

Veer Bahadur Singh Purvanchal University
Jaunpur



Pre- Ph.D. Course Work (Ordinance and Syllabus)

Biotechnology
(w.e.f. 2023-24)

(As per National Educational Policy-2020)

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Veer Bahadur Singh Purvanchal University, Jaunpur
Pre- Ph.D. Course Work (Ordinance and Syllabus)
Biotechnology (w.e.f. 2023-24)

As per the university ordinance, the research scholars who are provisionally registered for the Ph. D. Programme will undergo a Pre- Ph.D. Course work.

Aim of the Course Work: The aim of Pre- Ph. D. course work is to develop and enhance the research skills like investigation, evaluation, reasoning, comprehension, analysis, writing, editing and designing

List of all papers of Pre-Ph.D. course work or Post graduate diploma in Research (PGDR)

Year	Semester	Course Code	Course Title	Theory/ Research	Credit	Max. Marks
6	XI	B101101T	Fundamentals of Biotechnology	Theory	6	100 [25(CIE)+75(UE)]
		B101102T	Advanced Analytical Techniques	Theory	6	100 [25(CIE)+75(UE)]
		B101103T	Research Methodology, Research Publication Ethics and Computer Applications	Theory	4	100 [25(CIE)+75(UE)]
			Research Project	Research	-	100 [25(CIE)+75(UE)]

Credit system:

- A four (4) credit theory course/paper will have four Lectures/periods (of one hour) in a week. In one full semester the course will be covered in 60 Lectures.
- Similarly, a six (6) credit theory course/paper will have six Lectures/periods (of one hour) in a week. In one full semester the course will be covered in 90 Lectures.

Continuous Internal Evaluation (CIE) of 25 marks:

- Continuous internal evaluation will be performed by the teacher/ course coordinator concerned.
- CIE shall be 25% of total assessment in a Theory paper and research project.
- 25 marks shall be distributed as 5 marks for attendance, 5 marks for presentation and assignment and remaining 15 marks for class test.

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Marking system:

- All papers will have a total maximum mark of 100, including both CIE and University Examination (UE). Maximum marks of 25 will be allotted to CIE and 75 to UE in a theory paper/ research project.
- The CIE of the research project shall be evaluated by the research supervisor and co-supervisor (if any).
- 75 marks of **research project** shall be distributed as 50 marks (project work and presentation) and a viva voce of 25 marks.
- The evaluation (Max Marks 75 UE) of the *research project shall be done by internal examiner/s* (Supervisor and Co-supervisor (if any)) and one external examiner appointed by the University.

Research Project Submission:

- The evaluated research project report in two sets of hard copy (spiral binding) must be prepared. One copy of it shall be submitted to the university if it demands. A second copy of the evaluated research project report must be in the records of the college/research centre.
- The format of university Ph.D. thesis writing guidelines can be used as format of Research project writing *guidelines*.

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Programme/Class: Post Graduate Diploma in Research(PGDR)		Year: Six (6)	Semester: XI
Subject: Biotechnology			
Course Code: B101101T		Course Title: Fundamentals of Biotechnology	
Course Outcomes (COs)			
This course introduces the principles of cell biology and after completion of this course, students will be able to;			
CO 1: understand the chemical basis of life, composition of living matter, chemical foundations of biology and biomolecular hierarchy			
CO 2: understand chemical and internal organization of cells, chromatin organization and molecular biology of the cell.			
CO 3: understand scope of microbiology: physical and chemical methods for control of microorganisms.			
CO 4: understand the different types of immune system, their regulation and advance techniques of Immunology.			
CO 5: understand tools and techniques of recombinant DNA technology and Impact of genetic engineering in modern society.			
CO 6: understand the fundamentals and applications of bioinformatics and protein analysis			
Credits: 6		Core Compulsory	
Maximum Marks: 100 (75(UE)+25(CIE))		Minimum Passing Marks: 55	
Total Number of Lectures-Tutorials-Practical (6 hours per week) L-T-P: 6-0-0 (90hr#)			
Unit	Topics		No. of Lectures
I	Introduction to biochemistry and biomolecules. Chemical basis of life: Miller-Urey experiment, abiotic formation of amino acid oligomers, composition of living matter; Water – properties of water, essential role of water for life on earth, Chemical foundations of biology -pH, pK, acids, bases and buffers. Introduction to pH meter, maintenance of blood pH and pH of gastric juice, pH optima of different enzymes (pepsin, trypsin and alkaline phosphatase), ionization and hydrophobicity, emergent properties of biomolecules in water, biomolecular hierarchy, macromolecules, molecular assemblies		15
II	Chemical and internal organization of cells Chromatin organization - histone and DNA interactome: structure and assembly of eukaryotic and prokaryotic DNA polymerases, DNA-replication, damage and repair; Transcriptional control: Structure and assembly of eukaryotic and prokaryotic RNA Polymerases, promoters and enhancers. Post transcriptional modification, miRNAs and siRNAs, RNAi, protein translation machinery, mitochondrial genetic code.		15
III	Introduction to microbiology and microbes, history & scope of microbiology, morphology, structure, growth and nutrition of bacteria, bacterial growth curve, bacterial culture methods; bacterial genetics: mutation and recombination in bacteria, plasmids, transformation, transduction and conjugation; antimicrobial resistance. Sterilization, disinfection and antiseptics: physical and chemical methods		15

