DEPARTMENT OF COMPUTATIONAL BIOLOGY AND BIOINFORMATICS
UNIVERSITY OF KERALA

MPhil. PROGRAMME IN BIOINFORMATICS
SYLLABUS

Under Credit and Semester System w. e. f. 2016 Admissions
DEPARTMENT OF COMPUTATIONAL BIOLOGY AND BIOINFORMATICS
UNIVERSITY OF KERALA

SYLLABUS
MPhil. PROGRAMME IN BIOINFORMATICS

PROGRAMME OBJECTIVES

- To impart moderate programming skills of relevance in processing bioinformatics data.
- To impart necessary mathematical knowledge that underpins various concepts in Bioinformatics.
- To expose students to popular genomic and proteomic databases and to impart knowledge and skills in processing and analyzing genomic data.
- To introduce students to advanced topics in bioinformatics and allied areas including systems biology, synthetic biology, drug discovery and modelling.
- Considering the heterogeneous nature of students admitted into the programme, to impart generic knowledge and skills in the field of life science and computer science.

STRUCTURE OF THE PROGRAMME

<table>
<thead>
<tr>
<th>Semester No.</th>
<th>Course code</th>
<th>Name of the course</th>
<th>Number of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>BIN-711 (I)</td>
<td>Research Methodology</td>
<td>4</td>
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<tr>
<td></td>
<td>BIN-712 (I)</td>
<td>Introduction to Bioinformatics</td>
<td>4</td>
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<tr>
<td></td>
<td>BIN-713 (I)</td>
<td>Advanced Bioinformatics</td>
<td>4</td>
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<td></td>
<td>BIN-714 (I)</td>
<td>Bioinformatics and Molecular Biology Lab</td>
<td>4</td>
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<td></td>
<td>BIN-715 (I)</td>
<td>Applied Mathematics &amp; Scientific Computing</td>
<td>0</td>
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<tr>
<td></td>
<td>BIN-716 (I)</td>
<td>Introduction to Informatics (E)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>BIN-717 (I)</td>
<td>Introduction to Biosciences (E)</td>
<td>0</td>
</tr>
<tr>
<td>II</td>
<td>BIN-721 (I)</td>
<td>Dissertation</td>
<td>20</td>
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<tr>
<td></td>
<td></td>
<td>TOTAL CREDITS</td>
<td>36</td>
</tr>
</tbody>
</table>
AIM: To expose students to creative and critical thinking skills as relevant to a scientific research and innovation process and introduce the student to current professional issues in research process and allied areas.

COURSE OBJECTIVES:

- To develop an in-depth understanding of the scientific method and research process management.
- To trigger the creativity of students.
- To temper research attitudes and skills.
- To create awareness about current issues related to research management and ethics.

COURSE CONTENT

Module I: Creativity, Innovation & Thinking Skills: Various views on creativity; characteristic features of creativity; stimulating creativity; obstructions to creativity; creativity & innovation, creativity & craft; Thinking skills: critical thinking, logical thinking – inductive & deductive logic – common logical fallacies; Problem solving strategies, Visual thinking- Mind mapping; Lateral thinking.

Module II: Research and Scientific Method: Various outlooks on Research; Types of research: pure versus applied, incremental versus innovative, qualitative versus quantitative; Philosophy of science; the scientific method, evolution & philosophy, falsifiability, the research process – creative question – hypothesis – planning and designing of experiments – critical analysis – sources of errors and minimization.

Module III: Publishing Science: Formats of a science research paper – the IMRAD format – objectives of each section – reference citing styles; Proof reading & editing; Authorship models; Publication process -Peer review – single/double blind and open; Open Access publications and other emerging trends in scientific communication; case study of designing and conducting experiments, paper writing and peer review, Making effective multimedia and poster presentations, Writing research proposal, Major funding agencies.

Module-IV: Information Literacy Skills: Learning about Learning- multiple intelligences-learning styles; Active reading, listening and comprehension skills; Advanced internet search skills –Google scholar and scopus; Current awareness: TOC alerts, DB alerts, popular journals in Computational Biology & Bioinformatics (brief overview of their scope). Journal Indexing and Scientometrics, Bibliometrics and webometrics – impact factors –h, h-b and g indices – pitfalls in interpreting impact; Ethics – its role in scientific research and academics. Fabrication, falsification and plagiarism, Introduction to Latex, Reference management tools:
diigo, zotero, mind manager, endnote; Plagiarism- URKUND, Turnitin, Social Media in research.


