

**RAJIV GANDHI CENTRE FOR BIOTECHNOLOGY
THIRUVANANTHAPURAM**



**AN AUTONOMOUS INSTITUTE OF THE
GOVERNMENT OF INDIA,
MINISTRY FOR SCIENCE & TECHNOLOGY,
DEPARTMENT OF BIOTECHNOLOGY**

Ph.D. Programs

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PREFACE

RGCB: Pushing the frontiers of knowledge

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.

RGCB prepares individuals who have a deep and genuine interest in discovery science to shape the translation of biotechnology through academic research towards applications for a knowledge economy, business development and science of tomorrow. Previous RGCB PhD's have all done impressive work and received excellent placements. Guided by an expert faculty, a rigorous fundamental science course work and a host of innovative academic programs, the RGCB PhD program is made even richer by its place in Thiruvananthapuram, capital of "Gods own country".



Professor M. Radhakrishna Pillai
FRCPath, PhD, FAMS, FASc, FNASc
Director

1. Eligibility for Admission to the Ph.D. Program in Biotechnology & Disease Biology

1. Candidates with a post-graduate degree in Life/Chemical/Agricultural/Environmental/Veterinary/Pharmaceutical/Medical Sciences; or with an MCI certified MBBS degree are eligible to apply.
2. Only candidates who have completed their qualifying degree in all respects will be considered.
3. Applicants with UGC/CSIR/ICMR/DBT/DST-INSPIRE/KSCSTE fellowships must have a first class at their qualifying examination.
4. Other applicants should have a minimum of 70% marks (CGPA - 7.0)
5. SC/ST candidates should have a minimum of 55% marks (CGPA-5.5) for their qualifying degree.
6. A limited number of institute stipends will be available for those selected candidates without a research fellowship. This conditional financial support will be a subsistence allowance for an initial period of two-years during which they will be strongly encouraged to seek their own fellowships from external agencies so that the PhD program continues uninterrupted.
7. Upper age limit is 28 years as on January 30, 2017. Age limit will be relaxed for SC/ST candidates as per Government of India regulations.
8. RGCB is currently affiliated to the University of Kerala, Manipal University, Mahatma Gandhi University and Kerala University of Health Sciences (KUHS). Registration of the selected candidates will be as per the guidelines issued by these Universities for award of PhD degrees.

2. Admission Procedure to the Ph.D. Program in Biotechnology & Disease Biology

Admission notification will be placed in national newspapers and put up on the institute website Applications must be submitted in the prescribed format which can be downloaded from the RGCB website (www.rgcb.res.in)

1. All eligible candidates, irrespective of their fellowship status, will have to appear for a qualifying entrance test which will be conducted at RGCB for short listing candidates for the selection interview.
2. Results of the qualifying test will be announced within one hour and selection interview for shortlisted candidates will begin on the same day.
3. Candidates selected at the interview must first successfully complete RGCB's PhD coursework for 4-6 months and will then be allowed to choose their mentor. Final allotment will be decided on mutual acceptance by student and mentor.
4. Description of the research programs, faculty, and highlights of research can be seen at the institute website www.rgcb.res.in
5. Applications can be submitted by either as a scanned copy by E-mail to phd2017@rgcb.res.in or by post to Director, Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram 695014, Kerala State, India. Last date for receiving application form

is December 31st 2016. In case of online submitted applications, the originals should be submitted at the time of interview.

6. Candidates shortlisted for written test will be informed through-E-mail only.

3. Selection procedure of Ph.D. Students to the Ph.D. Program in Biotechnology & Disease Biology

All eligible candidates, irrespective of their fellowship status, will have to appear for a qualifying entrance test which will be conducted at RGCB for short listing candidates for the selection interview.

Results of the qualifying test will be announced within one hour and selection interview for shortlisted candidates will begin on the same day.

Applicants qualifying in the written test will be interviewed by a selection committee consisting of panel of experts.

The selection committee makes an evaluation of the candidates appearing for the interview based on the following criteria. The distribution of maximum marks for each criterion is given in brackets.

- i. Knowledge in subjects of specialization (40)
- ii. General knowledge & awareness, analytical skill, logical & creative thinking (30)
- iii. Research Methodology and Instrumentation (20)
- iv. Presentation and Communication skills (10)

To be short-listed, candidates should score at least 70% marks at the selection interview.

Names of the candidates short listed for further selection procedures, based on their performance at the selection interview, will be displayed on the RGCB notice boards after completing the interview of all candidates.

The selection committee, subject to available vacancies and institutional commitments may prepare a second “wait list” of candidates. These would be candidates scoring marks between 60 and 69 at the selection interview. Such candidates may be called for further selection procedures within 45 days after first round of admission against vacancies that arise as a consequence of some candidates not joining or leaving.

Candidates selected after interview must successfully complete RGCB’s PhD coursework for 4-6 months and will then be allowed to choose their mentor.

The Ph.D. Program of RGCB is currently affiliated to the University of Kerala, Manipal University, Mahatma Gandhi University and Kerala University for Health and Allied Sciences (KUHAS) for the award of PhD degrees. The mentor and/or the doctoral committee will decide which University the PhD student is to be registered with.

4. Faculty Interaction Process

All candidates enrolling in the course work will undergo lab rotation to become familiar with and understand research activities, research groups and various research facilities at RGCB. After successful completion of course work, the candidates will be allowed to visit all laboratories that have vacancies, interact with faculty and then decide on their laboratory of choice.

During these interactions, the candidate and the faculty member can have detailed discussions on the proposed research work that the faculty member is interested and his/her philosophy of choosing the topic and guiding a PhD student.

