DEPARTMENT OF GENETICS
M..D. UNIVERSITY ROHTAK

Scheme of Examination of Pre-PhD (Course Work) Examination

Paper no	Nomenclature	Max Marks	Internal assessment	Theory	Time
Genet-CW-I	Research methodology	100	20*	80	3Hrs
Genet-CW-II	Biostatistics & Computers	100	20*	80	3Hrs
Genet-CW-III	Tool and Techniques in Genetics	100	20*	80	3Hrs

* Following will be criteria for the award of Internal Assessment:-
   a)   Attendance   :   5 Marks
          Less than 65 %   :   0 mark)
          65 to 70 %   :   2 marks)As per ordinance of PG classes
          71 to 75 %   :   3 marks)
          76 to 80%   :   4 marks)
          Above 80%   :   5 marks)

   b)   Assignment/ Presentation   :   5 Marks
   c)   Written Test   :   10 Marks

                                                  Head, Deptt. of Department

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SYLLABUS OF COURSE WORK FOR PhD

Genet-CW-I: RESEARCH METHODOLOGY

Instructions for paper setter
There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight to ten short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each of the four units. They will attempt five questions in all.

Max. Marks: 80
Time: 3 Hrs.

UNIT I
Meaning of Research in Biological Sciences - Purpose, Characteristics and Types of Research - Process of Research -Formulation of objectives - Formulation of Hypotheses - Types of Hypotheses - Methods of testing Hypotheses - Research plan and its components - Methods of Research (Survey, Observation, case study, experimental, historical and comparative methods) - Difficulties in Biological research.

UNIT II
Identification and formation of research problem (Hypothesis). Elements in research methodology: Research design (CRD, RBD, LSD). Scientific database: Science Direct and Pubmed.

UNIT III
Ethical, legal, social and scientific issues in Biological Research. A brief idea about the funding agencies such as DST, DBT, ICMR, CSIR and UGC. Role of IPR in Research and Development.

UNIT IV
Writing of Research Proposal, Report and Research Paper: Meaning and types - Stages in preparation - Characteristics - Structure - Documentation: Footnotes and Bibliography - Editing the final draft-Evaluating the final draft- Checklist for a good proposal/report/research paper.
Basic knowledge of organizing conferences, symposia, workshop, exhibition etc.

Books Recommended:

- Research Methodology- G.R. Basotia and K.K. Sharma.
- Research Methodology- C.H. Chaudhary, RBSA Publication

Genet-CW-II: BIOSTATISTICS & COMPUTER

Instructions for paper setter
There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight to ten short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each of the four units. They will attempt five questions in all.

Max. Marks: 80
Time: 3 Hrs.

UNIT I
Variables in Biology, Collection, classification and tabulation of data. Frequency distribution, Diagrammatic and Graphical presentation of statistical data, Sampling techniques. Specific applications of measures of Central tendency, Dispersion, Skewness and Kurtosis in research. Measures of Relationship: Correlation – Simple, Partial and multiple- Regression- Simple and multiple-Association of Attributes – applications in research.

UNIT II
PROBABILITY: - Meaning, Fundamental Concepts, Approaches to measurement of Probability, Random experiments, sample space, events. Mathematical definition of probability of an event. Use of permutations and combinations in calculation of probability.
PROBABILITY DISTRIBUTIONS: - Distribution of binomial, poisson and normal variables and their fittings only Binomial, Poisson and Normal, (areas method only) Distributions (including problems).

UNIT III
Sample statistics and parameters, population null hypothesis, level of significance. Definitions and applications of Chi-square test,'t' and 'f' test.
Meaning of analysis of variance with linear models. Analysis of variance for one-way classified data, analysis of variance for two-way classified data

UNIT IV
Computer Basics: Course introduction, MS Windows basics, UNIX basics, File management, E-mail (PINE, EUDORA, Internet mail), File Transfer (ftp, WSftp).
Office Applications: MS Office 2000/XP including MS Word, MS Excel, MS Power Point.

Books Recommended:

- Elements of Biostatistics in Health Science- W. Daniell.
- Statistical Methods for Research: S. Singh et al (1988) Central Publishing Ludhiana.
- Fundamental of Statistics – D. N. Enhance.
- Statistical Methods: S.P. Gupta. S. Chand Publication
- Fundamentals of Biostatistics- Khan and Khanna, Ukaz Publication
- Biostatistical analysis- Zerold and Jar.

Genet-CW-III: Tools and Techniques in Genetics

Instructions for paper setter
There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight to ten short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each of the four units. They will attempt five questions in all.

Max. Marks: 80
Time: 3 Hrs.

Unit-I
General Principles of gene cloning: Isolation and purification of DNA, RFLP analysis, DNA fingerprinting and its application, Principles and techniques of nucleic acid hybridization and cot curves, sequencing of nucleic acids, Southern, Northern and Western blotting techniques, Preparation of probes, Polymerase Chain reaction, RT-PCR, Methods for measuring nucleic acid and protein interaction.

Unit - II
Biophysical methods: Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, Crystallography, Structure determination using X-ray diffraction and NMR, Different types of mass spectrometry and surface plasma resonance methods, Protein sequencing.

Unit - III
Bioseparation techniques: Principle & application of gel filtration, ion exchange & hydrophobic interaction chromatography, thin layer chromatography, gas chromatography; High pressure liquid chromatography (HPLC), Fast Protein Liquid Chromatography, Electrophoresis (agarose and page); Isoelectric-focussing (IEF); Ultracentrifugation (Velocity and buoyant density).

Unit – IV
Radio labeling techniques: Properties of different types of radioisotopes normally used in biology, their detection and measurement; incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines
Computational methods: Nucleic acid and protein sequence databases; data mining methods for sequence analysis, web-based tools for sequence searches, motif analysis and presentation.

Suggested Books:
1. Molecular cloning A Laboratory Manual 3rd edition Vol. 1, 2, 3- Sambrook and Russell, Churchill press, 2007
2. Principals and Techniques of Biochemistry and Molecular Biology, Edited by Keith Wilson and John Walker, Sixth Edition, Cambridge University Press.