25BIO803 Professional Practice in Science: Communication and Ethics 1 2 0 3

Course Description: This course is designed to equip PhD students with the skills to effectively communicate scientific findings to diverse audiences, including fellow researchers, funding agencies, policymakers, and the general public. The curriculum will cover academic writing, publishing strategies, oral presentations, grant writing, science outreach, and digital communication.

Learning Objectives: This course develops essential skills in scientific writing, presentation, visualization, and public communication that are crucial for research, academia, industry, policy, and science outreach careers. Students will learn to structure scientific manuscripts, craft compelling research proposals, create visually impactful figures and posters, and deliver effective oral presentations to both expert and non-expert audiences. Emphasis will also be placed on communicating science through digital media and social platforms. Graduates of this course will be equipped to pursue roles such as research scientists, science communicators, technical writers, grant specialists, policy advisors, and educators, with the confidence to disseminate complex scientific ideas, accurately, and persuasively. These communication competencies are increasingly valued across scientific disciplines and enhance career advancement and collaborative opportunities globally.

Pedagogy:

- Lectures: Foundational knowledge on writing, publishing, and presenting
- Workshops: Hands-on writing, editing, and communication exercises
- Guest Lectures: Talks from editors, science communicators, and funding agency representatives
- Peer Reviews: Collaborative evaluation of writing and presentation skills
- Final Project: A creative science communication piece

Module 1: Introduction to Scientific Communication (Week 1-2)

- Importance of scientific communication in research
- Different types of scientific communication (academic, professional, public)
- The role of ethics and integrity in communication
- Case studies of effective and poor scientific communication
- Learning Activity: Discussion on real-world examples of scientific communication success and failures

Module 2: Writing Scientific Papers (Week 3-5)

- Structure of a scientific manuscript (IMRaD format: Introduction, Methods, Results, Discussion)
- Writing a compelling abstract and title
- Creating clear and effective figures and tables
- Writing an impactful discussion and conclusion
- Common writing mistakes and how to avoid them
- Citation management and avoiding plagiarism
- Learning Activity: Peer review of a short research article draft

Module 3: Publishing and Peer Review (Week 6-7)

- Choosing the right journal for publication
- Understanding impact factors and journal metrics
- The peer review process and responding to reviewer comments
- Preprints, open-access publishing, and predatory journals
- Learning Activity: Simulated peer-review exercise

Module 4: Grant Writing and Funding Proposals (Week 8-9)

- Types of grants and funding agencies (Government, Industry, Private Foundations)
- Key components of a grant proposal (Title, Summary, Objectives, Methodology, Budget)
- Writing a compelling research statement
- Strategies for successful grant applications
- Learning Activity: Writing and reviewing a mini-grant proposal

Module 5: Oral and Poster Presentations (Week 10-11)

- Designing and delivering a compelling scientific talk
- Structuring presentations for different audiences (scientists, funding agencies, general
- public)
- Creating engaging and visually appealing slides
- Poster design and presentation tips
- Learning Activity: Students present a short research talk and receive feedback

Module 6: Communicating Science to Non-Experts (Week 12-13)

- Writing popular science articles and blog posts
- Science communication through social media (Twitter, LinkedIn, YouTube)
- Storytelling techniques in science
- Engaging with policymakers and the media
- Learning Activity: Writing a science communication blog post for a general audience

Module 7: Digital and Visual Communication Tools (Week 14-15)

- Creating effective infographics and scientific illustrations
- Using AI tools for scientific communication
- Video abstracts and science podcasts
- Learning Activity: Designing an infographic or short video on a scientific topic

Module 8: Ethics and Responsible Scientific Communication (Week 16)

- Ethics in publishing and authorship
- Avoiding scientific misconduct (plagiarism, data manipulation, predatory publishing)
- Communicating controversial scientific topics responsibly
- Learning Activity: Case study discussion on ethical dilemmas in scientific publishing

References

- Alley, M. (2018). The Craft of Scientific Writing. Springer.
- Day, R. A., & Gastel, B. (2011). How to Write and Publish a Scientific Paper. Cambridge

University Press.
- Montgomery, S. (2003). The Chicago Guide to Communicating Science. University of
- Chicago Press.
- Peat, J., Elliott, E., Baur, L., & Keena, V. (2002). Scientific Writing: Easy When You Know
- How. BMJ Books.
- Gastel, B., & Day, R. A. (2016). How to Write and Publish a Scientific Paper. Greenwood.

Course Outcomes:

- Structured and wrote scientific papers, grant proposals, and review articles.
- Understand the publication process and peer-review system.
- Deliver compelling oral and poster presentations at conferences.
- Effectively communicate complex scientific concepts to non-specialists.
- Utilize digital tools for scientific communication, including social media and infographics.
- Develop ethical and responsible communication practices in science.