The content of the syllabus is lengthy for a
semester which need to be minimize.

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	for control of microorganisms, antibiotics, antiviral and antifungal drugs, biological control of microorganisms.	
IV	Components of innate and acquired immunity; phagocytosis; complement and inflammatory responses; antigens -immunogens, haptens, superantigens; Major Histocompatibility Complex. Immunoglobulins - basic structure, classes & subclasses of immunoglobulins, Precipitation, agglutination and complement mediated immune reactions; advanced immunological techniques - RIA, ELISA, Western blotting, ELISPOT assay, immunofluorescence, flow cytometry and immunoelectron microscopy; surface Plasmon resonance, biosenor assays for assessing ligand-receptor interaction.	15
V	Impact of genetic engineering in modern society; restriction endonucleases and methylases; DNA ligase, Klenow enzyme, T4 DNA polymerase, polynucleotide kinase, alkaline phosphatase; cohesive and blunt end ligation; linkers; adaptors; homopolymeric tailing; labeling of DNA: nick translation, radioactive and non-radioactive probes, Insertion of foreign DNA into host cells; transformation, electroporation, transfection; isolation of mRNA and total RNA; cDNA and genomic libraries; study of protein-DNA interactions: electrophoretic mobility shift assay; DNase footprinting; methyl interference assay.	15
VI	Biological databases, Primary & Secondary database, Sequence file formats, Introduction to structures, Protein Data Bank (PDB), Molecular Modelling Database (MMDB), Structure file formats, Visualizing structural information, Collection of sequences, sequence annotation, sequence description. Sequence alignment and database searching FASTA, BLAST, Multiple Sequence Alignment, Motifs and patterns, Clustal, Muscle; Scoring matrices, Distance matrices. Phylogenetic analysis. DNA barcoding. Applications in drug design. Introduction to Protein analysis & prediction; Basics of Protein Structure Prediction (Homology Modeling, Fold Recognition, Ab-Initio Prediction); Fundamentals of molecular docking.	15
. Further Suggestions:		
Suggested Reading		
<ol style="list-style-type: none"> 1. Nelson DL, Cox MM, Hoskins A A . (2021) Lehninger Principles of Biochemistry, 8th Edition. WH Freeman & Co., New York. 2. Berg JM, Tymoczko JL, Gatto GJ and Stryer L (2015) Biochemistry, 8th Edition, WH Freeman & Co., New York. 3. Lodish H, Berk A, Kaiser CA, Kreiger M, Bretscher A, Ploegh H, Martin KC, Yaffe MD, Amon A.(2021). Molecular Cell Biology 9th Edition. WH Freeman & Co., New York. 4. Alberts B, Heald R, Johnson A, Morgan D, Raff M, Roberts K, Walter P(2022). Molecular Biology of the Cell 7th Edition. Garland Science, Taylor & Francis Group New York. 5. Punt J, Stranford SA, Jones PP Owen JA. (2019) Kuby Immunology, 8th Edition. WH Freeman & Co., New York. 6. Delves PJ, Martin SJ, Burton DR, Roitt IM, (2017). Roitt's Essential Immunology 13th edition John Wiley & Sons, Ltd, UK 7. Abbas AK, Lichtman AH, Pillai S. (2021) Cellular and Molecular Immunology 10th edition, Elsevier. 8. Brown TA (2018) Genomes 4 Garland Science, Taylor & Francis Group New York 9. Brown TA (2020) Gene Cloning and DNA Analysis: An Introduction. 8th Edition. John Wiley and Sons, Ltd. 10. Mount, D. W. (2004). Bioinformatics: Sequence and Genome Analysis. Cold Spring 		

