

DEPARTMENT OF GENETICS
MAHARSHI DAYANAND UNIVERSITY, ROHTAK-124001, INDIA
(A⁺ Grade University Accredited by NAAC)
Web site: <http://www.mdurohtak.ac.in>

Ph.D. COURSE WORK IN GENETICS

Duration: One Semester (Six months)

Total Credit requirement: 12 credits

Program Structure: Ph.D. Coursework in Genetics

Program specific Outcomes

PSO-1: Ph.D. coursework in Genetics is to provide students the foundations for research in Genetics and to impart the knowledge of basic principles and novel techniques with respect to various aspects of research.

PSO-2: Student will be enabled to explore, formulate and analyze challenges and research problems related to field of Genetics and Life Science.

PSO-3: Student would be confident enough to formulate research projects for finding as well as to execute the research projects.

PSO-4: Ability to design and conduct experiments with novel ideas, techniques, skills, and to analyze and interpret data for Ph.D. Programme

Scheme of Examinations						
SEMESTER 1						
Course Code	Nomenclature of Course	External	Internal	Total marks	Hours /Week	Credits
23GENPH11C1 (Compulsory for all Ph.D. Course work)	Research Methodology	70	30	100	4	4
23GENPH11C3	Tools and Techniques in Genetics	70	30	100	4	4
23GENPH11C4	Biostatistics	35	15	50	2	2
23MPCC1 (Compulsory for all Ph.D. Course work)	Research and Publication Ethics*	50		50	2	2
Total marks/Credits		300		300	12	12

*Note: The course on 'Research and Publication Ethics' course code 23MPCC1 shall be offered by Ch. Ranbir Singh Institute of Social and Economic Change for all UTDs/Centres/Institutes passed vide Resolution No. 27 of the 271st meeting of EC held on 29.7.2020.

DEPARTMENT OF GENETICS
SYLLABUS
23GENPH11C1: RESEARCH METHODOLOGY

Name of the Program	Ph.D. Course work in Genetics	Program Code	GENPH
Name of the Course	Research Methodology	Course Code	23GENPH11C1
Hours/Week	4	Credits	4
Max. Marks.	100	Time	3 Hours
Marks Internal =30 External = 70 Course Objectives: 1. To provide understanding about research plan and its components. 2. To explain role of ethical, legal, social and moral implications of research 3. To explain the role of IPR and various funding agencies in research. 4. To provide knowledge for organizing conferences, symposia, workshop, exhibition etc. at national and international level.			
Course Outcomes: 1. Understanding of basic concepts of research and its methodologies. 2. Organizing and conducting of research workshop in light of ethical, social & legal considerations. 3. Knowledge of preparing a research project proposal for financial assistance. 4. Well conversed in research problem formulation, hypothesis construction and selection of appropriate research designs.			
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 National and International funding agencies, 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, Bibliography, Editing and Evaluating the final draft, Checklist for a good proposal/report/research paper. Basic knowledge of organizing conferences, symposia, workshop, exhibition etc.			
References:			
1.Holland, C. J., Canuso III, V. A., Reed, D. M., Lee, S. H., Kimmel, A. I., & Peterson, W. K. (2007). Intellectual Property: Patents, Trademarks, Copyrights and Trade Secrets (Entrepreneur Magazine's Legal Guide). Entrepreneur Press. 2. Krause, S. D. (2007). The Process of Research Writing. Steven D. Krause. 3. Laake, P., Benestad, H. B., & Olsen, B. R. (Eds.) (2007). Research Methodology in the Medical and Biological Sciences (M. M. Brady, Trans.). Elsevier Ltd. (Original work published 2004). 4.Marczyk, G., DeMatto, D., & Festinger D. (2005).Essentials of Research Design and Methodology (A. S. Kaufman, & N.L. Kaufma, Eds.).John Wiley & Sons, Inc. 5. Mishra, S.B., & Alok, S. (2017). Handbook of Research Methodology. Educreation 6. Gurumani,N.(2013).Research methodology for Biological Sciences. 7. Laake,P., Benestad, H., & Olsen,B .R.(2007) Research methodology in the medical and Biological Sciences.			