ASSESSMENT:

End-Semester Assessment (100 marks):
3 hour written exam consisting of 30% short answer questions, 40% descriptive questions and 30% long essay questions.

REFERENCES:


ADDITIONAL REFERENCES:

• Mak, Don K., Angela T. Mak, and Anthony B. Mak. *Solving everyday problems with the scientific method: thinking like a scientist*. 2009.
• Meredith, Dennis. *Explaining research: How to reach key audiences to advance your work*. OUP USA, 2010.

**MOOC Courses**

• Ignite Your Everyday Creativity: https://www.coursera.org/learn/ignite-creativity
• Learning How to Learn: https://www.coursera.org/learn/learning-how-to-learn/outline
AIM: To introduce the students to the sequence-level understanding of genomics and allied areas and to familiarize the related data bases, tools and important problems.

COURSE OBJECTIVES:

- To impart knowledge and skills in basic Molecular Biology, Genomics, sequencing informatics
- To familiarize the concept of phylogenetics, proteomics and allied areas in Bioinformatics.

COURSE CONTENT

Module I: Basic Molecular Biology: Composition of DNA- (Chargaff’s Rule), String view of DNA, Reading frames +1, +2, +3 and -1, -2, -3, ORFs, sense/coding and anti-sense/template strands, codon-genetic code, gene expression- Transcription, translation; microsatellite, minisatellite, tandem and inverted repeats, SNPs, Basic file formats, TIGR, BLAST & FASTA file formats, Sequence Data Bases, detailed study of GenBank of NCBI- typical Gen Bank (DDBJ+EMBL) entry for DNA and RNA. Basic gene statistics–base counts, word (n-mer) frequencies, sequence logos, sequence chromatograms, sequence profiles, Codon usage bias, Genome annotation- gene finding, splice site recognition, transcription factor binding site identification, RNA structure prediction.

Module II: Sequencing Informatics: History of DNA sequencing- Maxam and Gilbert, Sangers method, Sequence alignments: Pair-wise sequence alignment, Need of Scoring schemes-Penalizing gaps; Scoring matrices for amino acid sequence alignment, PAM, Probability matrix and Log odds matrix; BLOSUM; Dot-plot visualization; Needleman-Wunch algorithm effect of scoring schemes- e values, bit scores and sensitivity specificity; BLAST and FASTA, Smith-Waterman algorithm for local alignment; Multiple sequence alignment- SP measure- n dimensional dynamic programming- Tools for local global and MSA : Clustal W, Muscle, TCoffee.


Module IV: Protein Structure: Interatomic forces and protein structure; covalent interaction, hydrogen bonds, hydrophobic and hydrophilic interaction, charge/dipole
interaction, *Vander waals* forces, steric interaction. Primary structure; 20 amino acids as structural units, peptide bonds, proteins as polypeptides. Secondary structure; Alpha helices, Beta sheets and turns, Backbone flexibility- $\Phi$ and $\psi$. Properties of amino acids- Hydrophobicity, EIIP, Molecular weight, $\alpha$ and $\beta$ propensities. Tertiary and quaternary structures, protein folding, protein domains.

**Module V: Proteomics Tools & Databases:** Protein visualization tools- Swiss PDB Viewer, Pymol. Sequence manipulation suite. Protein databases: UniProtKB/Swiss-Prot, PDB, SCOP & CATH, ProDom, PFAM; Chou Fasman method- $p(a)$, $p(b)$ and $p(turn)$ propensities, Garnier Osguthorpe and Robson(GOR) method, Threading, Homology modeling, CASP, Ab-initio prediction, Introduction to proteomic tools: Phyre, JPred, 3DPSSM, 123D, Modeller, Procheck, I-TASSER; Prediction of function. Introduction about Molecular docking dynamics & conformational energy calculation.

**ASSESSMENT:**

**End-Semester Assessment (100 marks):**
3 hour written exam consisting of 30% short answer questions, 40% descriptive questions and 30% long essay questions.

