

Institute of pharmaceutical sciences (IPS)

MPhil Pharmacology course Content

Compulsory Courses

BMS 770: Integrative Cell Biology

(1+1 Credit Hrs)

22.1 Course Objectives: Upon completion of this course,

- 1 Recall and illustrate different facets of cell theory
- 2 Distinguish cellular organization of prokaryotic and eukaryotic cells
- 3 Describe Endomembrane systems
- 4 Compare and contrast biomolecular composition of cell
- 5 Explain physicochemical properties of biomolecular interactions/bonding within the cells.
- 6 Classify different proteins on the basis of their physicochemical properties and their function.
- 7 Elucidate the form-to-function relationship of molecular composition of cell membrane.
- 8 Compare different mechanisms of cellular transports across the barrier. 9 Show functional significance of endomembrane system 10 Explain the vesicular transport model of Golgi Complex.
- 11 Describe different fibers of cytoskeleton with contrasting structural and functional properties.
- 12 Classify motor proteins associated with microfilament, actin and intermediate filaments
- 13 Explain models of DNA replication in bacteria and eukaryotes
- 14 Enumerate proteins and pathways of DNA damage repair
- 15 Classify different types of RNA and express their function
- 16 Explain general mechanism of prokaryotic and eukaryotic gene transcription and its regulation
- 17 Enumerate different types of posttranslational RNA processing and their functional significance
- 18 Explain the mechanism of translation and its regulation
- 19 Describe different types of genetic variations and their possible functional consequences.

22.2 Course Contents:

1. Cells and their biochemical properties
 - a. Brief overview of cellular organization
2. Prokaryotic, eukaryotic cells and viruses
 - Comparative view of bacterial and eukaryotic cells.
 - Viral organization and replication cycles
3. Biomolecules within a cell
 - a. Biochemistry of cell and its compartments
4. Cellular metabolism
 - a. Brief view of the different metabolic pathways inside the cell
5. Functional elements of a cell e.g., enzymes
 - a. Proteins as representatives of function

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6. Structure elements of cell e.g., membranes
 - a. Biological membranes and their dynamic nature
7. Cellular transports
 - a. Mechanism governing inter and intra cellular transports
8. Nucleus; structure and function
 - a. Overview of nuclear compartment
9. Chromosomes and genes
 - a. Organization of genetic elements and their accessibility
10. DNA replication
 - a. DNA replication in prokaryotes and eukaryotes
11. Transcription
 - a. RNA synthesis and its regulation
12. Translation
 - a. Protein synthesis and its regulation
13. Cytoskeleton & cellular motion
 - a. Movement of cellular cargos
14. Cellular reproduction
 - a. Dynamics of cellular reproduction
15. Signaling within the cell
 - a. Basis and examples of principle signal transduction pathways in a cell
16. Gross cellular pathologies
 - a. Biological relevance of cellular dysregulations with examples

22.3 Lab

- I. Layout of the lab
- II. Pipetting and handling exercises
- III. Solutions and pH
- IV. Centrifugation
- V. DNA extraction
- VI. Agarose gel electrophoresis
- VII. Spectrophotometry for DNA Quality Control
- VIII. Polymerase Chain Reaction Preps
- IX. PCR extensions
- X. RNA extraction and quality control
- XI. cDNA synthesis
- XII. Quantitative Real-time PCR using SYBRgreen

22.4 Recommended Readings:

1. Molecular Cloning: A Laboratory Manual (Fourth Edition), Volume 1, 2 & 3 4th Edition by Michael R. Green (Author), Joseph Sambrook (Author)
2. Gerald Karp, Janet Iwasa, Wallace Marshall-Karp's Cell and Molecular Biology-Wiley E-Text (2016)
3. Roger L. Lundblad_ F MacDonald (eds.) - Handbook of Biochemistry and Molecular Biology-CRC Press (2018)
4. Harvey F Lodish_ et al-Molecular cell biology-W.H. Freeman and Co (2013)

BMS 702: Applied Biostatistics

(1+1 Credit Hrs)

23 Course Objectives:

Upon completion of course the students will be able to comprehend basic knowledge of epidemiology and will be able to:

