SRI BALAJI VIDYAPEETH

ACCREDITED BY NAAC WITH 'A' GRADE

DEEMED TO BE UNIVERSITY

DECLARED U/S 3 OF THE UGC ACT, 1956

NIRF - INDIA RANKINGS 2019 : 72 among Universities in India

PG DIPLOMA IN PHARMACOGENOMICS &PERSonalized MEDICINE

SYLLABUS & REGULATIONS

2019-2020 ONWARDS

(As Approved in the Academic Council at the Meeting held on 22.05.2019)

PG Diploma in Pharmacogenomics and Personalized Medicine

Central Inter – Disciplinary Research Facility

Sri Balaji Vidyapeeth ,

Puducherry

Post Graduate Diploma in Pharmacogenomics & Personalized Medicine

(CIDRF-PGDPPM)

Rationale for starting new programs in Pharmacogenomics & Personalized Medicine

Personalized medicine is the next generation of medicine and healthcare research with the potential to provide significant benefits to patients and effect strategic shifts in the way healthcare is delivered in the clinic. Personalized medicine uses an individual's genetic profile to guide decisions made in regard to the prevention, diagnosis, and treatment of a disease. Developing new diagnostic tests and expanding the use of biomarkers enabling the identification of the molecular cause of a disease will ultimately support the development of novel more precisely targeted treatments. It has been estimated that only 30-70% of patients respond positively to drugs. Stratifying in advance groups of patients who have a greater likelihood of responding to a particular therapy or avoiding adverse effects based on their unique genetic and environmental profiles is the aim of personalized (or stratified) medicine.

This program aims to blend together for the first time, experimental medicine with precision medicine approaches to equip the participants design and deliver better, more targeted therapies to patients to ensure optimal responses.

Pharmacogenomics and Personalized medicine: Changing the future of healthcare

Pharmacogenomics has the potential to radically change the way health care is provided, though the field is only in its infancy. In the future, pharmacogenomics could find uses along the entire drug discovery and development timeline, all the way from target discovery and validation to late-stage clinical trials.

Beyond that, pharmacogenomic tests could find their way into the doctor's office as a means to get the right medicine to the right patient at the right time. In future, pharmacogenomics will lead to the stratification of diseases into genetically defined categories. Pharmacogenomics will probably be most successful in areas such as oncology, where many therapies are available but each one works for only a small percentage of patients.

It is hoped that by the year 2030, the diagnosis of the patient illness as well as the therapy to be prescribed would be made by genomic testing using the DNA chip rather than by clinical symptoms alone. Discoveries of gene variations, affecting how the drugs work in breast cancer, asthma, hypertension, diabetes point to just a few of the diseases in which pharmacogenomics

will have a big impact. Once the researchers have pinpointed the genes and the associated variations responsible for these diseases, therapies for each would quickly follow.

Employment scenario

Human genetics has a great job potential in India and abroad. A large number of students in this field are getting a good response from foreign countries in the research as well as the job sector. Students have a good opportunity to work in the area of pharmacogenomics in the pharmaceutical industry, besides having good career options in genetic testing laboratories, there is also a chance to work in genetic counseling to the couples and families suffering from genetic diseases.

There are good prospects in clinical laboratories in the field of molecular diagnostics for various genetic disorders and infectious diseases and in reproductive genetics, where help is offered to infertile couples and those afflicted with genetic problems through prenatal genetic analyses.

Forensic genetics have opened up new vistas for human geneticists, who by molecular genotyping can provide valuable insights into genetic individualization of criminals, thus helping in solving crime.

