SRI GURU RAM DAS UNIVERSITY OF HEALTH SCEINCES
CHOICE BASED CREDIT SYSTEM

CURRICULUM MASTER OF MEDICAL PHARMACOLOGY

(With effect from 2026-27 Academic session)

Approved as per BOS –-57/2026, Dated 17/08/2026

PROPOSED CURRICULUM
M.Sc. MEDICAL PHARMACOLOGY
FOUR-SEMESTER POSTGRADUATE PROGRAMME

Programme	**M.Sc. Medical Pharmacology**
Duration	2 years / 4 semesters
Semester I	Foundations and Systemic Pharmacology
Semester II	Chemotherapy, Therapeutics and Experimental Pharmacology
Semester III	Clinical, Regulatory, Research and Medical Education
Semester IV	Dissertation / Research Work only
Proposed total credits	120
Teaching language	English

1. Programme Rationale

The M.Sc. Medical Pharmacology programme is designed to provide advanced theoretical, practical, clinical, analytical, regulatory, research and teaching competencies in pharmacology. The sequence progresses from fundamental and systemic pharmacology in Semester I to chemotherapy and experimental methods in Semester II, followed by clinical pharmacology, pharmacokinetics, drug regulation, research methodology and medical education in Semester III. Semester IV is reserved entirely for supervised research and dissertation work.

2. Programme Educational Objectives

- Develop advanced knowledge of pharmacological principles, mechanisms of drug action and therapeutic applications.
- Develop competence in experimental pharmacology, bioassay, drug analysis and interpretation of pharmacological data.
- Apply pharmacokinetic, pharmacodynamic and therapeutic drug-monitoring principles to clinical problems.
- Understand drug discovery, preclinical development, bioequivalence, clinical research, ethics and regulatory requirements.
- Develop skills in research methodology, biostatistics, scientific writing, presentation and critical appraisal of literature.
- Develop competency in postgraduate medical teaching, lesson planning, learner assessment and feedback.
- Prepare graduates for careers in academic pharmacology, clinical research, pharmaceutical research, drug development, regulatory affairs and related biomedical fields.

3. Programme Learning Outcomes

- Demonstrate comprehensive knowledge of major drug classes, mechanisms, pharmacokinetics, pharmacodynamics, indications, adverse effects and contraindications.
- Integrate pharmacology with therapeutics and rational drug selection.
- Design and interpret appropriate experimental pharmacology and bioassay studies while observing ethical requirements.
- Use and interpret basic analytical techniques including spectrophotometry and chromatography.
- Calculate and interpret major pharmacokinetic parameters and relate them to clinical dosing.
- Explain major stages of drug discovery and development and relevant regulatory and ethical requirements.
- Apply appropriate statistical methods to pharmacological and clinical datasets.
- Critically appraise scientific literature and communicate evidence-based conclusions.
- Plan and conduct postgraduate teaching activities using appropriate educational methods.
- Plan and complete an independent research project and communicate its findings through dissertation, seminar and viva voce.

4. Eligibility for Admission

I. Master of Medical Pharmacology (MMP) shall be a two-year postgraduate programme. The minimum eligibility for admission shall be as follows:
Candidates holding MBBS, BDS, B.Sc. (APB), B.Pharm, or BPT degree from a recognized University/Institution shall be eligible to apply.

II. Candidates must have secured a minimum of 55% aggregate marks or equivalent CGPA in the qualifying examination. A relaxation to 50% aggregate marks or equivalent CGPA shall be applicable to candidates belonging to SC/ST categories, as per the applicable rules of the University/Government.

III. Candidates possessing a B.Pharm degree shall have secured a minimum of 60% aggregate marks, with relaxation to 55% for candidates belonging to SC/ST categories.

OR

IV. Any other qualification/examination recognized as equivalent by the Board of Management of Sri Guru Ram Das University of Health Sciences (SGRDUHS) from time to time shall also be considered eligible.

V. Selection of candidates for admission to the M.Sc. Medical Pharmacology programme shall be based on merit/performance in the Centralized Entrance Test (CET) conducted by SGRDUHS, or through any other entrance examination recognized/adopted by the University from time to time, including the Common University Entrance Test–Postgraduate (CUET-PG) conducted by the National Testing Agency (NTA), subject to applicable University regulations.

VI. The Centralized Entrance Test (CET) for admission to the M.Sc. Medical Pharmacology programme shall consist of Multiple-Choice Questions (MCQs) and shall be of 1hours duration, carrying a maximum of 50 marks.

VII. The entrance examination syllabus shall comprise the relevant subjects/topics from the undergraduate syllabus in Medical Sciences.