**REFERENCES:**

• Orengo C, Jones D. T., & Thornton J. M., Bioinformatics: *Genes, proteins and computers.* Garland Science, 2012

**ADDITIONAL REFERENCES**

• [http://159.226.149.45/kizszx/hpc/mpi-course.pdf](http://159.226.149.45/kizszx/hpc/mpi-course.pdf)
• BED Tools: [https://code.google.com/p/bedtools/](https://code.google.com/p/bedtools/)
• UCSC Tools: [http://hgdownload.cse.ucsc.edu/admin/exe/](http://hgdownload.cse.ucsc.edu/admin/exe/)
• IGV genome browser: [http://www.broadinstitute.org/igv/](http://www.broadinstitute.org/igv/)
• PeakAnalyzer: [http://www.ebi.ac.uk/research/bertone/software#peakanalyzer](http://www.ebi.ac.uk/research/bertone/software#peakanalyzer)
• [https://www.encodeproject.org/](https://www.encodeproject.org/)

**MOOC COURSES**

• Bioinformatics algorithms (Part 1), conducted by University of California San Diego. [https://www.coursera.org/course/bioinformatics](https://www.coursera.org/course/bioinformatics)
• Bioinformatics methods I, conducted by University of Toronto. [https://www.Coursera.org/course/bioinformaticmethods1](https://www.Coursera.org/course/bioinformaticmethods1)
• Bioinformatics: introduction and methods conducted by Peking University. [https://www.coursera.org/course/pkubioinfo](https://www.coursera.org/course/pkubioinfo)
• [https://bigdatacourse.appspot.com/course](https://bigdatacourse.appspot.com/course)
• [https://bigdatauniversity.com/courses](https://bigdatauniversity.com/courses)
• [https://www.encodeproject.org/](https://www.encodeproject.org/)
Semester : I
Course Code : BIN 713 (I)
Course Title : ADVANCED TOPICS IN BIOINFORMATICS
Credits : 4

AIM: To expose the student to current and emerging areas and techniques in Bioinformatics and allied areas so as to prepare them to take up problem solving in frontier areas.

COURSE OBJECTIVES:

- To impart knowledge and skills in systems and synthetic Biology
- To introduce the basic concepts in Programming Bioinformatics, Data science, Machine Learning and metabolomics
- To familiarize the basic concepts in Mitochondriomics and Metabolomics

COURSE CONTENT


Module III: Data Science and Machine learning: Introduction to data science, Data mining-Mining in massive datasets, Concept of Metadata, Data at rest/Data in motion, Collaborative filtering, Concepts of semantic web, Data science Methods- classification, regression & similarity matching, Soft Computing & Machine learning: Overview of soft computing techniques & Algorithms in Bioinformatics, Feature extraction, Dimensionality reduction. Pattern recognition, classification and prediction, Training and testing, Evaluation methods for classification and prediction; Hidden Markov Models (Basic Concepts only); Artificial Neural Networks (Basic Concepts only); Overview of Support Vector Machines; Genetic Algorithms (Basic Concepts only) Ant Colony Optimization: Swarm Intelligence (Basic motivation only) Soft computing tools: WEKA and applications to pattern classification and clustering. Overview of tensor flow.
Module IV: Big data: Big data Challenges, Computing facilities for analyzing big data, Overview of Genome Sequencing, Next generation DNA sequencing Informatics, Introduction to NGS technology, advantages, limitations and applications, Different methods of NGS technology:- Genomics- Whole genome sequencing, Exome sequencing, Transcriptomics- RNA sequencing, Epigenomics- MeDIP, ChIPSeq ; NGS Data analysis - Data formats, Data handling, Quality checking, preprocessing, Basic concepts about data alignment and genome assembly, Alignment analysis - Quality aware aligners- Principles and tools-BWA, Bowtie, Genome/Exome Variant calling, VCF Genome Browsers, Advanced data analysis-Denovo assemblies, different assemblers - basic principle of de bruijin graph, Application - NGS in Clinical diagnosis.

Module V: Mitochondriomics and Metabolomics: Population genetics - Mitochondrial haplogroups, Human Y-chromosome DNA haplo groups, rCRS, SNP, Mitochondrial eve, Metabolomics: Metabolism, metabolic pathways- Glycolysis, Krebs cycle, metabolomite, metabolome, metabolomic separation and analysis techniques, metabolic profiling, fingerprinting, Metabolome informatics. Resources/databases of metabolomics, applications. Basic concepts of Toxicogenomics, Pharmacogenomics, Glycomics, Metagenomics.

ASSESSMENT

End-Semester Assessment (100 marks):
3 hour written exam consisting of 30% short answer questions, 40% descriptive questions and 30% long essay questions.

REFERENCES:


Semester: I  
Course Code: BIN 714 (I)  
Course Title: BIOINFORMATICS AND MOLECULAR BIOLOGY LAB  
Credits: 4  

**AIM:** To give hands on exposure to students in basic wet-lab and informatics lab techniques covered in various courses in this programme.  