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Harbor, NY: Cold Spring Harbor Laboratory Press 11. Baxevanis, A. D., & Ouellette, B. F. (2001). Bioinformatics: a Practical Guide to the Analysis of Genes and Proteins. New York: Wiley-Interscience. 12. Prescott, Harley & Klein's Microbiology, - Willey, Sherwood and Woolverton. Pub:McgrawHill, International Ed. 13. General Microbiology – R.Y. Stanier, J.L Ingraham, M.L. Wheelis, P.R. Painter, Pub: The MacMillan Press Ltd.		
Suggested link https://www.youtube.com/watch?v=uDXH6Uu0ghc https://www.youtube.com/watch?v=kVu37T6sB E https://www.youtube.com/watch?v=JuwErrBz3b4 https://www.youtube.com/watch?v=2JUu1WqidC4 https://www.youtube.com/watch?v=sREv4rfpbCY&list=PLoNoar1DIEiltg7qYV5N-3846Pu1O2BAG https://www.youtube.com/watch?v=Dyv6YiH5rME&list=PLECA78684C931E6B7 https://www.youtube.com/watch?v=777v-XCHW1c&list=PLJoALJA KMOCLX 4GKqeEiG11tDeeGX3N https://www.youtube.com/watch?v=Bhe6Tj2Ebys https://www.youtube.com/watch?v=3QHA698oMXw&list=PLvqSpQzTE6M93irerMnIZWfAsx5kU9yRI https://www.youtube.com/watch?v=haO3ChM2wUs&list=PLvqSpQzTE6M-JgOPBvDus1CRmpR6Pwq1W		
Suggested Digital platform/Web link		
Course prerequisites: As per the university ordinance, the research scholars who are provisionally registered for the Ph. D. Programme will undergo a Pre- Ph.D. Course work.		
Suggested equivalent online courses		
Suggested Continuous Internal Evaluation (CIE) methods Continuous Internal Evaluation shall be based on Class test, presentation along with assignment and class interactions. Marks shall be as follows Total marks: 25 10 marks for Test 10 marks for presentation along with assignment 05 marks for Class interactions		
Programme/Class: Post Graduate Diploma in Research(PGDR)	Year: Six (6)	Semester: XI
Subject: Biotechnology		
Couse Code: B101102T	Course Title: Advanced Analytical Techniques	
Course Outcomes (COs)		
On successful completion of this course, student will be able to;		
1. execute the techniques used for enzyme assay, Kinetic assay, protein assay, nucleic acid assay and structural studies 2. understand principles and types of centrifugation and principles & applications in biochemical		