VIII. The number of seats, reservation policy, admission procedure, eligibility relaxation, and other admission-related matters shall be governed by the rules and regulations of SGRDUHS, Government of Punjab, and other competent regulatory authorities, as applicable and amended from time to time.

5. Examination Schedule

Each course shall be evaluated through Continuous Internal Assessment and an End-Semester Examination. The assessment scheme shall include Internal Assessment and End-Semester Examination, with prescribed weightage as approved by the University. Assignments/seminars may be used as alternative components of internal assessment with the approval of the Head of the Department.

Eligibility for End-Semester Examination

A student shall be eligible to appear in the End-Semester Examination only after:

- securing the prescribed minimum marks in Continuous Internal Assessment;
- fulfilling the minimum 75% attendance requirement in theory and practical courses; and
- satisfying all other University examination requirements.

6. Research Project/Dissertation

Each student shall undertake an approved research project under the guidance of a recognized postgraduate teacher/supervisor. The research proposal/synopsis shall be submitted within the prescribed period. The dissertation shall demonstrate originality, scientific rigor, ethical compliance, appropriate methodology, critical analysis and scholarly presentation. It shall be evaluated by one internal and one external examiner.

7. Examination and Passing Criteria

The End-Semester Examination shall be conducted as per the scheme approved by the Board of Studies and University. A student shall be declared to have successfully completed a course upon obtaining a minimum of 50% marks (Grade Point 5.0) or as otherwise prescribed by the University.

8. Supplementary Examination

A student failing in a course shall be permitted to appear in the supplementary examination as per University regulations. Internal assessment marks shall ordinarily be carried forward. The maximum number of courses permitted for supplementary examination shall be governed by the University rules.

Re-evaluation

Re-evaluation shall be permitted for eligible End-Semester theory examinations in accordance with the University's prescribed rules and within the stipulated time and fee requirements.

Grading System

The programme shall follow the UGC-recommended 10-point grading system, with grades and Cumulative Grade Point Average (CGPA) awarded in accordance with the University's approved grading policy.

9. Re-entry after break of study

I. Re-entry/readmission shall be governed by the University regulations applicable to the programme.

II. A student absent from the programme for more than three months shall obtain readmission to the appropriate semester with the approval of the Competent Authority.

III. The student shall follow the syllabus and academic regulations in force at the time of readmission.

IV. Readmission shall be subject to the approval of the Vice-Chancellor and shall normally be permitted only once.

V. A student seeking readmission shall submit the application to the Registrar within the prescribed period and the case shall be considered by the designated committee.

10. Ranking

I. The first and second ranks shall be determined on the basis of the overall CGPA obtained in the programme.

II. In case of a tie, the percentage/marks obtained in core courses shall be considered for determining the rank.

11. Credit load per Semester

I. The normal full-time academic load shall be 24 credits per semester. A student may normally register for a minimum of 18 and a maximum of 30 credits in a semester, subject to University regulations.

II. A student in Good Academic Standing may be permitted to register for up to 34 credits, subject to approval of the Dean and availability of the courses.

12. Programme continuation, promotion and discontinuation

I. A student shall be eligible for continuation and promotion upon securing a minimum CGPA of 5.0 at the end of the prescribed assessment period.

II. A student failing to meet the minimum CGPA requirement shall be required to clear the deficient courses and achieve the prescribed CGPA before progression, as per University rules.

III. A student obtaining Fail/Absent grade shall reappear in the concerned course examination when the course is next offered. Internal assessment marks shall be carried forward as per University regulations.

IV. A minimum of 75% attendance in each course shall be required for appearing in the End-Semester Examination.

V. Shortage of attendance shall be treated course-wise. A student failing to meet the prescribed attendance requirement in a course shall repeat that course with the subsequent batch.

VI. A maximum of three attempts (one regular and two supplementary/backlog attempts) shall be permitted for clearing a course, subject to the maximum period prescribed by the University for completion of the programme.

VII. Failure to complete the programme within the prescribed maximum duration shall result in discontinuation of enrolment, subject to applicable University provisions.