About Sri Balaji Vidyapeeth

One of South India's premier healthcare academic and research institutions, Sri Balaji Vidyapeeth has been at the forefront of health professions education, healthcare delivery and research ever since its inception in 2008. Sri Balaji Vidyapeeth is accredited by India's National Assessment and Accreditation Council (NAAC) with 'A' Grade and is ranked among top Private Medical Universities of India. The vision of SBV is to be in the forefront of higher education in order to give the country high caliber manpower. The Mission statement envisages collegiate education that culminates in post-doctoral programs, to produce knowledgeable professionals in various aspects of health science with a high concern for providing and organizing appropriate health services including health education and policy, to provide service to the underprivileged, to impart specialized skills, to be successful in their endeavors and to set a very high standard of professional conduct and ethics for staff and students alike.

CIDRF: an overview

Central Inter-Disciplinary Research Facility (CIDRF) is an innovative research institute under Sri Balaji Vidyapeeth, Pondicherry, recognized by Department of Scientific and Industrial Research (DSIR), Government of India. It is a comprehensive, inter-disciplinary bio-medical research center inaugurated in 2012, having a state of art infrastructure; unique and first of its kind in a medical institution in southern India. The laboratories are housed in clean rooms with totally controlled and regulated airflow, temperature and pressure. There are laboratories dedicated to cell culture, genomic and proteomic studies, analytical chemistry, developmental therapeutics and microbial technology. The infra structure and human resource of CIDRF is constantly growing.

CIDRF bridges together and coordinates the research interests of medical, dental, nursing and scientific faculty under SBV dedicated to Translational research, aimed at product development and application in public health. It fosters knowledge and skilled work force development, by organizing research and educational activities such as Doctoral degree program, Research Internships, Medical Student Research Preceptorship, Research Mentorship, Research Clusters, Investigator-Initiated Research Alliance, Conferences/Seminars/ Journal Clubs and such other academic activities on a regular basis..

CIDRF is committed to National Economy and empowering the public with refined healthcare products and services. Currently, CIDRF has filed two provisional patents with Government of India.

Innovative programs:

Though there are a few courses available in Indian universities (e.g., Alagappa Univerity, Tamilnadu) based on Pharmagenomics, they are mainly bioinformatics based and none of the program deals comprehensively with applied Pharmacogenomics and Personalized Medicine. With the aim of training interested post-graduates to gain expertise in fundamentals of Pharmacogenomics and Personalized Medicine, CIDRF proposes a PG Diploma program under the umbrella of CIDRF-Innovative PG Diploma programs.

Post Graduate Diploma in Pharmacogenomics and Personalized Medicine (PGDPPM) - One Year (Two Semesters)

The major highlight of the new program is adoption of Cumulative Grade Point Average (CGPA) as recommended by the NAAC and UGC as a major reform in higher education. The candidate will complete the course module with all the subjects being compulsory for a comprehensive training.

Advantages of the Credit System	
To the learners	Focus from teacher-centric to learner-centric education
	Facilitates learners' mobility across the courses, programs, institutes
	It accounts for the self-learning efforts made by the student
	Linked with Grading, which is fair to the students, compared with marks
To the Institutes	Provides scope for fixing, and assessing learning outcomes in an objective and transparent manner. Credit calculations are based on competencies and linked with study hours, rather than routine time table approach.
	Possibility to optimize the teaching workload, and respect teachers' expertise, interest and preference
	Twinning mechanisms can be developed with other institutes, to allow credit transfers
To the System, Parents, Society	Facilitates issues of recognition and accreditation
	To move towards international standards
	Ultimately, it promotes quality assurance to the society

Definition of Key Words

1. **Program:** Program refers to the entire period of study, leading to the degree. The duration for the PG Diploma is one year.
2. **Academic Year:** The PG Diploma program is held for one full academic year cycle. The academic year is divided in to two semesters of six months each.
3. **Courses:** Courses refer to the blocks of studies/program conducted during the year.

4. **Credits:** A Unit by which the course work is measured. It determines the number of hours of instruction required per week. Credits are awarded based on the following rationale.
5. **Credit Point:** It is the product of grade point and number of credits for a course.
6. **Letter Grade and Grade Point:** The program follows Relative Grading for evaluating the competency of the candidate.