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fractionation methods in biological analysis 3. describe the basic principle and application of chromatography and X-ray crystallography in biotechnology 4. understand DNA cloning, Polymerase Chain Reaction and genome editing technology. 5. describe microbial growth and kinetics, methods for identifying microbes and different types of microscopy 6. understand the basic principle and applications of different types of electrophoresis.		
Credits: 6		Core Compulsory
Maximum Marks: 100 (75(UE)+25(CIE))		Minimum Passing Marks: 55
Total Number of Lectures-Tutorials-Practical (in hours per week)L-T-P: 6-0-0		
Unit	Topics	No. of Lectures
I	Basic principles of electromagnetic radiation and related spectroscopic Techniques: Absorption and emission spectra, Beer-Lambert's law, UV and visible spectro photometry-principles, instrumentation and applications on enzyme assay and kinetic assays, protein structural studies, nucleic acid structural studies; Basic principles, instrumentation and applications of UV-visible, IR, fluorimetry, atomic absorption and emission spectrophotometry. Basic principles, instrumentation and applications of ESR, NMR; IR-Raman Spectroscopic applications in biology.	15
II	Hydrodynamic methods: Basic principles and types of centrifugation-rotors, boundary, differential, density gradient, zonal isopycnic, introduction to equilibrium; Sedimentation - sedimentation velocity, preparative and analytical ultracentrifugation techniques; principles & applications in biochemical fractionation methods. Cell disruption and fractionation of organelles; Isolation and purification of membrane proteins; Various methods to study cell-cell and cell-virus fusion	15
III	Chromatography and X-ray crystallography; Chromatography, principles of adsorption, partition and ion-exchange chromatography, gel permeation chromatography, GC, GC-MS and HPLC; X-ray Crystallography – protein crystals, Bragg's law, unit cell, isomorphous replacement, fiber pattern of DNA; Small-angle Xray diffraction methods: Principles & applications; Basic protein structure prediction methods.	15
IV	DNA cloning; bacterial transformation; transfection; chromosome integration; screening for transformants; Polymerase Chain Reaction; PCR types; DNA sequencing; Molecular hybridization: Southern blot; Northern blot; Protein analyses: Western blot & Immunoprecipitation; Rewriting DNA: mutations; random mutagenesis; point mutation; Site-specific mutations; Genome Editing Technology; DNA array & protein array.	15
V	Microbial growth and kinetics, Methods for identifying microbes Flow cytometry techniques; Light microscopy: lenses and microscopes, resolution: Rayleigh's Approach, Darkfield; Phase Contrast; Differential Interference Contrast; fluorescence and fluorescence microscopy; Confocal microscope: confocal principle, resolution and point spreadfunction, Total Internal reflection microscopy, STED microscopy. Scanning Electron Microscopy, Transmission Electyron	15

The content of the syllabus is lengthy⁶
for a semester which need to be minimize

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	Microscopy.	
VI	Principles of electrophoretic separation, zonal and continuous electrophoresis, paper, cellulose acetate/nitrate, gel and capillary electrophoresis, use of native and denaturing gels, Protein subunit molecular weight determination using SDS-PAGE, Anomalous protein migration of some proteins in SDS-PAGE, Acid-urea PAGE and their physical basis, Isoelectric focusing and two dimensional gel electrophoresis, electroporation, pulse field gel electrophoresis, Gradient gels.	15

Suggested Reading

1. Cantor, C. R., and Schimmel, P. R. (1980). Biophysical Chemistry Vol. I, II & III. W. H. Freeman and Company.
2. Nelson DL, Cox MM, Hoskins AA . (2021) Lehninger Principles of Biochemistry, 8th Edition. WH Freeman & Co., New York.
3. Berg JM, Tymoczko JL, Gatto GJ and Stryer L (2015) Biochemistry, 8th Edition, WH Freeman & Co., New York.
4. Plummer DT (2017) an Introduction to Practical Biochemistry 3rd Edition. Tata McGraw Hill
5. Hofmann A and Clokie S. (2018). Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology 8th Edition. Cambridge Univ. Press, (U.K.)
6. Lodish H, Berk A, Kaiser CA, Kreiger M, Bretscher A, Ploegh H, Martin KC, Yaffe MD, Amon A.(2021). Molecular Cell Biology 9th Edition. WH Freeman & Co., New York.
7. Alberts B, Heald R, Johnson A, Morgan D, Raff M, Roberts K, Walter P(2022). Molecular Biology of the Cell 7th Edition. Garland Science, Taylor & Francis Group New York.
8. Sambrook J Green MR(2012). Molecular Cloning : A laboratory Manual -1, 4th edition. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.
9. Sambrook J Green MR(2012). Molecular Cloning : A laboratory Manual -2, 4th edition. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.
10. Sambrook J Green MR(2012). Molecular Cloning : A laboratory Manual -3, 4th edition. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.
11. Barker K.(2005). At the bench a laboratory navigator 2nd Edition. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.
12. Hay FC Westwood OMR(2008). Practical Immunology 4th Edition. John Wiley & Sons, Inc.
13. Cappuccino J Sherman Natalie (2014). Microbiology a laboratory manual 10th Edition. Pearson Education India.
14. Levinson W, Chin Hong P, Joyce EA, NussbaumJ, Schwartz B(2017) Review of clinical infectious diseases 17th Edition. Mcgraw Hill/ Medical India