13. Proposed Credit and Contact-Hour Framework

Code	Course	Credits	Practical Hrs/Wk	Marks IA+UE
SEMESTER-I				
MPH-501	Fundamentals and Autonomic Pharmacology	3	—	30+70=100
MPH-502	Central Nervous System Pharmacology	3	—	30+70=100
MPH-503	Cardiovascular, Renal, Gastrointestinal and Respiratory Pharmacology	3	—	30+70=100
MPH-504	Autacoids, Blood, Endocrine and Reproductive Pharmacology	3	—	30+70=100
UHV.501	Universal Human Values & Ethics	2	-	NC*
RMB.501	Research Methodology & Biostatistics	3	-	30+70=100
MPH-525	Basic Pharmacology Practical and Prescription Skills	6	12	30+70=100
	Total	**23**	**12**	**600**
SEMESTER-II				
MPH-505	Chemotherapy of Microbial and Parasitic Diseases	4	—	30+70=100
MPH-506	Antineoplastic Agents, Immunomodulators and Therapeutics	4	—	30+70=100
MPH-507	Vitamins, Heavy Metals, Ocular, Dermatological and Recent Advances	4	—	30+70=100

Code	Course	Credits	Practical Hrs/Wk	Marks IA+UE
SEMESTER-I				
MPH-508	Experimental Pharmacology and Bioassay	4	—	30+70=100
MPH-509	Drug Analysis and Instrumentation	4	—	30+70=100
MPH-526	Experimental and Analytical Pharmacology Practical	6	12	30+70=100
	Total	**26**	**12**	**600**
SEMESTER-III				
MPH-510	Clinical Pharmacokinetics and Pharmacodynamics	4	—	30+70=100
MPH-511	Drug Regulation, Drug Development and Therapeutic Drug Monitoring	4	—	30+70=100
IPR.550	Bioethics & Intellectual Property Rights	2	—	50
MPH-527	Clinical Pharmacology, PK and Regulatory Practical	6	12	30+70=100
MPH-599	Teaching Practice and Seminars	5	5	50
	Total	**21**	**13**	**400**
SEMESTER-IV				
MPH-600A	Dissertation / Research Project	24	Full-time supervised research	100
MPH-600B	Research Seminar and Progress Presentation	2	Seminar	100
MPH-600C	Dissertation Submission and Viva-Voce	4	Thesis + viva	100
	Total	**30**		**300**

*Non-credit

The postgraduate student in Master of Medical Pharmacology shall undergo training that will comprise of the following:

Sr. No.	Clinical Training	Semester	Duration
1.	Clinical Biochemistry	II	1 week
2.	Clinical Microbiology	II	1 week
3.	Hospital Pharmacy	II & III	1 week
4.	Clinical Trail Unit/Research Centre	II	1 week

SEMESTER I

Foundations, autonomic/CNS pharmacology and major systemic pharmacology.

Code	Course	Credits	Practical Hrs/Wk	Marks IA+UE
MPH-501	Fundamentals and Autonomic Pharmacology	3	—	30+70=100
MPH-502	Central Nervous System Pharmacology	3	—	30+70=100
MPH-503	Cardiovascular, Renal, Gastrointestinal and Respiratory Pharmacology	3	—	30+70=100
MPH-504	Autacoids, Blood, Endocrine and Reproductive Pharmacology	3	—	30+70=100
UHV.501	Universal Human Values & Ethics	2	-	NC*
RMB.501	Research Methodology & Biostatistics	3	-	30+70=100
MPH-525	Basic Pharmacology Practical and Prescription Skills	10	10	30+70=100
	Semester I Total	27	10	600

*NC-Non Credit

MPH-501: Fundamentals and Autonomic Pharmacology

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Explain pharmacological principles, receptor interactions and dose-response relationships.
- Describe absorption, distribution, metabolism and excretion at an introductory level.
- Explain cholinergic and adrenergic transmission and pharmacology of drugs acting on the autonomic nervous system.
- Apply mechanisms, indications, adverse effects and contraindications to common clinical situations.

Detailed course content

Unit I – General principles

- Scope of pharmacology; drug nomenclature; routes of administration; dosage forms; pharmacokinetic and pharmacodynamic overview.
- Drug receptors, signal transduction, agonists and antagonists, potency, efficacy, therapeutic index, dose-response curves.
- Adverse drug reactions, drug interactions, tolerance, dependence, idiosyncrasy and factors modifying drug response.

Unit II – Pharmacokinetics

- Absorption, bioavailability, distribution, plasma protein binding, metabolism and excretion.

- First-pass effect, half-life, clearance and basic dosage-regimen concepts.

Unit III – Cholinergic pharmacology

- Cholinergic receptors; parasympathomimetics, anticholinesterases and antimuscarinic drugs.
- Clinical applications in glaucoma, gastrointestinal/urinary disorders, neuromuscular disorders and selected emergencies.

Unit IV – Adrenergic pharmacology

- Alpha- and beta-adrenoceptors; sympathomimetics and sympatholytics.
- Clinical applications in hypertension, asthma, shock, cardiac disease and other relevant conditions.