The candidate will inform the faculty member about his or her interest in the laboratory and as his/her first choice. The faculty member then makes a final choice on the matter. The student and the faculty member will sign a mutual consent letter addressed to Officer in Charge of the PhD program which will be forwarded to the Director, RGCB for final approval.

5. PhD Opportunities for Research Fellows in RGCB R& D Projects and Employees at RGCB

As a reward for sustained hard work and productivity, research fellows working in various research projects at RGCB will be allowed to register for PhD as per the following guidelines and conditions.

1. The research fellow (or project fellow) must have a post graduate degree with a minimum of 60% marks aggregate or equivalent. He or she must also meet all eligibility conditions prescribed by the concerned university.
2. The research fellow must have worked in a project at RGCB for a minimum of 18 months.
3. The research fellow must have one peer reviewed research publication as **first or second author** in an international journal with a minimum impact factor of 2. The work must have been done at RGCB. The candidate must be able to explain and justify his or her contribution to the publication. Applications will be evaluated and decided upon for further processing by an academic committee.
4. The candidate will continue to be eligible for a PhD position in the same laboratory if the paper is published within 12 months of project completion and getting a senior research fellowship or project position.
5. If the publication is a review paper it must include significant data generated from the concerned RGCB laboratory, a matter that will have to be approved by the Director.
6. It will be the responsibility of the PhD mentor and the research fellow to provide for funding for the PhD program including fellowship for the potential PhD student. RGCB management will have no role in this.
7. The research fellow can only do the PhD program with the mentor in whose laboratory/project the fellow works, subject to approved vacancies with the respective faculty scientist. PhD registration with other RGCB faculty scientists is not permitted except in very exceptional cases with the specific approval of the Director.
8. A three-member committee comprising the Director (or his nominee) another faculty scientist and the mentor will meet with the research fellow before finalizing approval for the PhD registration.
9. Employees in the permanent or non permanent cadre of RGCB may be permitted to do MTech, MPhil or PhD programs. These will be considered as exceptional cases and sanctioned by the Director, and will be considered as a separate category.

10. The PhD student will have to follow all prescribed academic procedures and institute regulations applicable to RGCB PhD students.
11. The Director reserves the right to take a final decision on the matter.

6. Part Time PhD Registration

1. No part-time registration for PhD is allowed.
2. Conversion of full time PhD registration to part time will be allowed in deserving cases subject to the candidate has completed three years from date of registration and having one first author publication in a peer reviewed indexed journal.
3. Any student converting to part time PhD registration must submit the thesis within 12 months from date of conversion. RGCB will not forward any PhD thesis not complying with this condition.
4. No re-registration of PhD will be permitted for any student having completed 5 years from date of first PhD registration.

7. Course Registration for PhD

It is mandatory for all students to undertake PhD course work prescribed by RGCB and registering in accordance with directions laid down by the Office of Academic Affairs. At the time of successful completion of the PhD program, all the students will be issued with a transcript, which will be useful in their academic career pursuits. The transcript will mention the details of the structured course work that they have completed in RGCB and grades obtained in each of these courses.

The minimum course requirements are 20 credits including both Research Methodology (12 credits) and Applied Biology (8 credits) offered by RGCB.

The teaching faculty for the curriculum includes RGCB Faculty Scientists as well as distinguished international and national professors.

The course work will be a combination of didactic lectures, assignments, seminars, Interactive sessions, quiz, a mid-term and a final exam.

Course feedback will be obtained in confidence from the students for all courses offered.

8. Course Assessment

Course evaluation is based on continuous assessment, in which sessional work, the mid-term and final examination contributions will be taken into consideration. Sessional work consists of class tests/quiz, homework assignments, power-point presentations, etc.

Each course is assigned a total number of credits, which is based on the scientific content and the number of hours of lecture per week.

There are 6 grades, designated A+, A, B+, B, C and D with the corresponding grade points as given in the Table. All except D are passing grades

Grade	Grade Point	% Marks
A+	9	≥90%
A	8	80 - 89%
B+	7	70 -79%
B	6	60- 69%
C	5	50 -59%
D	4	<50%

Absence from tests or late submissions of assignments will result in loss of marks. The distribution of marks among the various components will be announced at the beginning of each course work by the faculty-in-charge.

Only the grade is recorded in the transcripts; the marks are retained internally.

The Grade Point Average (GPA) is a measure of overall performance.

The semester GPA (SGPA) is based on the grades of the current semester, while the Overall GPA (OGPA) is based on the grades of all courses taken in the course work period. The

credit point contribution of each course is the product of the number of credits and the grade points obtained in it. For instance, in a 3-credit course, if the student gets B+(which corresponds to 7 grade points), then the contribution to the total credit points is equal to $3 \times 7 = 21$. To get the SGPA, one adds the credit point contributions of all the courses taken in the particular semester and divides the total quantity by the total number of credits. The OGPA is similarly calculated; the only difference being that one considers the credit point contributions of all the courses taken in the Ph.D. program. The SGPA and OGPA are rounded off to the first decimal place.

9. Examinations for Courses

The mid-term examinations will be held at the end of 45 days after starting the course work. Final examinations are held during the last fortnight of each semester. The timetable will be notified in advance.

Both the mid-term and final examinations will be of 120 minutes duration. The question papers will be of objective type. The distribution of marks will be 50% each for the mid-term and the final exams.

Attendance of examinations is compulsory. If a student does not attend it he/she shall be given zero marks, and will get D grade. Absence on medical grounds certified by the CMO of the Institute may be condoned and the student may be permitted to take a substitute examination(s) within a prescribed period.

10. Academic Criteria for continuation in Ph.D. Program

Only two D grades are permitted during the period of studentship. If a third D grade is obtained, the student shall leave the Institute.