- Know how to design a study and describe the validity and reliability of a study design
- Know the fundamental concepts and methods of statistics in the areas of medical and biological research
- Have good command on use of statistical computer software for data analysis

24 Course Contents:

Introduction to statistics, types of statistical applications, population and samples, data analysis and presentation, variables, elementary statistical methods, tabulation, chart and diagram preparations, measures of central tendency and dispersion, sampling techniques and sample size estimation, probability and proportions, Tests of significance; normal test, t test, Chi square test etc, correlation and its applications, linear regression and multiple regression, Clinical trials and intervention studies, Measures for developing health statistical indicators: morbidity and mortality statistics, Use of latest statistical computer software for data analysis.

24.1 Recommended Readings:

- Gordis, L. Epidemiology. Pennsylvania: W.B. Saunders Company. Latest Ed.
- Rothman KJ. Modern Epidemiology. Boston: Little, Brown and Company, Latest Ed.
- Kelsey JL, Thompson WD, Evans AS. Methods in Observational Epidemiology. New York: Oxford University Press, Latest Ed.
- Kleinbaum DG, Kupper LL, Morgenstern H. Epidemiologic Research: Principles and Quantitative Methods. Belmont, CA: Lifetime Learning Publications, Latest Ed.
- Larson R and Farber B. Elementary Statistics: Picturing the World. Latest Ed, Prentice Hall Publications. New Jersey USA.
- Oliver, M. and Combard MS. Biostatistics for Health Professions. Latest Ed. Prentice Hall Publications, New Jersey USA.
- Statistical Software: SPSS; EPIINFO; STATA; SAS

24.1.1 Journals:

- Cancer Epidemiology
- Epidemiologic Reviews
- Annals of Epidemiology
- American Journal of Epidemiology
- International Journal of Epidemiology

BMS 703: Communication Skills & Academic writing

(1+1 Credit Hrs)

25 Course Objectives:

Upon completion of course the students will be able to:

- Communicate effectively in various academic and professional settings, such as seminars, conferences and lecture halls etc.
- Develop structured and persuasive written arguments.
- Conduct research and use evidence to support academic writing.
- Improve presentation skills and confidence in public speaking.
- Learn the basics of Clinical and research communication skills
- Learn face to face and interpersonal communication, classroom communication skills, meeting with the supervisor, email communication and interview skills, CV and Resume writing.
- Present and communicate research articles/data in conferences and symposia.
- Critically analyse data, design a project and write up research proposals.
- Design experiments in the field of biological sciences.
- Collect information from the available resources, Prepare a presentation on a given topic,
- Distinguish different types of research, their audiences and how research material might be effectively presented
- Effectively use features of Microsoft Word, Power point, and Excel to create professional looking tables, graphs and figures.
- Accept constructive criticism and use reviewers' comments to improve quality and clarity of written reports and presentations • Work as a productive member of a task force

26 Course Contents:

1. Introduction to Communication Skills

Overview of Communication Skills, Importance of effective communication in academic and professional settings, Types of Communication (Verbal, non-verbal, written, and visual communication). Effective Listening and Feedback, Active listening, feedback methods, and constructive criticism.

2. Presentation Skills

Planning and Organizing a Presentation, Structuring presentations with a clear beginning, middle, and end, visual Aids, designing effective slides and using visual aids to enhance communication. Public Speaking Techniques, overcoming stage fright, body language, tone, and pacing, Audience Engagement and Q&A Handling.

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3. Introduction to Academic Writing M.Phil. Pharmacology Course Document

Understanding Academic Writing, Features and importance of academic writing, Types of Academic Writing, study designing and synopsis writing, research techniques as well as problem analysis, observations, data compilation and questionnaire designing. Communications, proposals, reports, research papers, literature reviews, theses, etc. Ethics and Plagiarism, Importance of academic integrity, and understanding plagiarism.

4. Writing Process and Techniques

Prewriting and Outlining, Brainstorming, mind mapping, and organizing ideas., Drafting and Revising, developing first drafts, revising content, improving clarity, and coherence, Proofreading and Editing, Common grammar mistakes, sentence structure, and selfediting techniques.