   The relative grading is based on the distribution (usually normal distribution) of marks obtained by all the students of the course and the grads are awarded based on cut-off marks or percentile. Under the absolute grading, the marks are converted to grades based on pre-determined class intervals. The UGC recommends 8 Letter Grades as follows:

Letter Grade	**Grade Point**	**Marks range**
O (Outstanding)	10	90-100
A+ (Excellent)	9	80-89
A (Very good)	8	70-79
B+ (Good)	7	60-69
B (Average)	6	50-59
C (Below Average)*	5	40-49
F (Fail)	4	39 or below
Ab (Absent)	0	

**But can be compensated by higher grades in other papers to give an overall grade of B*

   The above formula is used for converting the marks in to grades. In case of both, the certificate and PG Diploma programs, a minimum grade point of 5 (C Grade) is required for a pass in each paper/course, and overall grade point 6 (B Grade) is required for pass.
7. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student at the end of a program. The CGPA is the ratio of total credit points secured by a student in various courses and the sum of total credits of all courses. It is expressed up to two decimal places.
8. **Certificate of Course completion:** It is issued to a student based on 80% attendance of sessions/weekly seminars and internal assessment. The credits earned for the course will be mentioned in the certificate.

Course regulations:

Duration of the Course: Two semesters of 6 months each. Each semester will have two terms of three months.

Course objectives: Upon completion of this course, the student shall be able to:

1. Understand the basics of pharmacogenomics, molecular biology techniques and bio-informative tools relevant for personalized therapy
2. Comprehend how pharmacogenomic variations can affect pharmacokinetic and pharmacologic principles.
3. Describe how pharmacogenomics can be utilized to improve the efficacy of certain drugs or reduce potential adverse effects.
4. Explain the current recommendations for pharmacogenomic implementation and the information necessary to advance emerging scenarios into clinical practice.
5. Predict how health care professionals might be involved in the application of pharmacogenomics at the organizational level (such as monitoring drug appropriateness and interpreting pharmacogenomic data and testing results).
6. Summarize some of the key ethical, legal, and economic issues involved with pharmacogenomic testing and data collection.

Eligibility for admission to the PG Diploma course:

MBBS, B.Pharm, B.Tech (Biotechnology), B.D.S, Post-Graduate degree in Biomedical Sciences/ Biotechnology or any other equivalent degree

Annual intake of students: Four per year

Course Fee: Rs. 20,000/- per year

Course structure

- In the first semester, the students will be trained in the fundamental theoretical concepts and techniques of Pharmacogenomics. Towards the fulfillment of the PG Diploma, the student will carry out a research project during the course under the mentorship of a teacher/scientist. The findings of the research project will be submitted in the form of a dissertation which will be evaluated at the end of the 2nd semester.

- There will be a summative examination at the end of the second semester consisting of written theory, dissertation, practical's and viva-voce in addition to continuous internal assessment. After the successful completion of the examination the student will be eligible for the award of the PG Diploma.

Teaching Methods:

- The content delivery will use a unique combination of Classroom teaching, faculty guided "on-the-bench" teaching, discussions, assignments, seminars, journal club and self-directed learning.
- Training with instruments and techniques would be hands on under guidance.

Student responsibilities

Portfolio: Each student will maintain a portfolio of his/her activities during the course. The portfolio will have the detailed collection of the student's learning progression/research and a reflective description of progress, achievements and competencies gained during the course.

Project work and submission of Dissertation:

Project work is an important component of PG Diploma. Each candidate, with the help of an assigned faculty mentor is expected to identify, plan, design and conduct a research project leading to submission of a dissertation. In general, a dissertation will be a maximum of 75 pages and will be examined by an appointed examiner. If the work of the candidate results in a new publication/product/service or patentable information, the name of the candidate would be included as an author/inventor.

Mentoring: Every student pursuing PG Diploma would work under a faculty assigned by the Director, who will guide, supervise and mentor the student.