Student getting D grade will be counseled by the faculty-in-charge and he/she will be given a chance to improve the D grade by conducting a separate exam (re-exam) within a month. The option for re-exam is limited to a maximum of 2 courses

If a student repeatedly gets only D grade in the exam conducted for improvement the course has to be repeated in the next semester

The SGPA/OGPA should not be below 5.0 and if this condition is not satisfied, the student shall leave the Institute.

11. Successful completion of Course work

11A. Successful completion course work requires

A minimum OGPA of 5.0; and

At least min C grade in every course

11B. Only courses in which the grade is C or higher can be considered for meeting the course work requirements.

Since D is a failing grade, a student cannot graduate until he/she clears it, by repeating the same course.

Such repetition of courses is permitted only to clear D grades. Students are not permitted to reregister courses in which they have obtained any other grade.

Until a D grade is cleared, it will be used for the computation of the SGPA and OGPA. After clearing, it will be omitted when re-computing the SGPA of the semester in question and the grade from the repeated course will replace subsequent OGPA computations.

The course completion certificate after the first semester will be forwarded to the research supervisor to initiate formation of the Student Research Advisory Committee (SRAC) and PhD Registration with the University.

12. Course Work Schedule

Description	Total Period
Total number of days /semester	100 - 105 days
Total number of weeks /semester	16 Weeks
Total credits/course	3 credits
Total number of hours /classes/week	3 hours/3 classes/week
Total number of hours/Semester	48 hours /semester
Total number of days for exams (6 courses)	12-15 Days
Semester Break	10-15 Days

13. Student Research Advisory Committee

After assignment of the Research supervisor/mentor and on completion of course work in the first semester a Student Research Advisory Committee (SRAC) comprising 4 members will

be formed for each Ph.D. student. The committee will include the research supervisor, a co-mentor/co-chairman, one RGCB faculty and one external subject expert (if required). The Research Supervisor will communicate the names of the members of SRAC for each student the Office of Academic Affairs from where it will be sent to the RGCB Director for final approval.

At the time of registration for PhD with the University, the student shall make a presentation to the SRAC of his/her proposed research work plan consisting of background/Introduction of the proposed research work, current status, research gaps, objectives, research methodology in brief, importance and scope of proposed research, research collaboration (if any), human or animal ethics issues, references and milestones with approximate time lines.

The student shall incorporate all suggestions given by the SRAC during the presentation and will submit to the Office of Academic Affairs a written synopsis of his/her proposed research work plan (not exceeding 6 pages) in consultation with the research supervisor for Ph.D. Registration.

All PhD registration applications will be routed from the Office of Academic Affairs to the RGCB Director for final approval

The Office of Academic Affairs shall forward the research work plan of the student to the Research Director/Dean/Registrar of the concerned University for further procedures.

The student will make a presentation on the work progress as well as submit progress report to the SRAC every six months.

The student will implement the suggestions given by members of the SRAC in the future research work plan.

The presence of the external member is mandatory for the annual research review meeting.

14. Registration and Duration of the PhD Program

The student shall follow the guidelines of the University in terms of Registration fee and other norms regarding PhD. thesis submission.

The minimum duration for PhD is 3 years and the maximum 6 years at RGCB.

15. Break in Studies

Research Scholars can be permitted to a break in studies only on medical grounds, on production of a medical certificate issued by the Chief Medical Officer (CMO) of the Institute.

Permission from the Director may be sought through the SRAC as soon as the problem is manifest. The break is for a maximum period of one year.

If prior permission is not obtained, it will be considered as a case of discontinuation and action will be taken to cancel the registration.

PhD students who are permitted a break in studies should pay the application tuition fees and other fees to the University where they have registered, in order to maintain their studentship.

For resumption of studies, a Fitness Certificate issued by the CMO of the Institute is essential.

16. Submission of Thesis

A minimum of **two publications** with the student as the first author in peer-reviewed national or international journals, or **one publication with an impact factor 4** or above is required for the submission of thesis.

The research scholar has to present one open work seminar after three years of research and two journal club presentations within five years at RGCB.

A minimum 80% attendance is mandatory for open work presentations and journal club seminars. The Director will forward the thesis to the university only if this criterion is met. Thesis submission of student who does not meet this criterion will be delayed till they obtain 80% attendance by attending additional work/seminar presentations.

The research scholar has to give a colloquium on the research work carried out, three months before the submission of the synopsis of the Ph.D. thesis to the University.

Three weeks in advance to the probable date of submission of the thesis, a synopsis not exceeding four pages is to be submitted by the student, both as hard copy and in electronic format. This would facilitate the finalization of the panel of examiners in advance by the University where the Research Scholar has registered for PhD

All other University norms will also be followed for submission of the PhD Thesis

17. Thesis Fee

The thesis fee will be as prescribed by the different Universities where the student has registered for Ph.D. The fee structure prevailing currently in the various Universities should be followed by the students for payments at the time of registration and subsequent years.

18. Continuing after submission of Thesis

With prior approval from the RGCB Director, full-time PhD students can continue research work at the Institute from thesis submission up to the successful completion of the oral examination. A formal request must be made through the Research Supervisor(s) while submitting the thesis.