5. Research Skills and Information Literacy

Research Fundamentals, finding credible sources, using databases, and evaluating information, Citation and Referencing Styles, In-text citations, bibliographies, and mastering citation software (e.g., EndNote, Zotero), Avoiding Common Errors, Techniques for avoiding bias, logical fallacies, and assumptions in academic writing.

6. Writing Different Types of Academic Documents

Such as research proposals, elements of a report and proposal, such as purpose, methodology, and expected outcomes. Research papers and theses, introduction, literature review, methods, results, discussion, conclusion. Literature Reviews, synthesizing research, organizing themes, and identifying research gaps. Writing of the Resume and CV.

7. Advanced Topics in Academic Writing

Scientific Writing and Data Interpretation, presenting data, interpreting results, and writing scientific abstracts, manuscripts, articles, choosing journals, writing of the cover letter. Understanding peer reviewing, and responding to reviewer comments, effective emails and formal correspondence, professional email etiquette, writing recommendation requests, and cover letters.

Theoretical knowledge of the students will be supplemented by hands-on practical training in the formulation of research project designing, writing of the articles, responding to the comments of the reviewers, and training in bibliographic and data analysis softwares like Endnote and GraphPad etc.

26.1 Recommended Readings:

- "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams
- "They Say, I Say: The Moves That Matter in Academic Writing" by Gerald Graff and Cathy Birkenstein

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- "Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded" by Joshua Schimel
- "Essentials of Writing Biomedical Research Papers" by Mimi Zeiger
- "How to Write a Lot: A Practical Guide to Productive Academic Writing" by Paul J. Silvia

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- "The Elements of Academic Style: Writing for the Humanities" by Eric Hayot
- "On Being a Scientist: A Guide to Responsible Conduct in Research" by the National Academy of Sciences
- "How to Write and Publish a Scientific Paper" by Barbara Gastel and Robert A. Day
- "The Professor Is In: The Essential Guide to Turning Your Ph.D. into a Job" by Karen Kelsky
- "Introduction to Academic Writing" by Alice Oshima, Ann Hugue
- "Clinical communication skills" by Richard Fielding
- "Interpersonal communication" by Marco Tapia
- "Arifullah, Shahnaz, and Bhatti K.M Research process simplified, Peshawar Latest Ed.
- "Academic Writing, A handbook for international students" by Stephen baily
- "W.H.O. Training manual on health research methodology Latest Ed.
- "Research Methods and Statistics" by Sherri L Jackson

26.1.1 Journals:

- Journal of Communication
- Journal of Communication Theory
- European Journal of Communication
- Journal of Developing Effective Communication Skills
- International Journal of Business Communication (Sage Journals)
- Journal of Telematics and Informatics
- Journal of Written Communication
- Methods and Protocols
- Journal of Academic Writing (Coventry University)
- Journal of Academic Writing (Publon)
- Journal of Writing Research
- Journal of English for Academic Purposes
- Journal of Critical Reviews - Innovare Academic Sciences
- BMJ Evidence Based Medicine

BMS 704: Bioethics, Biosafety & one health

(1+1 Credit Hrs)

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1 Course Objectives:

- To empower students with the skills, tools, and confidence on sustainable biorisk management.
- To enable them to apply principles of biosafety and biosecurity in facilities.
- To reduce/eliminate the risk of infection in laboratory setting.
- Comprehend basics of research in light of the modern ethics
- Comprehend basic knowledge of the ethical issues in biomedical research
- Select and design research project and critically analyze and communicate scientific data
- Analyze literature critically and comprehend the foundations of Bioethics theories
- how to deal with patients within the boundaries of biomedical ethics
- how to improve the basic health care services on ethical grounds
- Understand the value of the One Health approach in tackling difficult public health problems
- Understand the etiologic, environmental, and host factors important to infectious disease epidemiology;
- Understand the value of epidemiological principles and methods in the identification and control of infectious disease;
- Develop skills needed to apply epidemiological principles and methods in solving problems related to infectious diseases and including identifying surveillance and control measures given a specific infectious disease outbreak.