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23GENPH11C3 – TOOLS & TECHNIQUES

Name of the Program	Ph.D. Course work in Genetics	Program Code	GENPH
Name of the Course	Tools and Techniques in Genetics	Course Code	23GENPH11C3
Hours/Week	4	Credits	4
Max. Marks.	100	Time	3 Hours
Marks Internal =30 External = 70 Course Objectives: 1. To impart knowledge about latest updates on instrumentation used in Genetics and Biosciences. 2. To learn purification and characterization of biomolecules and their computational analysis. 3. To appraise students about application part of various instruments			
Course Outcomes: 1. In-depth understanding principles and applications of various instruments and techniques research. 2. Learning of protocols/methodologies related with biophysical methods, purification of biomolecules & microscopy. 3. Conversant in computational techniques to be used for research. 4. Well equipped for planning and execution of scientific experiments.(with background knowledge of instrumentation)			
Unit – I			
Isolation and purification of DNA, RNA and Proteins, Gene cloning, RFLP analysis, Techniques of nucleic acid hybridization and cot curves, sequencing of nucleic acids/proteins, Southern, Northern and Western blotting, Preparation of probes, Polymerase Chain reaction, Real-Time PCR, Cell culture spectrophotometry and maintenance).			
Unit – II			
Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, Crystallography, Microscopy, Spectroscopy; Phase contrast, Inverted Fluorescent, SEM, TEM.			
Unit – III			
Bioseparation techniques: Principle and applications of gel filtration, ion exchange & hydrophobic interaction chromatography, thin layer chromatography, gas chromatography; High pressure liquid chromatography (HPLC), HPTLC, Fast Protein Liquid Chromatography, Electrophoresis (agarose and page); Isoelectric-focussing; Ultracentrifugation (Velocity and buoyant density).			
Unit – IV			
Properties of different types of radioisotopes used in biology, their detection and measurement, 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.			
References: 1. Sambrook, J. and Russell, D. (2007), Molecular cloning: A Laboratory Manual 3rd edition Vol. 1-3. Churchill press. 2. Wilson, K. and Walker, J. (2012) Principles and Techniques of Biochemistry and Molecular Biology, Sixth Edition, Cambridge University Press. 3. Walsh, G. (2015) Proteins: Biochemistry and Biotechnology, 2nd Eds, John Wiley and Sons, Inc. 4. Prabu, M. and Shagirtha, K. (2016) Tools and Techniques in Life Sciences. LAP LAMBERT Academic Publishing 5. Bayot, M.L. and Limaïem F. (2020) Biosafety Guidelines. StatPearls. NCBI Bookshelf			

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23GENPH11C4 – BIOSTATISTICS

Name of the Program	Ph.D. Course work in Genetics	Program Code	GENPH
Name of the Course	Biostatistics	Course Code	23GENPH11C4
Hours/Week	2	Credits	2
Max. Marks.	50	Time	3 Hours
Marks Internal =15 External = 35 Course Objective:- 1. To provide statistical knowledge in biological sciences 2. Exposure to computer basics for data interpretation.			
Course Outcome:- 1. Well, conversed with biostatistics for research data analysis. 2. Understanding of computer basic for research and thesis writing.			
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			
Sample statistics and parameters, parametric and nonparametric tests, 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 Computer Basics, Course introduction and Office Applications: MS Office 2000/XP including MS Word, MS Excel, MS Power Point knowledge of SPSS.			
References: 1. W. Daniell. (2018) Biostatistics: A Foundation for Analysis in the Health Sciences, 11 th Eds Wiley, USA 2. Singh et al (1988) Statistical Methods for Research: Central Publishing Ludhiana. 3. Khan, I.A. and Khan, I.A. (1994) Fundamentals of Biostatistics. Ukaz Publication 4. Zar, J.H. (2009) Biostatistical analysis, Pearson			

23MPCC1 – RESEARCH & PUBLICATION ETHICS ***Template for Ph.D. Course Work syllabus**

Name of the Program	Ph.D. Course work	Program Code	PH
Name of the Course	Research and Publication ethics	Course Code	23MPCC1
Hours/Week	2	Credits	2
Max. Marks.	50	Time	3 Hours
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