19. General Guidelines

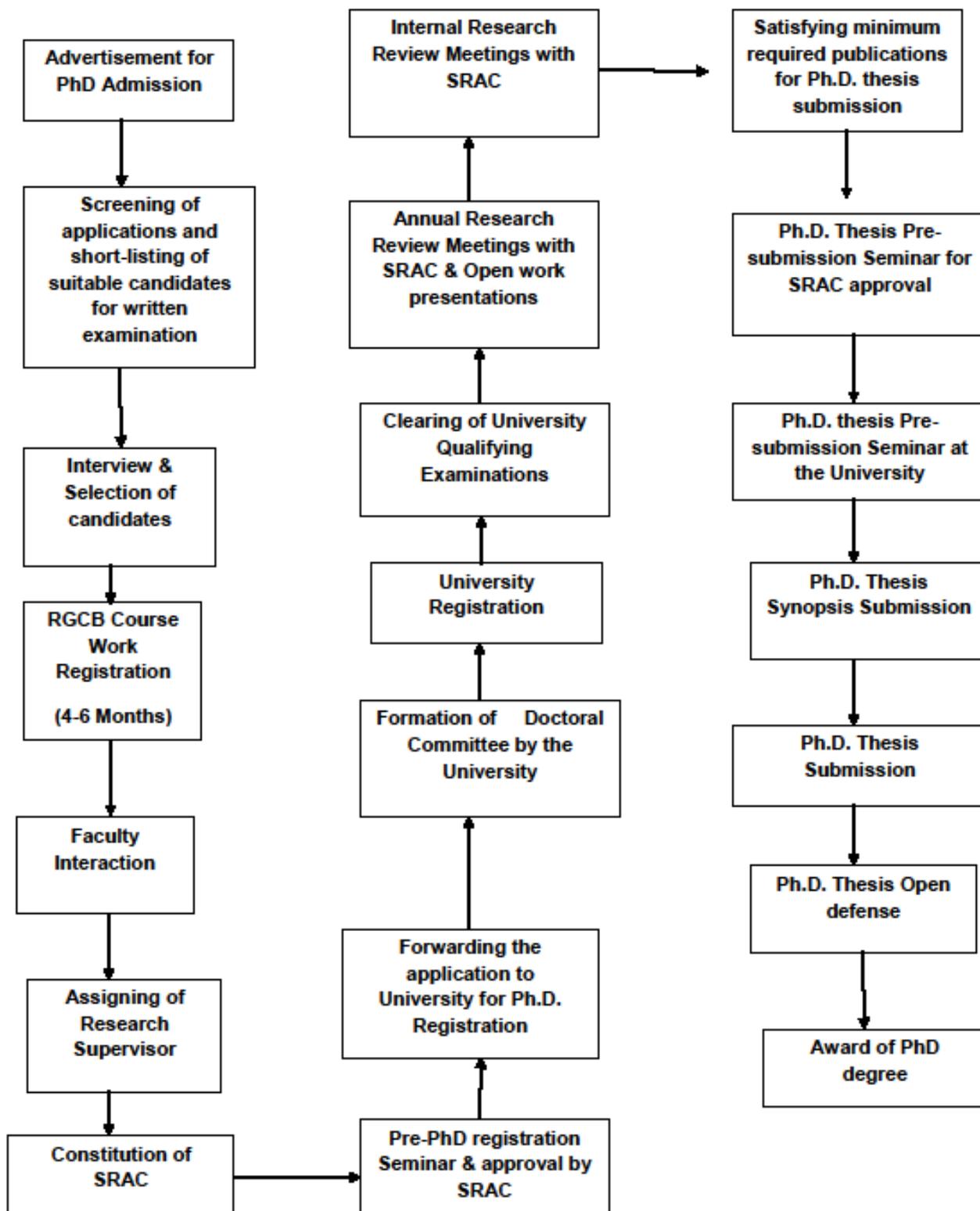
In all matters connected with research work and the prescribed requirements for research degrees, the students are advised to seek guidance from their Research Supervisor(s) and the Office of Academic Affairs.

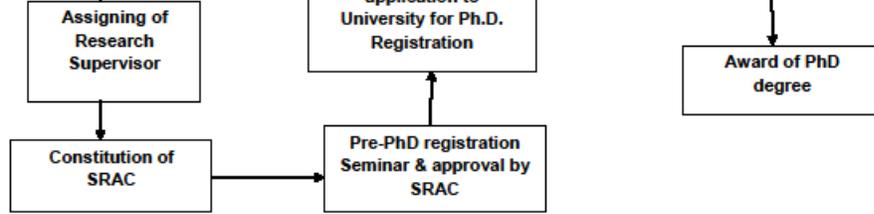
All data generated in RGCB belongs to the institute and IPR issues will be followed as per the Institute policy.

20. Activities-Flow chart

A flow-chart of major activities/ milestones that are required for successful completion of the PhD are shown in the Figure.

Flow-chart of Activities





21. Discipline, Attendance and Leave Rules

Students are expected to dress and to conduct themselves in a proper manner and befitting the institute.

All forms of ragging are totally prohibited. If any incident of ragging comes to the notice of the authorities, the student will be given an opportunity to explain. If the explanation is not found satisfactory and there is sufficient evidence, the institute will expel him/her from the Institute.

Students are expected to conduct themselves in a manner that provides a safe working environment for women. Sexual harassment of any kind is unacceptable and will attract severe disciplinary action including filing of criminal charges.

Students are required to attend prescribed lectures and other academic activities. Applications for leave of absence are to be made through the Research Supervisor(s).

Applications for leave should be submitted to the Office of Academic Affairs. Any type of absence for more than 7 days should also be notified to the Office of the Director.

All other rules regarding leave will be those prescribed by the authority providing the fellowship to the student and those followed by the Institute will be followed.

22. Code of Ethics and Conduct

At the time of admission, each student is required to sign a prescribed statement accepting the code of ethics and conduct.

If a student commits a breach of the code of conduct, he/she will be asked to leave the Institute and will not be eligible for the following re-admission for a period of three years and will not be issued a grade card or certificate for the courses studied or work carried out

On account of misconduct or unsatisfactory work, the RGCB Director may withdraw the research scholarship at any time and /or decide that the scholarship has to be refunded from the date of the last award.

23. Do's and Don'ts: General instructions for PhD students

“DO's”

- a) Do work independently and manage his/her time effectively. The success of a student's PhD depends entirely on this.