**COURSE OBJECTIVES:**  
- To familiarize students with basic wet laboratory concepts and techniques  
- To give an overview about basic microbiology and molecular biology concepts  
- To understand the basic Bioinformatics databases and algorithms used in computational biology  
- To give an overview about structural proteomics and computer aided drug design  

**COURSE CONTENT**  

**Module I:** Laboratory safety guidelines, equipment handling, Preparation of buffers, reagents and media: simple media, special media.  

**Module II:** Basic experimental concepts in Microbiology, Sterilization: dry heat, moist heat, Radiation, chemical treatment, Isolation of bacteria from different samples: soil, water and air, Microscopic examination of bacteria by simple and differential staining, bacterial colony characterization, Biochemical characterization of bacterial colonies, Antibiotic sensitivity test, Bacterial growth curve, Decontamination of microbial culture. Differential staining of blood, Blood typing, chromosome preparation: mitosis- onion root tip.  

**Module III:** Facilitating access from various Bioinformatics databases: NCBI, PDB, SWISS PROT, Pfam etc., and pairwise sequence alignment using BLAST, multiple sequence alignment tools- Clustal X, Clustal Omega, Phylogenetic Analysis – Mega.  

**Module IV:** Extraction of DNA and protein, quantification of DNA and protein, Separation techniques- chromatographic methods- paper, column, Thin layer, Electrophoresis- Agarose gel electrophoresis, Poly acrylamide gel electrophoresis, Polymerase Chain Reaction, Extraction of plant metabolites.  

**Module V:** Experiments in Genomics and structural proteomics-ORF finder, Genscan, Pymol, Rasmol, Modeling tools.  

**ASSESSMENT:**  

**End-Semester Assessment (100 marks):**  
3 hour examination consisting of 30% for major experiments, 40% for minor experiments, 10% for lab report and 20% for course viva voce.  

**REFERENCES:**  

ADDITIONAL REFERENCES:
http://www.ncbi.nlm.nih.gov/books/NBK143764/
AIM: The course serves to provide basic overview of Mathematical concepts of Applied Mathematics relevant to Bioinformatics and introduce the use of scientific computing tools, aimed at students from non-technical background.

COURSE OBJECTIVES:
- To revive basic concepts in mathematics studied so far
- To reinforce fundamental concepts of higher mathematics through Scilab exercises
- To introduce basic algebra and calculus
- To introduce probability and allied areas
- To understand the use of statistical methods in analyzing biological data

COURSE CONTENT

Module I: Number systems, real numbers, rational numbers and complex numbers (basic operations only), solving equations- first-order equations, quadratic equations, simultaneous linear equations, introduction to vectors and matrices: scalars & vectors, addition, subtraction, dot, cross & scalar triple products basic operations, inverse of a matrix, solution of simultaneous equation by using matrix, Eigen value, Eigen vector (basic concepts using 2*2 matrix only). Scilab: basic environment, data types, variables, operators, built-in functions and user defined function, matrix processing, and toolbox overview.

Module II: Functions, inverse functions, exponentials and logs, e-to represent natural growth and decay, circles and angles, straight lines, angles, area and volume, Pythagoras’ theorem, basic trigonometric functions: sine and cosine, sinusoidal oscillations, amplitude, frequency and phase of sinusoidal oscillation, damped oscillations, waves, Fourier series- basic introduction only, introduction to trigonometric Scilab functions.

Module III: Differentiation: slope of a straight line, average and instantaneous rates of change, slope of a curve, differentiating simple expressions, differentiating a sum of two functions, maximum and minimum points, points of inflexion, sketching graphs integration: the area under a curve, integration as reverse process of differentiation, integrating simple expressions, definite and indefinite integrals, introduction to differential calculus and integration Scilab tool box.

Module IV: Statistics and Probability : importance of data handling, continuous and discrete data, pie charts and column graphs, histograms, sample mean, variance and standard deviation, median, range and interquartile range, covariance and correlation probability: permutation and combination, definition of probability, basic problems, conditional probability, Bayes theorem- intro only probability distributions- binomial, Poisson and normal distribution, probability mass functions of distributions, Familiarization of statistical toolbox.
Module V: Statistical inference and Graph theory: Interpreting confidence intervals, hypothesis testing using test statistics, hypothesis test when the population variance is estimated (t tests), Pearson's chi-square test for goodness-of-fit for categorical data. Graph terminology: edges, vertices, loop, path, circuit, bridge, Euler's path; graph representation: adjacency matrix, incident matrix. Graphs: null, complete, regular, bipartite and complete bipartite.


REFERENCES:

AIM: This course is aimed at students with non-IT background, to enable them to understand basic concepts and acquire moderate skills in selected computing tools/systems.