Suggested link

https://www.youtube.com/watch?v=n18jMutR_z0&list=PLbMVogVj5nJQnmDi4vK8EYwQvNoL_vSRU

https://www.youtube.com/watch?v=gaBXQW9rCDA&list=PLbMVogVj5nJQnmDi4vK8EYwQvNoL_vSRU&index=14

https://www.youtube.com/watch?v=BM9qQ_sHWP8&list=PLbMVogVj5nJQnmDi4vK8EYwQvNoL_vSRU&index=21

https://www.youtube.com/watch?v=jn8iT31w9s4&list=PLbMVogVj5nJQnmDi4vK8EYwQvNoL_vSRU&index=29

https://www.youtube.com/watch?v=o8zELwp358A&list=PLbMVogVj5nJQnmDi4vK8EYwQvNoL_vSRU&index=34

https://www.youtube.com/watch?v=CgXtJ4ooaUU&list=PLbMVogVj5nJQnmDi4vK8EYwQvNoL_vSRU

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<p>oL ySRU&index=40 https://www.youtube.com/watch?v=fzMXboYnp5s&list=PLbMVogVj5nJQnmDi4vK8EYwQvN</p>																				
<p>oL ySRU&index=41</p>																				
<p>Suggested Digital platform/Web link</p> <p>https://www.youtube.com/@iit https://onlinecourses.nptel.ac.in/ https://epgp.inflibnet.ac.in/ https://heecontent.upsdc.gov.in/Home.aspx</p>																				
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<p>Suggested equivalent online courses</p> <p>https://onlinecourses.nptel.ac.in/</p>																				
<p>Suggested Continuous Internal Evaluation (CIE) methods</p> <p>Continuous Internal Evaluation shall be based on Class test, presentation along with assignment and class interactions. Marks shall be as follows Total marks: 25 10 marks for Test 10 marks for presentation along with assignment 05 marks for Class interactions</p>																				
<table border="1" style="width:100%; text-align:center;"> <tr> <td>Programme/Class: Post Graduate Diploma in Research(PGDR)</td> <td>Year: Six (6)</td> <td>Semester: XI</td> </tr> <tr> <td colspan="3">Subject: Biotechnology</td> </tr> <tr> <td>Course Code: B101103T</td> <td colspan="2">Course Title: Research Methodology, Research Publication Ethics and Computer Applications</td> </tr> <tr> <td colspan="3">Course Outcomes (COs)</td> </tr> <tr> <td colspan="3"> <p>CO1: With the help of this course, students will be able to decide the research field, topic, design, and pros and cons of research, sampling, and data collection techniques.</p> <p>CO2: The student will be able to understand the research process and acquire the skill of writing research articles.</p> <p>CO3: The course will enable you to execute the best practices, morals, and ethical values in scientific conduct and avoid publication misconduct.</p> <p>CO4: With the help of this course, students will be able to learn about the standards of journals for good-quality publications of their research work.</p> <p>CO5: After this course, the students will be able to learn how to use computers and different application software for manuscript writing.</p> <p>CO6: This course will enable the students to learn about reference management and the maintenance of academic integrity using scientific tools. They will be familiar with the protection of the machines from computer hazards.</p> </td> </tr> <tr> <td>Credits: 4</td> <td colspan="2">Core Compulsory</td> </tr> </table>			Programme/Class: Post Graduate Diploma in Research(PGDR)	Year: Six (6)	Semester: XI	Subject: Biotechnology			Course Code: B101103T	Course Title: Research Methodology, Research Publication Ethics and Computer Applications		Course Outcomes (COs)			<p>CO1: With the help of this course, students will be able to decide the research field, topic, design, and pros and cons of research, sampling, and data collection techniques.</p> <p>CO2: The student will be able to understand the research process and acquire the skill of writing research articles.</p> <p>CO3: The course will enable you to execute the best practices, morals, and ethical values in scientific conduct and avoid publication misconduct.</p> <p>CO4: With the help of this course, students will be able to learn about the standards of journals for good-quality publications of their research work.</p> <p>CO5: After this course, the students will be able to learn how to use computers and different application software for manuscript writing.</p> <p>CO6: This course will enable the students to learn about reference management and the maintenance of academic integrity using scientific tools. They will be familiar with the protection of the machines from computer hazards.</p>			Credits: 4	Core Compulsory	
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Credits: 4	Core Compulsory																			