- b) Do treat PhD studies as an intensive training program and take every opportunity to practice and learn new techniques, present data, etc.
- c) Be systematic in your approach, at work, remain devoted and establish a strict work & study routine.
- d) Do interact with your colleagues and help each other wherever possible. This helps them get to know you and vice versa. You will be surprised at the opportunities for interdisciplinary growth.
- e) Do exchange information and ideas with your colleagues for the benefit of everyone. Your colleagues may unintentionally use these ideas without reference to you, but will remember you will be the “Bright Spark”.
- f) Do proofread your proposal carefully or get it done with help from someone else. Spelling and grammar do count, especially in professional research proposals and reports.
- g) Summarize your results as you go. From the beginning, get yourself into the discipline of writing a monthly summary of experiments performed, results and conclusions and include all laboratory book references/data/images.
- h) Do constantly seek feedback and ways to improve from your Mentor.
- i) Do volunteer to review research project proposals and manuscripts handed over by your mentor.
- j) Do seek to integrate teaching and outreach with your research. Consider ways to enhance learning within your institution and also to teach practicing professionals and students when appropriate.
- k) Do join local chapters of professional organizations and attend their meetings. Take time to know your local professional community. Invite subject experts with the consent of your mentor to give seminars or guest lectures.
- l) Do observe proper decorum and maintain decent and responsible conduct within the Institution.
- m) Do observe courteous and respectful behavior with Faculty and Staff.
- n) Do read and follow the RGCB Policy on Scientific Integrity and the RGCB Policy on Sexual Harassment.

DON'TS

- a) Do not leave the responsibility of your research project to others.
- b) Don't leave responsibility to your mentor/supervisor to tell you how to work, what to read or plan your project. This is your research and so get involved in the work and take responsibility as early as possible.
- c) Do not abandon the research proposal if you are convinced that it is a good one. If you really believe in it, concentrate on improving the proposal.
- d) Do not spend long hours in the laboratory without any real work. Make sure that when

you are in the laboratory, you are working and not just hanging around disturbing others.

- e) Do not indulge in acts unbecoming of a PhD Scholar.
- f) Do not be discourteous to anyone in the laboratory or outside.
- g) Do not indulge in long and loud conversations on a mobile phone within the laboratory.
- h) Do not make joint representations in matters of individual interest.
- i) Do not join any association or demonstration whose activities are not in line with the interests of the institution.
- j) Do not enter into any private correspondence or stay with foreign diplomats or foreign nationals in India.

Ten Commandments for Ph.D. Students (inspired by Hermann's Laws)

- 1. It is YOUR thesis. YOU will have to do it.**
- 2. Your vacation begins only AFTER you defend your thesis.**
- 3. What matters is WHAT is right, not WHO is right.**
- 4. If you think you are right, convince others; they will be happy.**
- 5. Your productivity is directly proportional to effective productive time spent on your work each day.**
- 6. Take data today as if the equipment will break down tomorrow.**
- 7. Make a backup copy of your data within 5 min of acquiring it.**
- 8. Your productivity will initially be low, but expect it to get better with time.**
- 9. You must become a bigger expert in your thesis area than your mentor.**
- 10. Your mentor wants YOU to become famous so that he/she can finally become famous.**

24. Infrastructure Facilities at RGCB

RGCB has state of the art facilities on par with reputed national and international institutes. Details can be obtained from www.rgcb.res.in

25. Syllabus for Fundamental Courses for RGCB PhD Program

Total Number of Credits required: 20

Primary Course Work: RESEARCH METHODOLOGY (12 CREDITS)

This course has different modules comprising of lectures, demonstrations, hands on training, seminars and workshops. All modules of this course are mandatory for all students. As part of this course the students are also expected to attend all events organized by the institution such as invited talks, PhD open defense, seminars and workshops. The course will also contain invited talks related to entrepreneurship and other applied fields. Classes will be handled by RGCB faculty, external faculty and senior PhD students.

RM-01. Introduction to Research (2 Credits)

RM-02. Quantitative Methods including Biostatistics/Statistical Software (1 Credit)

RM-03. Hands on training in Computational Biology & Bioinformatics (3 Credits)

RM-04. Biochemical and Biophysical techniques (4 Credits)

RM-05. Ethics in scientific research (1 Credit)

RM-06. Certification courses (10 Lectures)

RM-07. Research Seminars (1 Credit)

RM-08. Laboratory Internship

RM-01: Introduction to Research (2 Credits)

This module will introduce the students to the concepts of Research Methodology and is expected to help the students in planning their research topic in a better way. This module will include but not limited to the following topics.

- Research Methodology: An Introduction
- Formulating the Research Question
- Defining the Research Question
- Research Questions
- Approaches and Methodology
- Literature Review
- Formulation of Hypothesis
- Sources of Hypothesis
- Research Design
- Sampling Design
- Data Collection
- Documentation and presentation of data
- Analysis and interpretation of data
- Elements / Types of Analysis
- Interpretation of Data
- Writing manuscript, Research Paper, Research Project, Thesis, Book chapter, Reviews
- Criteria of Good Research
- Citation Methods

- Citation Rules
- Assignments

RM-02: Quantitative Methods including Biostatistics/Statistical Software (1 Credit)

This module will introduce the students to Biostatistics methods, and software's used for analysis of scientific data. The students will also analyze and interpret data sets provided to them using different biostatistics tools.

- Biostatistics methods
- Software's used for analysis of scientific data
- Quantitation and analysis of graphical data (PCR data, Western blots, Microscope images)
- Statistical analysis large datasets such as microarray, ChIP Seq and proteomics data.