COURSE OBJECTIVES:

- To review the basic concepts in the field of Informatics and basic programming
- To enable the students to understand basic concepts and acquire moderate skills in selected computing tools/systems
- To give an overview of Programming languages and Web Programming

COURSE CONTENT

Module I: Review of IT Fundamentals: Social and Ethical aspects of IT; Data, information, knowledge; Introduction to Hardware (CPU, memory, storage, etc.); Role of IT in Bioinformatics; Introduction to problem solving: algorithms, flow charts; Introduction to networking: Types of networks, world wide web; distributed computing; Introduction to Programming: Elements of classical programming- Syntax and Semantics; Primitives: Data types, built-in data, built-in functions; combination: Setting Expressions, Operators, Control structures, Subroutines; Abstraction: Naming Variables, Data and procedure abstraction; Capturing common patterns: Object oriented concept, classes, objects, Inheritance; Execution environment: Tools, interpreter, compiler, Debugger, Executable files.

Module II: Overview of classic Programming languages & Web programming: Basics of C: Basic data types, writing a subroutine in C; Basics of C++: Basic datatypes, writing a subroutine in C ++, Basic Object Oriented concepts in C++; Overview of Java: JVM, Running a simple program in Java; Basic Web Programming: Introduction in to HTML5, Basic tags, Creating web pages & forms with basic tags; Styling Web pages with basic CSS3; Making Dynamic web pages with JavaScript: Basic Datatypes & Operators, Writing basic JavaScript programs for HTML pages.

Module III: Scripting Languages for Bioinformatics-I: Python: Python environment, IDLE, Core Containers, Basic Operators & Control Structures, File Handling, Creating Modules & Packages, Regular Expressions, Basic Object Oriented concepts, CGI programming, Database connectivity, Bio-Python.


REFERENCES:

• Thareja, Reema. *Introduction to C programming*. Oxford University Press, 2015.

ADDITIONAL REFERENCES:

• A byte of Python  http://python.swaroopch.com/
• An introduction to interactive programming in Python, conducted by Rice University  https://www.coursera.org/course/interactivepython.
• Dive into Python  http://www.diveintopython3.net/
• Google's Python Class  https://developers.google.com/edu/python/?hl=de-DE&csw=1
• http://learn.perl.org/tutorials/
• http://www.bioperl.org/wiki/BioPerl_Tutorial
• http://www.ebi.ac.uk/~lehvasla/bioperl/BioperlOverview.html
• https://www.perl.org/books/beginning-perl/
• https://www.perl.org/books/beginning-perl/
• Learn Python the Hard Way  http://learnpythonthehardway.org/book/

MOOC COURSES:

• Computer-fundamentals :  https://www.coursera.org/specializations/computer-fundamentals
• Learn/logic-introduction :  https://www.coursera.org/learn/logic-introduction
• Python Programming:  https://www.coursera.org/specializations/python
• Programming for everybody (Python), conducted by University of Michigan.  https://www.coursera.org/course/pythonlearn.
AIM: To give a bird's eye view of Bioscience and to introduce basics of Biotechnology with specific reference to their application in Bioinformatics, aimed at students from non-life-science background.

COURSE OBJECTIVES:
- To introduce students to basic concepts and theories in the field of biosciences
- To give an overview about basic Molecular Biology concept
- To introduce the concepts in Biotechnology and various techniques rDNA technology

COURSE CONTENT

Module I: Basics of Biology: Characteristics of Life; Levels of organization in nature: from atoms to biosphere; Different Kingdoms; Branches of Biology; Cell Biology: Cell as the structural and functional unit of life, Cell theory, Structural components of a cell, Types of cells, Comparison between plant and animal cells, Evolution: Evolution at molecular level, Mutations, Cell division.

Module II: Basics of Biochemistry: Biomolecules and its properties; Acids and bases; Other small molecules: sugars, fatty acids, amino acids, nucleotides; Macromolecules: Monomer, Polymer, Carbohydrates, Lipids, Proteins, Nucleic acids; Cofactors and vitamins.

Module III: Basics of Genetics: Definition and scope of genetics, Inheritance of acquired characters, Genotype and phenotype, Mendel’s principles, Multiple alleles-definition; Flow of genetic information, Gene structure, Expression and regulation

Module IV: Basics of Biotechnology: What is Biotechnology, Recombinant DNA technology, Putting new genes into cells, Genetic engineering, Gene cloning Vs Animal cloning, PCR, DNA probes, DNA fingerprinting, gene therapy.