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Maximum Marks: 100 (75(UE)+25(CIE))		Minimum Passing Marks: 55
Total Number of Lectures-Tutorials-Practical (in hours per week)L-T-P: 4-0-0 (60 hr)		
Unit	Topics	No. of Lectures
I	Research Methodology Definition, and Objectives, Motivation and Significance of Research, Types of Research, Truth and Facts of Research, Similarity and Contrast in Literary Research and Scientific Research, Research and Criticism, Research Problem and Research Design, Sampling Design and Methods of Data Collection.	12
II	Research standards: Layout of the Research Report, Research Process: subject Selection, Outline of the Research, Review of Literature, Material Collection; Testing and Classification, Analysis, Discussion and Conclusions, Precautions in Writing Synopsis/Research Paper/Thesis/Research Report.	12
III	Philosophy, Ethics, Scientific Conducts and misconducts Moral Philosophy, Nature of Moral Judgments and Reactions, Publication Ethics, Best Practices/Standards Setting Initiatives and Guidelines: Committee on Publication Ethics (COPE), World Association of Medical Editors (WAME) etc., Intellectual Honesty and Research Integrity: Falsification, Fabrication and Plagiarism (FFP), Open Access Publishing, and Publication Misconduct.	08
IV	Databases and Research Metrics Databases: Indexing Databases, Citation Databases: Web of Science, Scopus etc., Research Metrics: Impact Factor of Journal as Per Journal Citation Report, SNIP, SJR, IPP, Cite Score; Metrics: h-Index, g-Index, i-10 Index, and Altmetric.	08
V	Fundamentals of Computers and application Softwares Types Of Computers, Computer Peripherals and internal component, Types of Operating Systems, Web Browser, Web Search Engine, Spreadsheet Processing, Presentation (MS PowerPoints Preparation or Beamer or Libre Office (Optional), Project/Thesis/Report writing, Using MS-Word or LaTeX or LibreOffice documentation style Labelling, References Style, Footnotes etc.	12
VI	Scientific Softwares Use of Reference Management Software Like Mendeley, Zotero, Reference Manager, Endnote, Authorea Etc. Anti-Plagiarism Software Like Turnitin, iAuthenticate, Urkund, Ebooks and Virtual Library, UGC-Infonet, Computer Hazards and Security	08
Suggested Reading		
<ol style="list-style-type: none"> 1. C.R. Kothari, Research methodology Methods and Techniques, 4th Edition, New Age International (P) Ltd. Publisher, 2014. 2. W. Creswell, Research Design, Qualitative, Quantitative and mixed method approaches, 3rd Edition, Sage Publications, Inc. 3. D.B. Resnik, (2011) What is ethics in research & Why is it important. National institute of Environmental Health Science, 1-10 Retrieved from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm 4. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7. https://www.insaindia.res.in/pdf/Ethics_Book.pdf 5. Reema Thareja (2019) Fundamentals Of Computers (2nd Edition), Oxford University Press 6. Microsoft Office 365 : A complete Guide to Master Word, Excel, and PowerPoint 365 		