RM-03: Hands on training in Computational Biology & Bioinformatics-Lectures with demonstrations (3 Credits)

This module will introduce the students to basic bioinformatics tools and software. The module will include theory classes as well as hands on training with datasets. The aim of this module is to make the students competent in using the latest computational tools in their research.

- Introduction: Aim and branches of Bioinformatics,
- Application of Bioinformatics,
- Role of internet and www in bioinformatics,
- Forms of biological information, Types of Nucleotide Sequence: Genomic DNA, Complementary DNA (cDNA), Recombinant DNA (rDNA), Expressed sequence tags (ESTs), Genomic survey sequences (GSSs).
- Bioinformatics Resources: NCBI, EBI, ExPASy, RCSB, DDBJ: The knowledge of databases and bioinformatics tools available at these resources. Open access bibliographic resources and literature databases: PubMed, BioMed Central, Public Library of Sciences (PloS), CiteXplore.
- Sequence databases: Nucleic acid sequence databases: GenBank, EMBL, DDBJ; Protein sequence databases: Uniprot-KB: SWISS-PROT, TrEMBL, UniParc; Structure Databases: PDB, NDB, PubChem, ChemBank
- Sequence file formats: Various file formats for bio-molecular sequences: GenBank, FASTA, GCG, MSF etc. Protein and nucleic acid properties: Various tools at the ExPASy server, GCG utilities and EMBOSS, Computation of various parameters.
- Sequence Analysis: Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues and xenologues; Scoring matrices: basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSUM series, matrix derivation methods and principles.
- Sequence alignment: Measurement of sequence similarity; Similarity and homology. Pairwise sequence alignment: Basic concepts of sequence alignment, Needleman and Wunsch, Smith and Waterman algorithms for pairwise alignments, gap penalties, use of pairwise alignments for analysis of Nucleic acid and protein sequences and interpretation of results.
- Bioinformatics, databases and their applications, Drug design and delivery
- Protein structure prediction- Secondary structure prediction, fold-recognition, threading, homology modeling.

RM-04: Biochemical and Biophysical techniques- Lectures with demonstrations (4 Credits)

The aim of this module is to familiarize the students to the latest techniques used in modern biology. The module will also include application level demonstrations in using the advanced equipment's. The students are also expected to undertake practical training in their respective laboratories during the laboratory internship.

- Cell and molecular biology, genetic engineering techniques.
- Techniques used for purification and characterization of biomolecules: Centrifugation, Ultrafiltration, Chromatography, electrophoresis, spectrophotometry, GC-MS, LCMS, NMR, MALDI-TOF, X-ray crystallography, CD
- Microscopic techniques including Fluorescence microscopy, Confocal microscopy, Atomic force microscopy and live cell imaging FACS analysis, FRET analysis
- Histology and histochemistry: Fixation and sectioning of tissue, embryos and cells. Immunohistochemistry, immunofluorescence, histochemical staining for characterization of cell types.
- Real time PCR, DNA microarray, New generation DNA sequencing, Protein Microarray, protein sequencing,
- Mass spectrometry based proteomics, mapping of protein interactions using mass spectrometry based approaches, Mass spectrometry based quantitative proteomics (ICAT, ITRAQ, SILAC approaches), biomarker discovery using mass spectrometry based proteomics.
- Cell culture- Culture and maintenance of cell lines, Primary cell culture
- Transgenics and KOs
- Over view of spectroscopy, Electromagnetic and quantum theory of radiation, Wave – particle duality, Photons, Interaction of light with matter, Transition dipole moment, Jablonsky diagram, Beer – Lamberts law
- UV – visible absorption spectroscopy: applications of UV – visible for estimation of protein. DNA and RNA, enzyme kinetics: protein – ligand interaction.
- Fluorescence spectroscopy of Biomolecules: quantum yield, static and dynamic quenching of fluorescence, energy transfer, polarization, anisotropy, time resolved fluorescence, application to biomolecule structure and dynamics, Protein- ligand interaction
- Circular dichroism spectroscopy and its application for studying the secondary and tertiary structure of proteins;
- Diffraction of x-rays and Bragg's law, Surface Plasmon spectroscopy, Electron Microscopy of Biomolecules.

RM-05: Ethics in scientific research (1 Credit)

The aim of this module is to train and make the students aware of ethical procedures used in scientific research.

- Ethical Code of Conduct for researchers
- Ethics of Scientific Reporting
- Authorship criteria's
- Plagiarism
- Conflicts of Interests
- Research Misconduct
- Research using animals, Institutional Animal ethics committee (IAEC)
- Research with Human Subjects, Institutional ethics committee (IEC)
- Research with Stem Cells, Institutional committee for stem cell research (IC-SCR)

- Patents and Intellectual property rights
- GLP and Guidelines for Biosafety, Institutional Biosafety committee

RM-06: Certification courses (10 Lectures)

The certification courses will take care of certification requirements for using radioactive materials and laboratory animal handling.

- Certification course for using Radioactive materials
- Certification course in Animal handling

RM-07: Research Seminars (1 Credit)

In this course each student has to present 1 seminar from the topic assigned to them.

RM-08: 08. Laboratory Internship

The students are expected to spend the afternoons in their respective allotted laboratories fine tuning their practical skills, involving in lab meetings and discussions, joining senior students in their experiments and making a draft proposal of their own research plan with specific timelines. At the end of 6 months the student is expected to present their research proposal to their respective mentoring committees for evaluation. The student will receive the course completion certificate only after he/she presents the research proposal to the mentoring committee. The respective PhD mentor will also provide an evaluation report of the student's performance in the lab.

Secondary Course Work: APPLIED BIOLOGY (8 CREDITS)

8 credits which can be obtained by selecting through of the four combination options.

The syllabus for secondary course work will be modified depending on the number of candidates.