REFERENCES
AIM: To expose students to international project practices, through a real-life project work under time and deliverable constraints, applying the knowledge acquired through various courses, aiming at some original work.

COURSE OBJECTIVES:

- Students are required to carry out a 4-6 month individual project and submit a dissertation embodying the findings of the same.
- Being an M. Phil level dissertation, some original work is expected. The dissertation shall be evaluated by an external examiner as public viva voce and open to all faculty members of the Department, research scholars and interested experts/researchers/students.
- The project work is to be done preferably in an external organization of repute such as national R and D institutions or global IT/BT companies.
- Students should maintain Lab Note Books; with one page brief report for each day. Lab note books shall form a component for evaluation and shall be presented to the external examiner, if demanded.
- Internal evaluation shall be based on project progress reports submitted on a monthly basis. Along with it, a student peer review should also be given.
- Students are expected to spend a minimum of clear 8 hours per day, ideally 10-12 hours.
- Students are required to (i) give a handwritten anti-plagiarism statement and (ii) submit a verification report from URKUND, recommended by UGC. Plagiarism will not be condoned on whatever excuse. Overlap of less than 10% (excluding) shall be considered as unavoidable.

COURSE CONTENT:

Students need to solve an independent problem in Bioinformatics/Computer Aided Drug Design or allied areas, which involves 4-6 months of intellectual activity including documentation. The students are required to make a 20 min presentation of the project which will be evaluated by an external examiner.

The Viva shall, in addition to evaluation of project work, also attempt to gauge overall professional development of the student and also the generic subject awareness and knowledge of the student. Appendix I - describes project practices and evaluation components.
APPENDIX-I

DOCKETS INDICATING VARIOUS PHASES OF PROJECT MANAGEMENT

PART-A: PROJECT PLANNING DOCKET

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Name of the Student:</td>
</tr>
<tr>
<td>2.</td>
<td>What broad area would you like to work?</td>
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<tr>
<td>3.</td>
<td>List five areas of your interest:</td>
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<tr>
<td>4.</td>
<td>State your understanding of how an M. Phil project is different from a MSc. project.</td>
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<tr>
<td>5.</td>
<td>What are the general objectives of a Project work?</td>
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<tr>
<td>6.</td>
<td>List 5 skill sets you have in relation to your project work?</td>
</tr>
<tr>
<td>7.</td>
<td>List three Institution and guides in consideration. (Summary of their work that interests you (attach as appendix if lengthy), Skill sets required, Constraints, Name of Guide, His/her current area of work, Full Address.</td>
</tr>
<tr>
<td>8.</td>
<td>Does the institution have date/ skill/ fee or other constraints? Briefly note</td>
</tr>
<tr>
<td>9.</td>
<td>In case of institutions other than DCBB, please mention logistics like a. Arrangements for stay b. Living Expenditure and/or Fees (affordable?) c. Support from family. Mention 3 Key advantages of doing project in the concerned institution and three challenges that you envisage.</td>
</tr>
<tr>
<td>10.</td>
<td>Do you plan for a publication? Mention (title of the paper, one target journal).</td>
</tr>
<tr>
<td>11.</td>
<td>How many hours of work /day are you prepared to put in during the project? How will you raise so many hours? What changes will you make in your current routine?</td>
</tr>
<tr>
<td>12.</td>
<td>Have you read any past M. Phil? Give a brief summary of it and add 3 critical observations.</td>
</tr>
<tr>
<td>13.</td>
<td>Key resource persons you would like to consult regarding your project.</td>
</tr>
<tr>
<td>14.</td>
<td>Your choice of (i) Internal supervisor and (ii) Assistant supervisor.</td>
</tr>
<tr>
<td>15.</td>
<td>Remarks by Project advisory Committee.</td>
</tr>
</tbody>
</table>

PART-B: PROJECT PROGRESS REPORTING DOCKET

*Regular documentation is required to ensure that meaningful monitoring and management of project work is carried out. This docket to be submitted thrice during project period. You are also encouraged to record key discussions and minute them as appendix.*