Unit V – Neuromuscular and ganglionic drugs

- Neuromuscular blockers, reversal agents and drugs affecting autonomic ganglia.
- Adverse effects, contraindications and clinically important interactions.

Course learning outcomes

- Explain core pharmacological concepts accurately.
- Predict major drug responses from receptor mechanisms.
- Select appropriate autonomic drugs for common clinical indications.
- Interpret dose-response relationships and adverse effects.

Recommended books / references

- Goodman & Gilman's The Pharmacological Basis of Therapeutics.
- K.D. Tripathi, Essentials of Medical Pharmacology.
- Rang & Dale's Pharmacology.

MPH-502: Central Nervous System Pharmacology

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Explain major CNS neurotransmitter systems and their pharmacological modulation.
- Discuss drugs used for pain, epilepsy, anxiety, sleep and neurodegenerative disorders.
- Apply benefit-risk principles in CNS pharmacotherapy.

Detailed course content

Unit I – CNS principles

- Neurotransmitters, CNS receptors, synaptic transmission and principles of CNS drug action.

Unit II – Sedatives and anxiolytics

- Sedative-hypnotics, anxiolytics and related agents; mechanisms, therapeutic uses, adverse effects and dependence.

Unit III – Analgesics and pain

- Opioid and non-opioid analgesics; mechanisms, therapeutic uses, adverse effects and principles of pain management.

Unit IV – Epilepsy and migraine

- Antiepileptic drugs, mechanisms, clinical selection and adverse effects; pharmacotherapy of migraine.

Unit V – Neurodegenerative and sexual disorders

- Drugs used in Alzheimer's disease and selected neurodegenerative disorders; pharmacotherapy of male sexual dysfunction.

Course learning outcomes

- Explain CNS drug mechanisms and therapeutic applications.
- Differentiate major analgesic and antiepileptic drug classes.
- Discuss adverse effects and clinically relevant interactions.

Recommended books / references

- Goodman & Gilman.
- K.D. Tripathi.
- Rang & Dale's Pharmacology.

MPH-503: Cardiovascular, Renal, Gastrointestinal and Respiratory Pharmacology

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Explain pharmacological regulation of cardiovascular, renal, gastrointestinal and respiratory functions.
- Select major therapeutic drug groups for common disorders.
- Relate mechanisms to adverse effects and contraindications.

Detailed course content

Unit I – Cardiovascular pharmacology

- Antihypertensives, antianginal drugs and drugs used in heart failure.
- Antiarrhythmic drugs and principles of cardiovascular drug combinations.

Unit II – Renal pharmacology

- Diuretics and drugs affecting renal function; mechanisms, therapeutic uses and adverse effects.

Unit III – Gastrointestinal pharmacology

- Drugs affecting gastrointestinal motility, secretion and common gastrointestinal disorders.

Unit IV – Respiratory pharmacology

- Bronchodilators, antiasthmatic drugs and cough suppressants.

Unit V – Integrated therapeutics

- Rational combination therapy, contraindications, drug interactions and patient-specific selection.

Course learning outcomes

- Describe major cardiovascular, renal, GI and respiratory drug classes.
- Explain mechanisms and clinical applications.
- Recognize major adverse effects and contraindications.

Recommended books / references

- Goodman & Gilman.
- K.D. Tripathi.
- Rang & Dale's Pharmacology.

MPH-504: Autacoids, Blood, Endocrine and Reproductive Pharmacology

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Explain the physiological and pathological role of major autacoids.
- Discuss drugs acting on blood, endocrine and reproductive systems.
- Apply hormone and hormone-replacement principles to therapeutics.

Detailed course content

Unit I – Autacoids

- Histamine, serotonin, prostaglandins, leukotrienes and related mediators; antagonists and therapeutic applications.

Unit II – Blood

- Antiplatelet, anticoagulant and other drugs affecting haemostasis; drugs acting on blood-forming organs.

Unit III – Endocrine pharmacology

- Insulin and antidiabetic drugs; thyroid and antithyroid drugs; corticosteroids and other adrenal steroids.

Unit IV – Reproductive pharmacology

- Ovarian and testicular hormones, hormone replacement therapy and drugs affecting uterine motility.

Unit V – Bone/mineral and related therapy

- Parathyroid-related pharmacology, calcium regulation and selected agents affecting bone metabolism.

Course learning outcomes

- Explain major autacoid pathways and their pharmacological modulation.
- Discuss endocrine and reproductive pharmacotherapy.
- Identify important adverse effects and precautions.

Recommended books / references

- Goodman & Gilman.
- K.D. Tripathi.
- Rang & Dale's Pharmacology.