Progression: The formative assessment will be done by concerned faculty on a continuous basis based on attendance, behavior individually and in a group, commitment to work and the quality of the presentations and discussions and the same would be a part of the final assessment.

Course description:

This course is designed to assist candidates to develop an in-depth understanding of the fundamentals of Pharmacogenomics and Personalized Medicine techniques. The course will provide the candidates a strong foundation and exposure to promote pharmacogenomic research and to deliver personalized therapies to patients for ensuring better clinical responses.

Semester I

Core competencies- The course is designed to equip the candidate with the following core competencies at the end of the certificate program:

1. An understanding of the fundamental concepts of Pharmacogenomics and Personalized Medicine
2. An understanding and applications of the practical components of Pharmacogenomics and Personalized Medicine
3. The ability to use the techniques learnt, independently with precision when required.

First Semester - Term I 1st to 3rd month (3 months): During the first semester, the students will be taught the fundamental concepts and given practical training in the core subjects:

Applied Pharmacotherapeutics, Basics of Molecular Biology and Bioethics

1. **General Pharmacology:**

- Basics of drug development
- Drug absorption, distribution, metabolism and excretion
- Drug metabolism and transporter pathways, Pharmacokinetic modeling and analysis,
- Cellular and molecular mechanism of drug action
- Pharmacovigilance, Adverse drug reactions, Drug Interactions

2. **Clinical Pharmacology:**

- Clinical Pharmacology of hormones, cardiovascular drugs, anti-cancer drugs, and drugs acting on CNS and peripheral nervous system.

3. **Molecular biology :**

- Cell structure, Genome organization, Types of cell division, Cellular organelles, membrane transport, cellular cross-talk, cell cycle regulation
- DNA replication, DNA damage and repair mechanisms
- Transcription- Mechanism and regulation, Post-transcriptional modifications, Translation, Post translation modifications, Transformation, Transduction and Conjugation
- Recombinant DNA technology, restriction enzymes, vectors, Genomics and cDNA library construction, Molecular cloning and expression

4. **Bioethics:**
   - Human bioethics and its application to design and conduct of human drug research

5. **Laboratory techniques I :**
   - Sample collection and storage and Biobanking
   - PK-PD analysis

First Semester - Term II 4th to 6th month (3months)

Fundamentals of Pharmacogenomics and Biostatistics

1. **Fundamentals of Pharmacogenomics:**

- Concepts of Pharmacogenomics, Human genome project, Basic concepts about genetic diseases and mutations, Genetic diversity of population with special reference to India, genetic influences on medical disorders, epigenetics, non-genetic factors influencing phenotypes, inheritance patterns, Genome organization, Linkage analysis, medical application of genetics in diagnosis, treatment and prevention of disease, Hardy Weinberg equilibrium, Single gene disorders and Mendelian patterns of inheritance, Genetics of therapeutic targets and gene based targets, Pharmacogenomics of Cytochrome P450 enzymes, transporter enzyme and receptors, Ethnic differences in drug response

2. **Bioinformatics:**

- Basics of bioinformatics, Genome browsers, BLAST, Primer designing, NEBCutter
- Fundamental concepts including computational sequence analysis
- Molecular Docking, Primer 2 software analysis

3. **Biostatistics:**

- Statistical methods to calculate sample size and tests of significance, Statistical methods to process public health and genetic data , Statistical methods : clinical biomarker data analysis

4. Laboratory techniques II:

- DNA isolation, DNA quantification and quality test, Polymerase Chain Reaction (PCR), Gel Electrophoresis, Restriction Fragment Length Polymorphism (RFLP)
- Functional analysis of allelic variations
- Methods of genotyping including Taqman etc.