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Beginners, Matt Vic 7. Leslie Lamport, LaTeX, A Document Preparation System, 2 nd Edition, Addison-Wesley Professional Publisher, July, 1994. 8. Latex tutorials https://www.tug.org/twg/mactex/tutorials/ltxprimer-1.0.pdf 9. Libre Office tutorial: www.documentation.libreoffice.org/en/english-documentation		
Suggested link		
Suggested Digital platform/Web link		
Course prerequisites		
Suggested equivalent online courses https://epgp.inflibnet.ac.in/		
Suggested Continuous Internal Evaluation (CIE) methods Continuous Internal Evaluation shall be based on Class test, presentation along with assignment and class interactions. Marks shall be as follows Total marks: 25 10 marks for Test 10 marks for presentation along with assignment 05 marks for Class interactions		
Programme/Class: Post Graduate Diploma in Research(PGDR)	Year: Six (6)	Semester: XI
Subject: Biotechnology		
Course Code: B101104TR	Course Title: Research Project	
Course Outcomes (COs)		
Course Outcomes (COs) On successful completion of this course, student will be able to; CO1: write a research project CO2: carry out a research project CO3: analyse data and synthesize research findings CO4: report research findings in written and verbal forms CO5: publish research findings CO6: use research findings to advance theory and practice		
Credits: Non- Credit	Core Compulsory	
Maximum Marks: 100 (75(UE)+25(CIE))	Minimum Passing Marks: 55	
Suggested Reading		
1. Berry R(2004). The Research Project How to Write It, 5 th edition. Routledge New York 2. Thomas G(2017). How to Do Your Research Project: A Guide for Students 3 rd Edition.Sage Publications Ltd.		
Suggested link		

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Suggested Digital platform/Web link
Course prerequisites: As per the university ordinance, the research scholars who are provisionally registered for the Ph. D. Programme will undergo a Pre- Ph.D. Course work.
Suggested equivalent online courses https://epgp.inflibnet.ac.in/
Suggested Continuous Internal Evaluation (CIE) methods Continuous Internal Evaluation shall be based on Class test, presentation along with assignment and class interactions. Marks shall be as follows Total marks: 25 10 marks for Test 10 marks for presentation along with assignment 05 marks for Class interactions

The format of the question paper and evaluation will be as follows –

The duration of each question paper is 3 hours

Types of Question	Total No of Questions	Questions to be Attempted	Maximum Marks = 75 (UE) (Questions x marks)
Very Short Answer Type Questions (50 words)	10	10	10 x 2 = 20
Short Answer Type (200 words)	8	5	5 x 7 = 35
Longs Answer Type (500 words)	4	2	2 x 10 = 20
			= 75 (Maximum Marks)

10-point grading system for evaluation of the Pre-Ph.D. course work

As per the UP GOs 1567/सत्तर-3-2021-16 (26)/2011 TC dated 13 July 2021, 401/सत्तर-3-2022, dated 09 Feb. 2022, and 1032/सत्तर-03-2022-08(35)/2020, dated 20 April 2022 regarding NEP-2020, the grading system for the Pre-Ph.D. course work shall be followed as given in table -1

Table-1

Letter Grade	Details	Limit of Marks	Grade Point
O	Outstanding	91-100	10
A+	Excellent	81-90	9
A	Very Good	71-80	8
B+	Good	61-70	7
B	Above Average	55-60	6
F	Fail	<55	0
AB	Absent	Absent	0
Q	Qualified		
NQ	Not Qualified		

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In pre-Ph.D. course work, there is a mandatory research project that is qualifying in nature. This research project shall be a **non-credit course**. The letter grade for the research project will be Q or NQ. The grade of research project will not be included in the computations of the CGPA.

Computation of CGPA:

Calculations for SGPA and CGPA shall be followed as given table 2:

Table 2

For j^{th} Sem. SGPA (S_j) $\frac{\sum C_i G_i}{\sum C_i}$	Here: C_i = number of credits of the i^{th} course in the j^{th} semester G_i = grade point scored by the student in the i^{th} course in j^{th} semester
CGPA = $\frac{\sum C_j S_j}{\sum C_j}$	Here: S_j = SGPA of the j^{th} semester C_j = total number of credits in the j^{th} semester

Allocation of CGPA Into Division:

The allocation of CGPA into division in pre-Ph.D. course work follows as given in Table 3:

Table 3

Division	CGPA
First	Greater than or equal to 6.5 and less than or equal to 10
Second	Greater than or equal to 5.5 and less than 6.5

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MC
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