Subject: Research Methodology -BSCXX17404

Type of course: Major

Prerequisite:

Fundamental understanding of core subjects (e.g., Chemistry, Physics, Biology),Ability to relate theory with practical applications,Prior exposure to laboratory experiments. Basic use of MS Word / Google Docs (report writing),MS Excel (data analysis, graphs), Internet skills-Searching scientific information, Downloading research papers

Rationale:

This course equips students with research methodology and develops a systematic and logical approach to problem-solving. Students learn how to move from observation, hypothesis, conclusion.It bridges the gap between theory and real-world application of science.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				SEE		CCE			
CI	T	P	C	Theory	Practical	MSE	V	ALA	
4	0	0	4	100	0	30	0	70	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

4 Credits * 25 Marks = 100 Marks (each credit carries 25 Marks) Theory
SEE 100 Marks will be converted in to 50 Marks
CCE 100 Marks will be converted in to 50 Marks
It is compulsory to pass in each individual component.

Course Content:

Unit No	Course content	Hrs	% Weightage
1	**Introduction to Research Methodology** 1. Fundamentals of Research 2. Types of Research: Basic, Applied, Translational 3. Research Ethics and Responsible Conduct 4. Research Design and Planning 5. Experimental vs. Observational Study Designs 6. Variables and Controls in Research Design	15	25
2	**Literature Review and Research Proposal Development** 1. Systematic Literature Review 2. Evaluating Scientific Papers 3. Citation Management and Referencing Tools 4. Components of a Research Proposal 5. Grant Writing Basics 6. Peer Review Process and Responding to Reviewers	15	25

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3	**Data Collection Methods** 1. Quantitative Research Methods: Surveys, Questionnaires 2. Experimental Methods: Controlled Trials, Cohort Studies 3. Tools and Techniques for Data Collection 4. Qualitative Research Methods: Interviews, Focus Groups 5. Qualitative Data Analysis: Thematic, Content Analysis	15	25
4	**Data Analysis and Interpretation** 1. Descriptive vs. Inferential Statistics 2. Parametric and Non-Parametric Tests 3. Multivariate Analysis Techniques 4. Presenting Research Results: Tables, Graphs 5. Drawing Conclusions from Data	15	25

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Research Proposal Group Activity: Students work in groups to create a research proposal on a specific embryology topic, covering all essential components (Title, Abstract, Methods, etc.).and upload them on the GMIU web portal	10
2	Literature Review Critique: Students review and critique a research paper, identifying strengths, weaknesses, and potential improvements.and upload them on the GMIU web portal	10
3	Quantitative Data Analysis Exercise: Given a dataset, students practice conducting basic statistical analyses (e.g., t-tests, chi-square) using statistical software or manually.and upload them on the GMIU web portal	10

4	Qualitative Research Role-play: Students simulate a qualitative interview, practicing open-ended questions and analyzing responses based on thematic analysis.and upload them on the GMIU web portal	10
5	Case Study Presentation: In groups, students present a case study based on a real-world issue in ART or embryology, discussing the research methods and outcomes.and upload them on the GMIU web portal	10
6	Letter for grant permission: Faculty provide dint(writing proposal),thinking(problem-solving), evaluation(peer feedback), and students prepare grant permission letter..and upload them on the GMIU web portal	10
7	Design Your Own Research Study:Task:Divide students groups Each group will analyze and justify their decisions:Why did you choose this research design?Is your sampling method appropriate?What challenges might arise in data collection?How will you ensure validity and reliability? Prepared own report and submit in the GMIU web portal	10
	Total	**70**

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks **(Revised Bloom's Taxonomy)**						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	20%	10%	10%	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

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Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand the fundamentals of research in embryology and ART.
CO2	Develop research design and planning skills specific to embryology studies.
CO3	Gain skills in conducting literature reviews and developing research proposals.
CO4	Learn effective data collection methods for both quantitative and qualitative research.

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] "Research Methodology: A Step-by-Step Guide for Beginners" by Ranjit Kumar
[2] "Designing Clinical Research" by Stephen B. Hulley, Warren S. Browner, Steven R. Cummings, Deborah G. Grady
[3] "Research Methods in Reproductive Medicine" by Peter R. Brinsden
[4] "Embryology Journals: Human Reproduction, Reproductive BioMedicine Online, and Journal of Assisted Reproduction and Genetics