Dissertation work 4 th to 9 th month (6 months)

Semester II

Core competencies- The course is designed to equip the candidate with the following core competencies at the end of the second semester of the PG Diploma Program::

1. Develop skills to handle the research techniques independently.
2. Ability to analyze the data and interpret the results.
3. Ability to prepare a manuscript for scientific publication
4. Knowledge of good laboratory practices, concept of research and basic ethics

Second Semester - Term III 7 th to 9 th month (3 months): During the second semester, the students will be taught the fundamental concepts and given practical training in the following subjects:

Applied Pharmacogenomics and Laboratory Techniques

1. Applied Pharmacogenomics:

- Single Nucleotide Polymorphisms and other genetic variations, their impact on clinical medicine and clinical outcomes. Translation of genetic variations to drug selection, dosing regimen, adverse effects, regimen optimization
- Association studies in Pharmacogenomics, Linking NGS/Microarray/other technologies to bedside, Analyzing gene mutations
- Biomarker discovery, turning biomarkers into drug targets
- Molecular Diagnostic methods in Pharmacogenomics
- Role of Pharmacogenomics in Drug development

2. Modern Techniques in Genetics:

- Tools for pharmacogenomics analysis

- SNP polymorphisms, Gene expression analysis

3. Analytical techniques:

- Genotype-Phenotype association studies
- HPLC, Spectrophotometry

Dissertation work 4th to 9th month (6 months)

Second Semester - Term IV 10th to12th month (3months)

Personalized medicine in clinical practice; Ethical, Regulatory and Commercial Aspects of pharmacogenomics

1. Personalized Medicine in Clinical practice:

- Personalized medicine approach for prescribing antipsychotics, antidepressants, antiepileptics, antidiabetics, cardiovascular drugs, NSAIDs, analgesic drugs, hypnotics , anxiolytics drugs, gastrointestinal drugs, immunosuppressants
- Genetic counseling
- Medical liability for Pharmacogenomics

2. Commercial and regulatory aspects of Pharmacogenomics:

- Ethical issues of personal genetic information/ Individualized medicine
- Economics of Pharmacogenomics testing in clinical practice.
- Regulatory guidelines involving Pharmacogenomics.
- Intellectual property and commercial aspects of Pharmacogenomics.

Dissertation work 4 th to 9 th month (6 months)

University Examination

Research Project:

The candidates will carry out a research project under the mentorship of an assigned scientist. The candidate is expected to complete the research project and submit a dissertation. The final assessment will include a written exam, a practical exam, a dissertation as well as a *viva-voce.*

Recommended Books

1. Laurence L. Brunton, Bruce A. Chabner, Björn C. Knollmann ., 2011 *Goodman & Gilman's The pharmacological basis of therapeutic*s, (12th ed.) by McGraw Hill education.
2. Guilherme Suarez-Kurtz., 2007 *Pharmacogenomics in Admixed Populations*, by Landes Biosciences.

3. Alan H.B. Wu . Kiang-Teck J. Yeo., 2010 *Pharmacogenomic Testing in Current Clinical Practice* by Humana Press
4. Mark A. Rothstein., 2003 *Pharmacogenomics Social Ethical and Clinical dimensions* by Wiley & Sons Publication.
5. Sweet, Kevin M., Michaelis, Ron C., 2011 *The busy physician's guide to Genetics, Genomics and Personalized Medicine* by Springer Publications.
6. Lodish, H., Scott, M.P., Matsudaira, P., Darnell, J., Zipursky, L., Kaiser, C.A., Berk, A. and Krieger, M., 2003 *Molecular Cell Biology*; (5^{th} ed.) by W.H. Freeman and Co., New York.
7. Daniel A. Brazeau, PhD, and Gayle A. Brazeau. 2006 *A Required Course in Human Genomics, Pharmacogenomics and Bioinformatics*. American Journal Pharmaceutical Education
8. Rapley R and Harbron S., 2004 Molecular *analysis and Genome discovery* by John Willey & Sons, Ltd.
9. Mount, D., 2004 *Bioinformatics: Sequence and Genome Analysis*, by Cold Spring Harbor Laboratory Press, New York.
10. David Edwards, Jason Stajich and David Hansen., 2009, *Bioinformatics: Tools and Applications*, Springer.
11. C.R. Kothari., 2004 *Research Methodology: Methods and Techniques*, by New Age International Publishers.
12. G. Jagadeesh, Sreekant Murthy, Y.K.Gupta and Amitabh Prakash 2011 *Biomedical Research: From Ideation to publication* by Wolters Kluwer Health (India) New Delhi
13. Indian Council of Medical Research; 2006 *Ethical guidelines for bio-medical research on human participants.* by Director-General Indian Council of Medical Research New Delhi.
14. Seoul: WMA., 2008 Declaration of Helsinki. *Ethical principals for medical research involving human subjects* World medical association.