1.1 Course Contents:

1. BRM introduction, scope & importance
2. Terminology
3. AMP Model - brief introduction
4. Biorisk assessment
 - a. Hazards & threat identification & analysis (frequency and magnitude)
 - b. Levels of biological risks
 - c. Likelihood & consequences evaluation
5. Biorisk mitigation - introduction/ brief account of a-e
 - a. Elimination & substitution
 - b. Engineering control
 - c. Administrative control
 - d. Practices & procedures
 - e. PPE
6. Performance - introduction
 - a. Key elements of performance
 - b. Control (monitoring protocols)
 - c. Assurance
 - d. Improvement
7. **Biosafety** - Introduction, purpose, requirement
 - a. Biosafety Levels - brief description of levels 1 - 4
 - b. BSL-1
 - c. BSL-2
 - d. BSL-3
 - e. BSL-4

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- f. Laboratory Design & Facilities
- 8. GLWPs - importance
 - a. Responsibility for enforcing GLWPs
 - b. Barriers to glwps
 - c. Lab equipment calibration & validation
- 9. PPE, **Biosecurity** - introduction, principles, history, objective
 - a. Key pillars of biosecurity
 - Physical security
 - Personal management
 - Information security
 - Transport security
 - Material control & accountability
 - b. Incident Management: Scope
 - c. Incident response system
 - d. Incident reporting
- 10. Waste management: Collection, segregation, transportation, storage & disposal
- 11. Decontamination
- 12. Introduction to medical/bioethics
- 13. Ethical Theories
- 14. Historic perspective of bioethics in the development of vaccines and medicine and clinical trials, The Four Basic Principles of bioethics and their importance in research, Ethical justification and scientific validity of biomedical research involving human subjects
- 15. Ethical review committees. Ethical review of externally sponsored research,
- 16. Obtaining informed consent: Essential information for prospective research subjects, Inducement to participate in research, Benefits and risks of study participation
- 17. Ethical justification of research involving individuals who are not capable of giving informed consent, Children, mentally retarded, behavioural disorders, Choice of control in clinical trials, and Research involving vulnerable persons, children, women and pregnant women.
- 18. Safeguarding confidentiality, Bioethical research involving animals and research misconduct.
- 19. **One Health: Introduction to the One Health Approach** - To introduce students to the principles of employing the One Health approach in preventing and controlling infectious diseases. It includes a practical overview of host factors, environmental factors, and microbiological factors that influence this dynamic field of study. Through lectures and exercises, students will be introduced to infectious disease surveillance, diagnostic tools, outbreak investigations, vaccine

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trials, public health interventions, biodefense, emerging infectious diseases and analytical approaches as they pertain to infectious disease prevention and control.

20. **One Health: Public Health Laboratory Techniques** - To introduce students to public health laboratory methods. A special emphasis will be placed upon respiratory virus work, especially influenza.
21. **One Health: An Introduction to Entomology, Zoonotic Diseases, and Food Safety** -To introduce students to the epidemiology and control of entomological, zoonotic, and food-borne diseases. Each day there will be 3 hours of lecture and 3 or more hours of field activity. The course is comprised of readings, lectures, field studies, laboratory exercises, and a term paper. Zoonoses endemic to the Southeastern United States are emphasized.
22. **One Health: An Introduction to Environmental Health** - To examine sources, routes, media, and health outcomes associated with biological, chemical, and physical agents in the environment. Effects of agents on a disease, water quality, air quality, food safety, and land resources are reviewed, as well as legal frameworks, policies, and practices associated with environmental health and intended to improve public health.
23. Advantages of a closer cooperation between human and animal health
24. Trans-disciplinary processes that can solve an everyday One Health problem
25. Shortfalls resulting from poor communication between human doctors and veterinarians
26. Social-ecological perspectives for the improvement of human and animal wellbeing
27. Fundamental principles of cross-sector human and animal health economics
28. Environmental policy and law that supports food safety
29. Prevention of diseases from livestock to human via food
30. Matrix calculations to describe growth rates of populations
31. Principles of disease transmission dynamics between humans and animals
32. Collection of vaccination coverage data 33. Interpretation of vaccination coverage data

