**UNIVERSITY OF GONDAR
INSTITUTE OF BIOTECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY**

**COURSE SYLLABUS FOR RESEARCH METHODS IN BIOTECHNOLOGY**

**Course Title: Research Methods in Biotechnology**

**Course Code: Biot 609**

**Course Credit: 7 ECTS**

**Lecture: 3 hours/wk**

**Laboratory: 2 hours/wk**

**Collaborative learning: 2 hours/wk**

**Independent learning: 4 hours/wk**

**Length of time: 16 weeks**

**Total load hours: 176 hours**

**Co-requisite module: None**

**Pre-requisite module: None**

**Barred combination module: None**

**Description**:

The principles, concepts and process of research methods

Statistical concepts and methodology for planning experiments and analyzing data

Skills related to the interpretation and presentation of statistical results of biological experiments.

Usage of statistical analysis software to understand basic tabulation and organization of data, basic statistical applications, principles of sampling, and analysis of data

The art of making a written report and oral presentation

Generalized pattern of a scientific paper

**Learning outcome**:

At the completion of this module, students will: grasp the principles, concepts and processes of research methods discern between the various types of research methods appreciate the need to properly plan a research project, including experimental design, data collection, and data analysis understand the different types of scientific literature perform effective literature search, review and analysis use traditional and computer-aided search systems develop skills to summarize, categorize, synthesize, paraphrase, and quote information acquire skills to brainstorm, cluster to develop concept map, develop pattern to organize ideas, and develop outlines develop skills for selection of research topic and research proposal development know the basic statistical tools required for the analysis of data know the various components of experimental design develop experimental design appropriate for the objectives of the research apply data analysis tools appropriate to the experimental design use the SAS statistical analysis software to organize and analyze data Know the components of a scientific report. Know proper citation and referencing

Acquire the skills to edit and review scientific reports. Have an increased awareness of the importance of research ethics and plagiarism. Deliver an effective oral and written presentation

**Course content** :

• Introduction to research methods

• Steps in Scientific Writing

• Ideas, skills and capacity development

• The planning phase of scientific writing

• Estimation

• Hypothesis testing

• Components of experimental design

• Analysis of variance (ANOVA)

• Completely randomized design (CRD)

• Comparing treatment means

• Randomized complete block design (RCBD)

• Additional blocking designs

• Bivariate statistics

• Data interpretation

• Major topics in scientific writing

• Citations and referencing

• Editing the draft paper/report

• Ethics in research

• Scientific presentations

Mode of delivery:

The course module delivery will have lecture format where the instructor will lecture on the important principles of the topic under coverage. This will be supplemented with general reading assignments (primarily from the textbooks) and specific reading assignments (review and research articles pertinent to the topic) that will be the basis for group discussions. Additionally, students will be required to orally present a critical review on a subject/paper selected by the instructor relevant to their course. Students are also required to analyze simulated data using SAS statistical software and to present the output in a written scientific report.

**Mode of assessment/evaluation:**

The performance of students will be evaluated through multiple gauges that will continuously assess their understanding of the course material. Tentative grade distribution is shown:

 Assignments: 10%

 Midterm exam: 20%

 Oral presentation: 10%
 Data analysis and written report: 20%

 Final exam: 40%

**References:**

Matthews, J.R., Bowen, J.M. and Matthews, R.W. (2000). *Successful Scientific Writing: A Step-by-Step Guide for Biological and Medical Sciences*, Second Edition, Cambridge University Press, Cambridge.

Day, R.A. (1995). *How to Write and Publish a Scientific Paper,* Fourth Edition. Oryx Press, Phoenix, AZ.

Lobban, C.S. and Schefter, M (1995). *Successful Lab Reports: A Manual for Science Students.* Cambridge University Press, Cambridge.

Jones, A., Reed, R. and Weyers, J. (1996). *Practical Skills in Biology,* Fifth Impression: Longman Group, London.

Gopen, G.D. and Swann, J.A. (1990). *The Science of Scientific Writing*. *American Scientist*. 78: 550-558.

Woodford, F.P. (ed.) (1968). *Scientific Writing for Graduate Students.* CBE, Bethesda, Md.

Rubens, P. (1992). *Science and Technical Writing: A Manual of Style*. Henery Holt and Company, New York.

Council of Biology Editors (1983). *CBE Style Manual,* Fifth Edition*.* CBE, Bethesda, Md.

Ott, R.L. and Longnecker, M.T. (2001). *An Introduction to Statistical Methods and Data Analysis*, 5th edition, Duxubury Press.

Jackson, Sherri (2007). *Research Methods: A modular approach.* Cengage Learning.