OUTLINE OF THE PROGRAM WITH CREDIT HOURS

Semester I		**Semester II**		**Overall**
Term I **(1-3 months)**	**Term II** **(4-6 months)**	**Term III** **(7-9 months)**	**Term IV** **(10-12 months)**	**Semester I+II**
Lectures/seminars of 4 hours per week X 12 weeks = 48 hours = 3 credits	Lectures/seminars of 4 hours per week X 12 weeks = 48 hours = 3 credits	Lectures/seminars of 4 hours per week X 12 weeks = 48 hours = 3 credits	Lectures/seminars of 4 hours per week X 12 weeks = 48 hours = 3 credits	Lectures/seminars = 12 credits
Practical training of 5.5 hours per week X 12 weeks = 66 hours = 2 credits	Practical training of 5.5 hours per week X 12 weeks = 66 hours = 2 credits	Practical training of 5.5 hours per week X 12 weeks = 66 hours = 2 credits	Practical training of 5.5 hours per week X 12 weeks = 66 hours = 2 credits	Practical training = 8 credits
Supervised/self-learning 5.5 hours per week X 12 weeks = 66 hours = 2 credits	Supervised/self-learning 5.5 hours per week X 12 weeks = 66 hours = 2 credits	Supervised/self-learning 5.5 hours per week X 12 weeks = 66 hours = 2 credits	Supervised/self-learning 5.5 hours per week X 12 weeks = 66 hours = 2 credits	Supervised/self-learning= 8 credits
Total credits= 7	Total credits= 7	Total credits= 7	Total credits= 7	**Total credits = 28**
Internal assessment# exam (Theory+Practical) = 100 Marks	Internal assessment exam (Theory+Practical) = 100 Marks	Internal assessment exam (Theory+Practical) = 100 Marks	University Examinations Theory examination = 100 Marks (4 papers, 100 marks each, The total of 400 will be reduced to 100) Practical exam= 80 Marks Viva= 20 Marks Dissertation presentation: 50 marks	

Examinations:

Internal assessment:

There will be an internal assessment examination at the end of the 1st, 2nd and 3rd term of 100 marks each. The marks obtained in these exams will form the 25% of the final marks.

University Examinations:

The candidate will appear for the final university examination at the end of the 4th term in second semester. The marks allotment is as follows: Theory: 100 (4 papers of 100 marks each, The total marks of 400 will be reduced to 100), Practical: 80, Viva: 20, Dissertation: 50 (total 250 marks). The marks obtained in the university exam will form the 75% of the final marks.

Credit calculation: One credit is gained by engaging in 16 hours of direct instruction, or 32 hours of self-study; Marks of each semester examination are converted into Grade points and SGPA computed as per UGC norms. CGPA is computed for the total of semester as per UGC norms.

SCHEME OF ASSESSMENT

The assessment system will use tools which are proven to be valid, reliable, feasible, cost effective and have an educational impact.

Internal assessment:

Each semester is divided into two terms. One subject will be taught during each term and at the end of the term the candidate will appear for the internal assessment exam. The internal assessment exam will comprise of theoretical and practical papers.

The summative marks from the internal assessment examination at the end of the 1st, 2nd and 3rd term will form the 25% of the final marks.

