GENOME FOUNDATION

People's Foundation with People's Participation

SYLLABUS FOR DISSERTATION

Hands on experience and Knowledge of present status of technological development in the field is essential for the aspiring students to understand the mechanisms taught theoretically and to develop critical thinking, in order to compete Internationally. Designing dissertation consists of general modules I & II and students have to select only one module out of III, IV & V according to their Interest. Under every module there are some requirements that one has to fulfil.

GENERAL MODULE (COMPULSORY FOR ALL STUDENTS)

MODULE I - INSTRUMENTATION

Knowledge about Instrumentation:

- Basic description
- Principle and working
- Troubleshooting
- Safety measures
- Protocols for various instruments

Basic Instruments:

- Weighing balance
- pH meter
- Electrophoresis unit
- Spectrophotometer
- Centrifuge (various types)
- Magnetic stirrer
- Vortex mixer
- Water bath
- Incubator (various types)
- Laminar air flow
- Refrigerators (-20, -80)

Advanced Instruments

- DNA Sequencer
- Inverted Microscope
- Automated Karyotyping
- Qubit 3.0
- Biochemistry Analyser
- Gel Documentation

GENOME FOUNDATION
C/o Prasad Hospital, 44-617/2, First Floor, IDA Nacharam, Behind Telephone Exchange, Nacharam, Hyderabad- 500 076

Instructions for Module I:

- **This Module is compulsory for everybody, in which they have to understand the mechanism and principles with full safety features before using the equipment.**
- **Students have to understand the basic principles.**
- **A Manual Book Is provided to students for guidance.**

MODULE II – PREPARATORY MODULE

Reagents:

- Basic Reagent preparation
- Calculation
- Safety while Handling
- Optimization of reagents according to need.

Instructions for Module II:

- **This Module is compulsory for everybody, in which they have to understand the preparation of Reagents and the possible hazards.**
- **Students have to understand the basic principles.**
- **All safety precautions are compulsory to follow.**

SUBJECTIVE MODULES (TO BE CHOOSEN ONLY ONE OUT OF THREE)

MODULE III – MOLECULAR BIOLOGY

DNA ISOLATION FROM:

- Peripheral blood
- Bone
- Hair
- Saliva
- Plants

DNA Fractionation:

- Gel based
- Column based

DNA Quantification:

- By Spectrophotometer
- By Qubit 3.0
- By Electrophoresis

Polymerase Chain Reaction (PCR)

- Amplification of targeted DNA sequence
- Visualization of amplified product
- ExoSap/Column treatment

Pre Sequencing treatment

- Sequencing PCR products
- Sodium Acetate treatment

Sequencing with 3500 Genetic Analyser, as per need:

- Sanger Sequencing
- Fragment analysis
- DNA Fingerprinting
- Genotyping

Analysis employing Bioinformatics:

- General Information about Databases and their types
- Primer designing
- DNA alignment
- Sequence analysis
- Phylogenetic trees
- Haplogrouping
- Population networking
- Heat mapping
- Principal component analysis
- Conclusion

Instructions for Module III:

- **Students interested in some novel work has to collect samples (Blood, Bone, Hair) if possible, else they have to work on available samples at the Genome Foundation.**
- **It will be best if the desiring students can bring 10-20 tribal blood samples** (5-10 ml each in EDTA vacutainers which can be provided by the Genome Foundation on demand) **for themselves, any interesting observation can be published jointly with the student name and supervisor.**
- **Students will be assigned their projects immediately after joining.**

MODULE IV- CYTOGENETICS

Preparatory techniques:

- Sterilization and its maintenance
- Working in cell culture room

- Handling of equipment
- Understanding cell cultures

Cell Culture for Chromosome Preparation:

- Initial setup
- Media preparation
- Isolation of blood sample
- Incubation

Harvesting Cells for Chromosome Analysis:

- Pre-treatment
- Arrest of Metaphases
- Post-treatment
- Fixation

Slide preparation:

- Slide processing
- Dropping cells on the slide
- Slide aging/incubation
- Chromosome banding
- Staining of chromosome

Karyotyping:

- Visualization under microscope
- Recognising chromosomes
- Karyotyping chromosomes
- Interpretations and diagnosis
- Result

Types of Chromosome Banding:

- **G-** BANDING
- **C-** BANDING
- **R-** BANDING
- **Q-** BANDING

Other Techniques

- FISH

Instructions for Module IV:

- **Students have to collect samples from hospitals co-ordinated by the Genome Foundation.**
- **Any novel observation can be published.**

- **Students will be assigned their projects immediately after joining.**

MODULE V- MICROBIOLOGY

Understanding Microbiology:

- Basics
- Understanding Microbes
- Sterilization process
- Culture types
- Media preparation

Preparation of cultures:

- From Soil, Air, Water, Tissue, Animal Faeces

Techniques of Microbiology:

- Serial dilution
- Exposure method
- Pure culture technique.
- Pour plate technique.
- Spread Plate Technique.
- Streaking/spreading methods
- Gram staining

Advanced Techniques:

- Antibody sensitivity test
- Minimum inhibitory concentration test

Molecular Blended Microbiology:

- Competent cell preparation
- Plasmid isolation
- Restriction digestion
- Ligation
- Transformation
- Blue-White Screening
- Cloning PCR products

Instructions for Module V

- **Students have to follow the strict sterilization procedures.**
- **They have to present a medical fitness certificate for working in Module 3.**
- **Students will be assigned their projects immediately after joining.**