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<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>Name of Student:</td>
</tr>
<tr>
<td>2</td>
<td>Name(s) of Guide(s):</td>
</tr>
<tr>
<td>3</td>
<td>No. of weeks elapsed after beginning of the project:</td>
</tr>
<tr>
<td>4</td>
<td>List 2 keywords to describe the project:</td>
</tr>
<tr>
<td>5</td>
<td>List couple of papers published in journals which directly relate to the area of proposed work.</td>
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<tr>
<td>6</td>
<td>List 2 areas of basic knowledge that are directly related to the project work.</td>
</tr>
<tr>
<td>7</td>
<td>List 2 tools/ skills required to do the project.</td>
</tr>
<tr>
<td>8</td>
<td>List 2 prominent researchers in the field who are currently active in the area.</td>
</tr>
<tr>
<td>9</td>
<td>List 2 journals in which papers of this area are appearing</td>
</tr>
<tr>
<td>10</td>
<td>List some books which deal with basics of your project area.</td>
</tr>
<tr>
<td>11</td>
<td>List 2 upcoming conferences you would like to attend.</td>
</tr>
<tr>
<td>12</td>
<td>List 2 strengths you have to do this project</td>
</tr>
<tr>
<td>13</td>
<td>List 2 areas of weakness in doing this project (also say how you propose to overcome them)</td>
</tr>
<tr>
<td>14</td>
<td>List a possible title of paper that you could publish on your project.</td>
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<tr>
<td></td>
<td>List 2 possible titles of your thesis.</td>
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<tr>
<td>---</td>
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<tr>
<td>16</td>
<td>List the possible titles of your thesis chapters.</td>
</tr>
<tr>
<td>17</td>
<td>List 2 challenges you are facing:</td>
</tr>
<tr>
<td>18</td>
<td>List 2 deliverables of your project.</td>
</tr>
<tr>
<td>19</td>
<td>Write in one sentence the up to date Synopsis of your project.</td>
</tr>
<tr>
<td>20</td>
<td>Write in one paragraph (4-5 sentences), the up to date Synopsis of your project.</td>
</tr>
<tr>
<td>21</td>
<td>Attach hand out / print out of the following PPTs. i) 1 slide PPT describing your project (This should capture the essence of the work in compact graphics). ii) 10 slide PPT describing your project.</td>
</tr>
<tr>
<td>22</td>
<td>What are your major achievements in the reporting period?</td>
</tr>
<tr>
<td>23</td>
<td>What are your immediate milestones and estimated dates to reach them?</td>
</tr>
<tr>
<td>24</td>
<td>Papers read in the last month with a 2-3 sentence comment in your own words and also mentioning the open questions identified.</td>
</tr>
<tr>
<td>25</td>
<td>Lectures / Conferences / Training attended with 2-3 sentence summary/outcome.</td>
</tr>
<tr>
<td>26</td>
<td>Write an appreciation of your work during last month.</td>
</tr>
<tr>
<td>27</td>
<td>Write a criticism of your work during last month.</td>
</tr>
<tr>
<td>28</td>
<td>Describe your recent library usage. Key subject books you read; Key non-subject books you read; Key online resources you read:</td>
</tr>
<tr>
<td>29</td>
<td>Is there any query you would like to make to your supervisor?</td>
</tr>
<tr>
<td>30</td>
<td>What are some of the issues (intellectual as well as otherwise) you face in project? (Also mention personal circumstances which prevent full output.)</td>
</tr>
<tr>
<td>31</td>
<td>Rate your motivation level now: Poor/Average/Good /Very Good/Excellent.</td>
</tr>
<tr>
<td>32</td>
<td>Is there some specific query/request that you wish to make to your guide?</td>
</tr>
</tbody>
</table>

**RATING OF PROGRESS (in percentage)**

Your Own Rating of Progress since the last report, Guide’s Rating of Progress since the last report, Your own Rating of **Total Progress**, Guide’s Rating of **Total Progress**.

---

### PART-C: FORM FOR STUDENT PEER REVIEW OF PROJECTS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Name:</td>
<td></td>
</tr>
<tr>
<td>Title of project you are reviewing:</td>
<td></td>
</tr>
<tr>
<td>Name of Project student:</td>
<td></td>
</tr>
<tr>
<td>Give 5 positive aspects of the project:</td>
<td></td>
</tr>
<tr>
<td>Give 5 aspects that need improvement:</td>
<td></td>
</tr>
<tr>
<td>Do you find the quantum of work comparable to your own?</td>
<td>YES/NO</td>
</tr>
<tr>
<td>Do you find the quantum of references compared to your own?</td>
<td>YES/NO</td>
</tr>
<tr>
<td>What are your suggestions for enhancing the quality of work?</td>
<td></td>
</tr>
<tr>
<td>Are there books/web resources/journal papers/persons that you would like to suggest to the project student for drawing knowledge?</td>
<td></td>
</tr>
</tbody>
</table>
# PART-D: INTERIM REVIEW REPORTS BY INTERNAL SUPERVISOR