OPTION 1

- A) Disease pathophysiology, stem cells and regenerative medicine (4 credits).
- B) Current Advances in Genomics (4 credits)

OPTION 2

- A) Infection Biology - Immunology, Virology, Bacteriology and Parasitology (4 credits)
- B) Current Advances in Genomics (4 credits)

OPTION 3

- A) Reproductive Biology and Neurobiology (4 credits)
- B) Current Advances in Genomics (4 credits)

OPTION 4

- A) Plant Biology and Biotechnology (4 credits).
- B) Current Advances in Genomics (4 credits)

26.RGCB STUDENTS AWARDS

RGCB strives to make PhD students well groomed to meet challenges posed by advances in science and highly competitive placements in modern biotechnology R&D institutions. To foster true scientific spirits in our students and make them uncompromisingly productive on par with international standards, RGCB gives its Ph.D. students encouragement and motivation in the form of awards by showcasing their research talents.

RGCB – M. R. DAS RESEARCH EXCELLENCE AWARD FOR PhD STUDENTS (These guidelines come into effect from December 01, 2016)

NOTES

1. The M. R. Das Research Excellence Award is given for excellence during RGCB's PhD Program. It carries a cash award of Rupees 25,000, a gold medal and a citation.
2. A duly constituted three member external jury will adjudicate all parameters and award marks out of total of 100. The division of marks is explained below.
3. An applicant scoring over 70% will become eligible for the award.
4. There is no restriction on number of awards in a year.
5. Applicants are to submit their applications duly forwarded by the mentor to the Office of Academic Affairs within 3 months after submission of the PhD thesis to the University.
6. The application format can be downloaded from the RGCB Website.
7. The decision of the jury will be final and no further appeal will be entertained.

CONDITIONS

- 1. Time Limit:** The PhD thesis must have been submitted within 5 years from date of PhD registration with the University.
- 2. Contemporary importance and relevance of PhD thesis:** an extended abstract of not more than 5000 words to be provided that explains with the following headings: (i) background to the problem, (ii) working hypothesis, (iii) methodology used, (iv) results in brief, (v) conclusions and (vi) application and/or innovations derived from the study **(Total of 30 marks).**
- 3. Peer-reviewed publications (Total of 50 marks):**
The following conditions will apply to all applicants
 - i. Publications in predatory journals will not be considered
 - ii. A minimum of two publications of direct relevance to the PhD work and where the applicant is the first/joint first author.

- iii. The jury can consider a single outstanding publication where applicant is first/joint first author in lieu of the standard two publications
- iv. The jury can also consider (along with a second paper) one publication involving large multi- center studies such as GWAS/large scale genomics/clinical/epidemiological/molecular epidemiological studies, a publication where applicant is among the first three authors and the topic of the paper is of direct relevance to the PhD work.
- v. Two granted Indian patents or one granted International patent may be considered by the jury as equivalent to the conditions stated in (ii) and (iii) and (iv). The Jury will judge relevance of the patent and its significance.
- vi. The applicant must provide a detailed description of their exact role in any coauthored publication (iv) or patent application (v).
- vii. The jury will decide on the quality and marks for the above four conditions.

4. **International Fellowships** granted for short term training in international research laboratories during the course of PhD work (**Total of 10 marks**)

5. **Best Paper/Poster Awards** at National or International Conference presentations organized by registered national and international societies or equivalent during the course of PhD work (**Total of 10 marks**). Jury will decide on the standing and quality of the conference/seminar.

RGCB Merit award of the year

This will be a competitive awards granted to the best presentation of research work at an annual competition every year. The award will be a certificate and a cash prize of Rupees 20,000/- based on the evaluation of oral presentations given by senior Ph.D. students of the Institute by an independent evaluation committee. The presentation will be for 20 minutes followed by a 10-minute discussion. Ph.D. Students, who have completed three or more years from the date of registration, will be eligible. The evaluation committee will include distinguished panel of scientists. No RGCB faculty will be on the committee. There will be one merit award. However the committee may recommend an additional certificate of commendation. Those who do not win the award in first attempt can apply in the subsequent sessions. Only one award will be given to a student during his/her Ph.D. program.

Application for Awards can be downloaded from the website of RGCB

27. RGCB HOSTEL RULES AND REGULATIONS

1. ADMINISTRATION

- a) The Wardens will be officers in charge of the hostel and appointed from among the members RGCB scientific staff.
- b) Warden's and or RGCB Administration's decision will be final in the interpretation of rules and in all matters connected with Hostel.

2. ADMISSION

- a) Admission to RGCB hostels is restricted to Research Associates, PhD students and Research Fellows of RGCB.
- b) Application not in proper form will be rejected.
- c) The Warden will have the right to refuse admission without assigning reasons.

3. CAUTION DEPOSIT

Each student on admission should pay Rs.5, 000/- as caution deposit. This amount will be refunded only at the time of his/her leaving the hostel after adjusting for any liabilities on account of damage to property of the hostel. The original receipt should be produced to get the money back. This amount may be subject to change from time to time.

