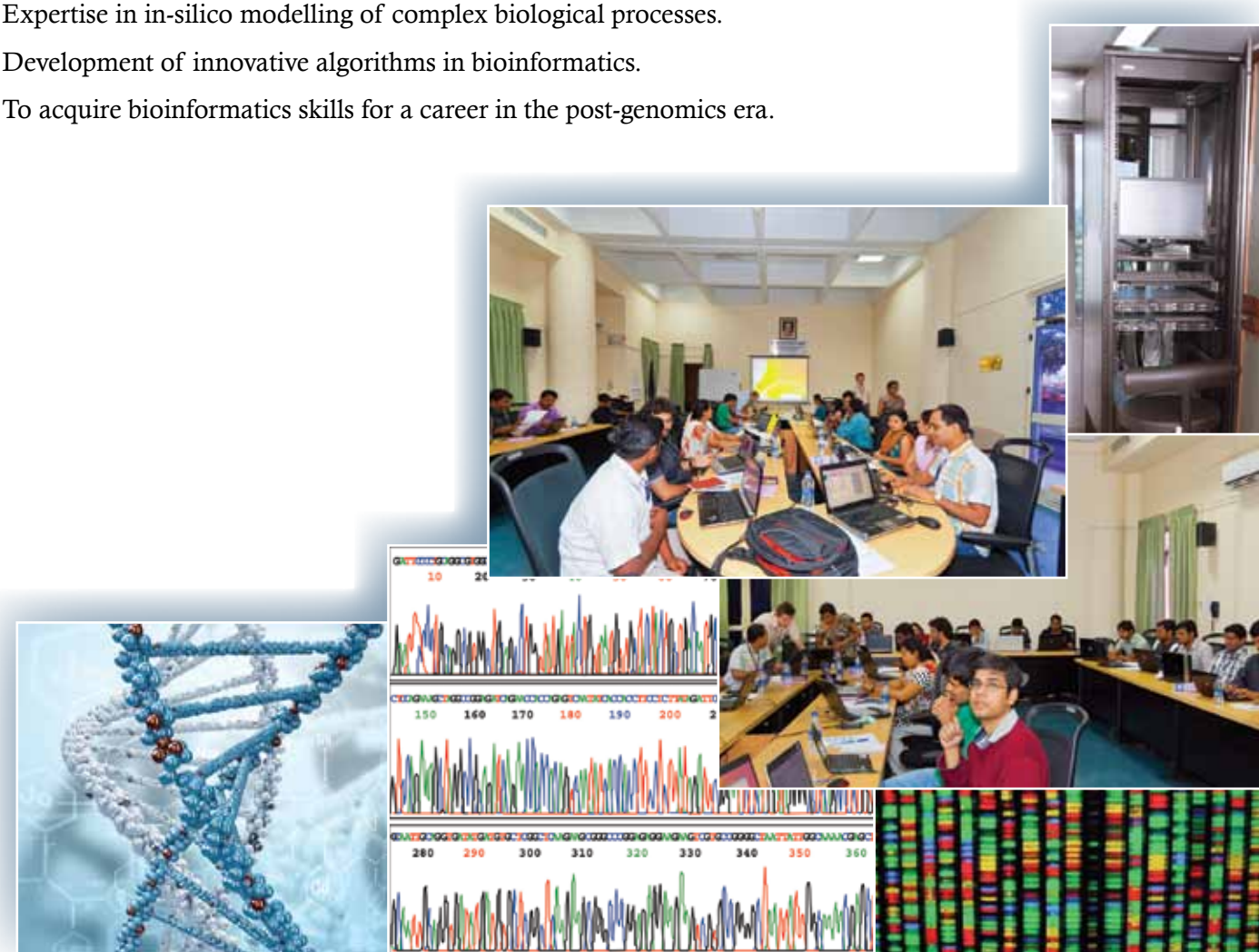
MODULE IV

Computational Biology and Bioinformatics

Modern training in biomedical sciences now requires knowledge of acquisition, management, analysis and interpretation of large biological datasets (such as the human genome) for improved understanding of complex living systems. To address this problem and train students in this important field of genomics, this module is a program that combines lectures with hands on experience in the field. This course is designed as 3 sub modules: database management systems, development and analysis of signaling pathways and genomics, proteomics & drug designing. The database and bioinformatics tools module will give exposure to management of different types of experimental data. The signalling pathway module will give exposure to different pathway resources, signalling pathway maps and their utility for therapeutic approaches. Finally, the Genomics, Proteomics & drug designing module, connected from pathways is provided as an application training program.

Course end points and skills acquired

- In-depth methodological expertise in bioinformatics/systems biology.
- Special expertise in genomics, transcriptomics, proteomics and metabolomics.
- Expertise in the development of new algorithms in high-throughput data analysis.
- Expertise in in-silico modelling of complex biological processes.
- Development of innovative algorithms in bioinformatics.
- To acquire bioinformatics skills for a career in the post-genomics era.



ADMISSION PROCEDURE

Application Form

- Candidates are required to take print out of the duly filled application form from RGCB Webpage (http://rgcb.res.in), paste a recent passport size photograph, complete and sign the form. Incomplete applications are liable to be rejected.
- Candidates should clearly mention the preferred discipline (one of four modules listed) in which they are interested to join in the application form.
- Selection will be based on written test and the top 10 candidates will be shortlisted for the program in each domain

Eligibility

1. Molecular Diagnostics :

First Class B.Tech or M.Tech in Biotechnology, MBBS or BVSc, M.Sc (Biotechnology or Life Science) or MD or MVSc from any recognised University.

2. Bio imaging :

First Class in M.Sc (Biotechnology or Life Science) or B.Tech or M.Tech (Biotechnology).

3. Analytical Science :

First Class in any branch of M.Sc Chemistry or B.Tech or M.Tech in Biotechnology or Chemical Engineering or equivalent from any recognised University.

4. Computational Biology and Bioinformatics :

First class in B.Tech / M.Sc / M.Tech degree Biotechnology, Biochemistry, Zoology, Botany, Bioinformatics, Computational Biology or any other disciplines in biology) from any recognized University.

Course Duration	:	6 months accelerated program
No. of Seats	:	10 per course
Age Limit	:	30 years
Fees	:	Rs 60,000/- (Rupees Sixty Thousand) per module, payable in full at the time of admission

RAJIV GANDHI CENTRE FOR BIOTECHNOLOGY
Thiruvananthapuram 695 014, Kerala, India.
Ph: +91 471 2341716, 2347975, Fax: +91 471 2348096, 2346333
Email: info@rgcb.res.in, Website: www.rgcb.res.in