1.1.1 Recommended Readings:

- Good Medical Practice (2013); General Medical Council
- CIOM Guidelines available online
- Beauchamp T, Childress J; Principles of Biomedical Ethics, 7th Edition. Oxford University Press.
- Antoniou SA, Antoniou GA, Granderath FA, et al; Reflections of the Hippocratic Oath in modern medicine. World J Surg. 2010 Dec;34(12):3075-9. doi: 10.1007/s00268-010-0604-3.
- Good Medical Practice - Explanatory Guidance; General Medical Council
- Managing a child or young person with suspected maltreatment; NICE CKS, March 2014 (UK access only)
- Confidentiality and information sharing; National Treatment Agency for substance misuse, 2003

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- David L. Heymann, MD, ed., Control of Communicable Diseases Manual (CCDM), 20th edition, 2015, ISBN 978-0-87553-018-5
- Stadtländer CT. One Health: people, animals, and the environment. Infect Ecol Epidemiol. 2015;5:30514. Published 2015 Dec 31. doi:10.3402/iee.v5.30514
- Cork SC, Hall D, Karen L. One Health Case Studies: Addressing Complex Problems in a Changing World. Published 2016/11/15. ISBN: 9781910455555

1.1.2 Journals:

- Applied biosafety
- Journal of Biosafety
- International Journal of Biosafety and Biosecurity
- Bioethics
- Cambridge Quarterly of Healthcare Ethics
- Hastings Center Report
- Journal of Clinical Ethics
- Journal of Medical Ethics
- Journal of Medicine and Philosophy
- Kennedy Institute of Ethics Journal

BMS 705: Health Professions Education

(3+0 Credit Hrs)

This course aims at introducing the basic and applied concepts of medical education to the Pakistani health sciences teachers and improving their skills to perform the basic functions of a teacher in health sciences institutes. HPE course is a teacher friendly program that helps teachers in health sciences to develop their basic teaching skills. All teachers must acquire basic teaching skills if they wish to adopt a teaching career in health sciences.

1 Competencies

The student as a “**Subject expert**”, “**Communicator**” and “**Research Scholar**”. These competencies are then further expanded upon by objectives designed to cover the development of knowledge, skills and behaviour of the students by the time they graduate.

2 Objectives

By the end of the course, the graduate of MPhil Anatomy must have acquired a reasonable working knowledge of:

2.1 Cognitive domain:

1. Of the Dynamics of teaching and learning
2. Planning effective teaching sessions in Physiotherapy
3. Principles and theories of learning to develop educational programs and curricula.
4. Educational psychology for better transfer of knowledge skills and attitudes to students.

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5. How to develop skills like critical thinking and problem solving among students and teachers.
6. Teaching and learning strategies to improve the quality of teaching and learning in an educational environment.
7. Guiding students in developing their learning strategies, keeping them motivated and eventually becoming self-directed learners;
8. Challenges and barriers in planning and implementing teaching and learning strategies in diverse and locally unique teaching and learning environment in both clinical and non-clinical setups.
9. E-learning and information technologies to develop and manage computerized teaching and learning solutions.

2.2 Affective Domain:

1. Manage time and courses to submit assignments on time
2. Apply principles of professional conduct in paper submission (plagiarism)
3. Demonstrate professional behavior by completing all course requirements, including course evaluations, in a timely manner.
4. Demonstrate responsibility and accountability by attending and being punctual at all required course activities such as laboratory sessions, workshops and exams.
5. Demonstrate professional behavior by requesting any excused absence from required course activities well ahead of the scheduled date.
6. Demonstrate professional behavior by responding to direct communication from the course faculty in a timely fashion, particularly in circumstances when a face-to face meeting is requested to discuss issues related to academic performance.
7. Demonstrate professional and ethical behavior by honestly completing course examinations without attempting to seek an advantage by unfair means; and by reporting any unethical behavior of peers to the course administration.

2.3 Research:

1. Critically analyse research articles and develop a literature review.
2. Discuss the research based recent advances in the relevant field.
3. Learn to interpret the findings in the medical literature for future research
4. Improve critical appraisal skills and conduct it effectively
5. Earn skills related to oral and written presentations
6. Comprehend the limitations of the application of evidence
7. Develop an understanding for the principles of a research proposal