4. ALLOTMENT OF ROOMS

- a) Rooms will be allotted at discretion of the Warden. No request for change of rooms in the middle of the year will be entertained unless it is a request for mutual change.
- b) Shared accommodation (two per room) will be provided to PhD students and Research Fellows/Project personnel in the RGCB Hostel.
- c) RGCB Men's Hostel may function at rented properties outside the main campus. Here again, shared accommodation (two per room) will be provided.
- d) There will be two categories of hostel fees.
- e) All shared accommodation will be charged at a uniform rate of Rs 3,200/- per month for Junior Research Fellows or equivalent (for first two years) and Rs 3,600/- for Senior Research Fellows or equivalent (from 3rd to 5th year).
- f) For any project personnel receiving monthly stipend of up to Rs 10,000/- a discounted hostel fee will be decided by the Director.
- g) The maximum tenure for hostel accommodation will be five years from date of joining RGCB or until termination of the research fellowship/project, whichever is earlier.
- h) Accommodation in the hostel for PhD students after five years from joining the institute will be only subject to availability of rooms. Rent will be at the same charges as applicable to regular senior PhD students (i.e. Rs.3,600/- per month). This facility will be made available only on a month-to-month basis and requires special sanction from the Director.
- i) Some rooms will be set-aside for Post-Doctoral Fellows or equivalent. These will be single accommodation rooms (either in the main campus or rented property) and will be charged at a rate of Rs 7,000/- per month. Should they share the room, it will be charged at Rs 3,600/- per month.

5. FURNITURE

Each student will be provided with one cot, one table, one chair and one cupboard. Inmates should not shift the furniture provided to other rooms.

6. ELECTRIC LIGHTS& APPLIANCES

Rooms are provided with electric lights. Student should see that the lights are switched off when they go to sleep or when they leave the room. Otherwise a charge of Rs 50/- each time will

be recovered from each occupant of the room irrespective of who was responsible for the neglect. Televisions, washing machines, fridges, microwave ovens, gas stoves and induction cookers provided by RGCB should be used carefully as per the instructions provided. Inmates cannot bring or use any such appliance.

7. GUESTS& LEAVING PREMISES

- a) No student is allowed to bring a guest into the Hostel to stay with him/her without prior permission of the Warden.
- b) The Warden shall have power to refuse permission to introduce the hostel any person as a guest without assigning any reason.
- c) No visitors to the hostel after 7.00 p.m.
- d) There is no regular provision for accommodating guests in the RGCB hostels. Any student wanting to accommodate guests in the hostel has to seek permission of the warden in the prescribed application form. The maximum period a guest can stay in the hostel is two nights. Repeated accommodation of guests is not permitted.
- e) Short-term accommodation in hostels (subject to availability) can be given only to students coming on fellowships from the Indian Science Academies or with specific permission from the Director.
- f) Students staying in both Men's and Ladies hostel who wish to leave the campus overnight have to intimate this in writing or by e-mail to the warden and deposit the room key with security. Failure to do so may result in withdrawal of hostel facilities.
- g) Students staying in the Men's and Ladies hostel have to be in campus before 10.30 pm at the latest. Security has been issued clear guidelines for this. Any exception to this requires previous sanction from the hostel wardens. Failure to do so may result in withdrawal of hostel facilities.

8. GENERAL DISCIPLINE

- a) Hostel inmates should keep the room and surroundings scrupulously clean. Waste matter, discarded rags, papers. etc. should not be thrown about in rooms, corridors, sunshades or premises. Clothes for drying cannot be placed in rooms and corridors and should be placed in the designated space provided for this. The rooms, doors etc should not be disfigured by writing, sticking hand bills, posters etc.
- b) Hostel inmates should behave with restraint and decorum. Shouting, reading aloud and other acts likely to disturb other inmates should be avoided at all times.
- c) A student shall not hand over the keys of his/her room to any other student/person except the Warden or person authorized by him.
- d) No notice shall be put in the Hostel by any student directly unless such permission has been granted by the Warden of respective hostels.
- e) No student or students shall raise or assist others to raise any donation for any cause in the Hostel on any account without prior permission of the authorities.
- f) Hostel inmates are not allowed to remove any article of furniture, fittings, lights, etc belonging to hostel. Any damage to the hostel property shall be reported to the Warden. The cost of the damage will be recovered from the individual concerned. If the person is not traced, the members of the room(s) concerned will be held responsible. In case of wanton damage, in

addition to recovery of the cost of repair the Warden might impose a suitable fine.

- g) All correspondence regarding the hostel should be made through the respective Warden.
- h) RGCB will not be responsible for money or goods lost by students or their guests.
- i) Consumption of alcoholic drinks, smoking, other intoxicants and drugs are strictly prohibited inside the hostel. Anyone found doing so would be expelled from the hostel immediately. No enquiry into the matter shall be entertained.
- j) Possession of firearms, daggers, cycle chains, rods, iron rods or any other kind of weapons is strictly prohibited (Arms Acts.). Hostel inmates found in possession of the above will be handed over to the police or expelled from hostel immediately. No inquiry into the matter shall be entertained.
- k) Misconduct or breach of any of these rules of the hostel will render the offender liable to suspension or dismissal from the Hostel.

28. Declaration form to be submitted by Ph.D. students

RAJIV GANDHI CENTRE FOR BIOTECHNOLOGY (RGCB)

Thiruvananthapuram

Declaration form to be submitted by Ph.D. students

I, ----- of permanent address -----

Hereby affirm and certify to the following:

1. I have read, understood and will accordingly follow *in total* all rules and regulations of the RGCB Ph.D. program provided to me as well as all other rules and regulations of RGCB.
2. I agree to attend and complete the prescribed course work for the RGCB Ph.D. program.
3. I also understand and accordingly certify that I will attend and complete the prescribed course work for the RGCB Ph.D. program irrespective of the University where I am registered for Ph.D degree.
4. I also understand and accordingly certify that should I in any way violate any of the above three undertakings or breach in any way rules and regulations of RGCB, my admission to the RGCB Ph.D. program will stand automatically cancelled.

I solemnly affirm and agree to all the above conditions

Signature of the student with date

Full name

CONFIRMATION BY PhD MENTOR/SUPERVISOR

I have read the above declaration given by my Ph.D. student _____ and I give my consent and concurrence to ensure that the student strictly abides by the contents of the above declaration.

Signature of the Research Supervisor with Date

Name of the Research Supervisor