University examination structure:

Theoretical paper (4 papers, 100 marks each):

Six Short answer questions 6 X 10 mark = 60 marks

Two long essay answer questions 2X20= 40 marks

Total for each paper = 100 marks,

Grand theory totals = 100 x 4 = 400 marks.

The total marks of 400 will be reduced to 100 for summative mark calculation

Practical:

Practical exams = 80 marks

Viva- 20 marks

Eligibility for appearing for the university examination:

Attendance: 80 %; internal assessment marks: 50%

COMPUTATION OF GRADES AND GRADE POINTS FOR REPORTING IN TRANSCRIPTS:

The total of the marks obtained in internal (formative and summative) and final university (summative) examinations will be converted to grades as follows:

Marks obtained by candidate (a)	Equivalent grade letter (b)	Grade descriptor (c)	Grade point (d)	Credit for the course (e)	Credit point (credit x grade) (cxd)
85 % and above	O +	Outstanding	10		
75-84	O	Excellent	9		
65-74	A+	Very good	8		
60-64	A	Good	7		
55-59	B+	Above average	6		
50-54	B	Average pass	5		
40-49	C	Conditional pass	4		
39 and below	F	Reappear			

Illustration of Computation of CGPA and format for Transcripts:

University Examinations:

Course	Credit	Grade letter	Grade point	Credit point (credit X grade)
Paper 1	3	A	7	21
Paper 2	3	B+	6	18
Paper 3	3	A	7	21
Paper 4	3	B+	6	18
Practical 1	8	A	7	56
Self-learning	8	A	7	56
TOTAL	28			190

CGPA = Credit points obtained/total no. of credits = 190/28 = 6.78

Pass Marks:

1. Candidate should secure not less than 40% in any theory paper and overall 50% in total theory marks.
2. Not less than 50% in other parts of the examination

Facility-wise infrastructure:

CIDRF laboratories are housed in clean roomswith totally controlled and regulated airflow, temperature and pressure. Of these laboratories, the culture labs (two in number with Class II and Class III biosafety cabinets) meant to culture stem cells and other cell lines in class 1000 while the other labs are class 10,000 and the corridor, as well as common areas are class 1 lakh in international standards of air purity. The servo-stabilized inverter backed up power is made available 24x7. Smoke and fire detectors and other safety measures are in place. In brief, the laboratory specific infrastructure can be summarized as follows:

Molecular Biology Facility:

- PCR thermal cycler
- Real – Time PCR
- DNA,RNA & protein gel electrophoresis
- Gel Documentation
- Mini Trans-blot apparatus
- Transblot semi-dry electrophoretic cell
- Sorvall refrigerated centrifuge
- Microcentrifuge
- Dry Bath

Developmental Therapeutics Facility:

- Microplate reader
- Orbital Shaker Incubator
- Low speed refrigerated centrifuge

Analytical Facility:

- HPLC
- TLC
- High Speed refrigerated centrifuge
- Ultrasonic Cleaner
- Solid-Phase extraction manifold

Microbiology:

- Hot Air Oven
- Shaker incubator
- PCR thermal cycler
- High speed refrigerated centrifuge

- Biosafety Cabinet Class III model A
- Fluorescent inverted phase contrast microscope
- Light microscope
- Laminar air hood

Cell Culture Facility:

- CO_2 incubator
- Class II Biosafety Cabinet model A
- Class III Biosafety Cabinet model A
- Cell Counter
- Fluorescent phase contrast microscope
- Non-refrigerated centrifuge
- Stereo Microscope

Storage Facility:

- Walk-in Cold room
- -20^0C deep freezer
- -80^0C deep freezer
- Cryo-storage

Supportive Infrastructure:

- Temperature, Pressure & Humidity regulation
- 24X7 uninterrupted power supply
- Gas manifold
- Air handling units
- RO water plant
- Generator backed power
- Personal safety system
- Air shower enabled entry and exit
- Automated fire safety system
- Communication and data server

Core Faculty:

S.No.	Name	Designation	Specialization
1	Dr. Adithan C.	Director, CIDRF	Pharmacology and Pharmacogenomics
2	Dr. Agiesh kumar.B	Deputy Director, CIDRF	Molecular Biology
3	Dr. Jayamuruga Pandian	Deputy Director, CIDRF	Molecular Biology
4	Dr. Pooja Pratheesh	Scientist, CIDRF	Molecular Biology
5.	Dr. Anitha	Scientist, CIDRF	Molecular Biology
6	Dr. Aarthi	Scientist, CIDRF	Molecular Biology
7	Dr. Uma.A.N	Scientist, CIDRF	Genetics
8	Mr. Ezhumalai	Statistician, SBV	Statistics

Adjunct faculty can be included as and when needed

Contact Address:

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MODEL QUESTIONS

Sri Balaji Vidyapeeth, Puducherry
PG Diploma in Pharmacogenomics and Personalized Medicine

Paper I

General Pharmacology, Basics of Molecular Biology and bioethics

Time: 3 hours Maximum marks: 100

1. Discuss the phase I and phase II reactions of drug metabolism with suitable examples.(20 marks)

2. Discuss different types of DNA damage and repair mechanisms. How DNA repair mechanisms are important for targeted cancer therapy. (5+10+5=20 marks)

3. Short answer questions (6 x 10 = 60 marks)

   (a) Adverse effects of a drug – types and mechanism
   (b) Enzyme induction and inhibition
   (c) Transcription: Mechanism and regulation
   (d) Restriction enzymes
   (e) Biobanking
   (f) Composition, role and responsibilities of ethics committee

MODEL QUESTIONS

Sri Balaji Vidyapeeth, Puducherry
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Paper II

Fundamentals of Pharmacogenomics and Biostatistics

Time: 3 hours Maximum marks: 100

Q1. Discuss the role of epigenetics in diseases, pharmacogenomics and as therapeutic target (10+5+5= 20 marks)

Q2. Discuss the pharmacogenomics of Cytochrome P450 enzymes. (20 marks)

Q3. Short answer questions: (6 x 10 = 60 marks)

(a) Hardy Weinberg equilibrium
(b) Genetic diversity of Indian population.
(c) Mendelian pattern of inheritance.
(d) Genome browser
(e) No parametric tests
(f) Pharmacogenomics of transporter enzymes.

MODEL QUESTIONS

Sri Balaji Vidyapeeth, Puducherry
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Paper III

Applied Pharmacogenomics and Laboratory Techniques

Time: 3 hours Maximum marks: 100

Q1. Discuss the various molecular diagnostic methods in Pharmacogenomics . (20 marks)

Q2. Discuss the role of pharmacogenomics in various phases of drug development. (20 marks)

Q3. Short answer questions: (6 x 10 = 60 marks)

(a) Biomarkers
(b) Single Nucleotide Polymorphism
(c) Genotype-Phenotype association studies
(d) HPLC
(e) NAT2 polymorphism
(f) HLA typing and hypersensitivity to drugs

MODEL QUESTIONS

Sri Balaji Vidyapeeth, Puducherry
PG Diploma in Pharmacogenomics and Personalized Medicine

Paper IV

Personalized Medicine in Clinical Practice, Ethical, Regulatory and Commercial aspects

Time: 3 hours Maximum marks: 100

Q1. Discuss the integration of personalized medicine into clinical practice of cardiovascular drugs with suitable examples. (20 marks)

Q2. Discuss the role of personalized medicine in prevention of adverse drug reactions with suitable examples (20 marks)

Q3. Short answer questions: (6 x 10 = 60 marks)

(a) Genetic counselling in pharmacogenomics
(b) IPR in pharmacogenomics
(c) Personalized medicine approach to prescribe anticancer drugs
(d) Economics of Pharmacogenetic testing in clinical practice.
(e) Regulatory guidelines for personalized therapy
(f) Ethical issues of personal genetic information.