<table>
<thead>
<tr>
<th>Name:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of Project</td>
<td></td>
</tr>
</tbody>
</table>

**Quick Remarks (Scale of 5/4/3/2/1/0)**

| Satisfactory Progress: | |
| Technical correctness of methodology: | |
| Sufficient use of knowledge resources (References): | |
| Good library usage: | |
| Good work habits: | |
| Satisfactory maintenance of lab Note Book: | |
| Student Peer Review and use: | |
| Satisfactory Attendance: | |

**Remarks on Technical Progress of Work:**

**General Advices on bettering project work**

**Specific reply to questions, if any, raised by student in Progress Report**

**Any ‘To-Do’ before Next Review:**

---

# PART-E: MPHIL FINAL EVALUATION REPORT

**PAGE-1: DATA TO BE FILLED-IN BY STUDENT**

1. **Name of Student**
2. **Title of Thesis**
3. **Supervisors:**
4. **Total no. of pages in Dissertation**
5. **No of pages of the final chapter (Conclusions and future work)**
6. **Total no of references**
7. **Have you taken peer reviews from other students?** YES/NO
8. **Give three key achievements in your project work.**
9. **Give three weak aspects of project work and dissertation**
10. **If you were asked to say in one sentence, the abstract of your project, what would you say?**
11. **What were the unanswered questions you identified at the end of the project?**
12. **Have you ensured that every sentence in your dissertation is your own?** YES/NO
13. **Have you cited any long paragraph as such with/without giving references?** YES/NO
   **Are all images, table, etc. your own, or sources cited clearly?** YES/NO
   **Have you verified the format of the dissertation based on instructions?** YES/NO
   **Have you separately checked the punctuation and formatting, including reference section?** YES/NO

**Dated Signature**

**Enclosures to be provided by students**

1. **One page synopsis including key references**, 2. **Lab Notebook**, 3. **Three project progress reports and corresponding assistant supervisors review report**, 4. **Peer review reports by fellow students**.
### EVALUATION COMPONENTS & SUB COMPONENTS (Weightage out of 100 in brackets)

<table>
<thead>
<tr>
<th>EVALUATION COMPONENTS</th>
<th>GRADE</th>
</tr>
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<tbody>
<tr>
<td><strong>1. PROJECT MANAGEMENT (15)</strong></td>
<td>A-Outstanding, B-Excellent, C-Good, D-Average, E-Below, F-Fail.</td>
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<tr>
<td>Lab Note Book is regular &amp; detailed (5)</td>
<td>A/B/C/D/E/F</td>
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<tr>
<td>Detailed &amp; Precise Progress Reports (5)</td>
<td>A/B/C/D/E/F</td>
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<tr>
<td>Regular Peer Review/Supervisor review &amp; Action (5)</td>
<td>A/B/C/D/E/F</td>
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<tr>
<td><strong>2. PROJECT REPORTING (10)</strong></td>
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<tr>
<td>Scientific Reporting Standards, Formatting (5)</td>
<td>A/B/C/D/E/F</td>
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<tr>
<td>Avoidance of Plagiarism, Citing Practice(5)</td>
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<td><strong>3. TECHNICAL WORK (40)</strong></td>
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<td>Quantum of work (10)</td>
<td>A/B/C/D/E/F</td>
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<td>Meetings Objectives (10)</td>
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<tr>
<td>Demonstration of Results (10)</td>
<td>A/B/C/D/E/F</td>
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<tr>
<td>Originality (Some originality in work is mandatory) (10)</td>
<td>A/B/C/D/E/F</td>
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<td><strong>4. SCHOLARSHIP (15)</strong></td>
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<td>Critical Analysis in concluding chapter (5)</td>
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<td>Contextualizing the work (5)</td>
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<td>Knowledge as demonstrated in Viva (5)</td>
<td>A/B/C/D/E/F</td>
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<td><strong>5. COMMUNICATION SKILLS (10)</strong></td>
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<tr>
<td>Presentation Skills in Viva (5)</td>
<td>A/B/C/D/E/F</td>
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<tr>
<td>Use of language in Dissertation (5)</td>
<td>A/B/C/D/E/F</td>
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<tr>
<td><strong>6. OVERALL IMPRESSION (10)</strong></td>
<td>A/B/C/D/E/F</td>
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<tr>
<td><em><em>Total Marks (out of 100</em>)</em>*</td>
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*Converting Grades to Marks*

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<th>MAX</th>
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<th>C</th>
<th>D</th>
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