RMB.501: Research Methodology and Biostatistics

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Formulate research questions and objectives.
- Select appropriate study designs and statistical methods.

- Perform and interpret basic statistical analyses relevant to pharmacology.

Detailed course content

Unit I – Research foundations

- Research question, hypothesis, objectives, literature search, protocol development and study design.

Unit II – Data and sampling

- Variables, scales, sampling, sample size concepts, bias, confounding, missing data and data management.

Unit III – Descriptive statistics

- Mean, median, mode, SD, variance, confidence intervals and graphical presentation.

Unit IV – Inferential statistics

- Paired and unpaired t-tests, chi-square, correlation and basic regression; assumptions and interpretation.

Unit V – ANOVA and reporting

- One-way ANOVA, post-hoc concepts, interpretation of concentration-time datasets, p-values, effect estimates and scientific reporting.

Course learning outcomes

- Formulate a feasible research protocol.
- Select an appropriate statistical test.
- Interpret statistical output.
- Present research data using appropriate tables and figures.

Recommended books / references

- Daniel, Biostatistics: A Foundation for Analysis in the Health Sciences.
- Altman, Practical Statistics for Medical Research.
- WHO/standard research methodology manuals.

MPH-525: Basic Pharmacology Practical and Prescription Skills

Credits: 10 | Theory: 0 hours/week | Practical/Clinical: 10 hours/week

Course objectives

- Develop practical skills in prescription writing, drug-information appraisal, graph interpretation and basic pharmacological calculations.
- Develop safe and ethical habits in practical pharmacology.

Detailed course content

Unit I – Prescription writing

- Prescription format, patient details, drug selection, dose, route, frequency, duration and instructions.

Unit II – Prescription audit

- Identification of prescribing errors, interactions, duplication, contraindications and irrational therapy.

Unit III – Literature and drug information

- Critical evaluation of pharmaceutical company literature, package information and selected scientific articles.

Unit IV – Graphs and calculations

- Dose-response curves, concentration-effect relationships and interpretation of experimental/clinical graphs.

Unit V – Toxicology exercises

- Recognition of common drug overdose/poisoning patterns and principles of emergency management; case-based exercises.

Course learning outcomes

- Write rational prescriptions.
- Audit a prescription systematically.
- Interpret pharmacological graphs.
- Communicate drug information clearly.

Recommended books / references

- K.D. Tripathi.
- WHO Guide to Good Prescribing.
- Goodman & Gilman.

Name of the Course	**HUMAN VALUES AND ETHICS**
Course Code	**HVE.501**
Credit hours	**03**
Teaching Objective	1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings. 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way. 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature. Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.
Learning Outcomes	By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a

	beginning would be made in this direction.	
Unit No.	**Content**	**L+T**
Module 1	Introduction to Value Education (6 lectures and 3 tutorials for practice session) Lecture 1: Understanding Value Education Lecture 2: Self-exploration as the Process for Value Education Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture 3: Continuous Happiness and Prosperity – the Basic Human Aspirations Lecture 4: Right Understanding, Relationship and Physical Facility Tutorial 2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario Lecture 6: Method to Fulfill the Basic Human Aspirations Tutorial 3: Practice Session PS3 Exploring Natural Acceptance	5+4
Module 2	Harmony in the Human Being Lecture 7: Understanding Human being as the Co-existence of the Self and the Body Lecture 8: Distinguishing between the Needs of the Self and the Body Tutorial 4: Practice Session PS4 Exploring the difference of Needs of Self and Body Lecture 9: The Body as an Instrument of the Self Lecture 10: Understanding Harmony in the Self Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the Self Lecture 11: Harmony of the Self with the Body Lecture 12: Programme to ensure self-regulation and Health Tutorial 6: Practice Session PS6 Exploring Harmony of Self with the Body	7+3
Module 3	Harmony in the Family and Society (6 lectures and 3 tutorials for practice session) Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction Lecture 14: Values in Human-to-Human Relationship Lecture 15: 'Trust' – the Foundational Value in Relationship Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust Lecture 16: 'Respect' – as the Right Evaluation Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture 17: Understanding Harmony in the Society Lecture 18: Vision for the Universal Human Order Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal	6+3
Module 4	Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session) Lecture 19: Understanding Harmony in the Nature Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels Lecture 22: The Holistic Perception of Harmony in Existence Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence	4+2
Module 5	Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session) Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order Lecture 26: Competence in Professional Ethics Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models Typical Case Studies Lecture 28: Strategies for Transition towards Value-based Life and Profession Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Orde	6+3
Suggested Readings:		
Text Book and Teachers Manual The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 b.		

The Teacher's Manual Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
Reference Books 1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 3. The Story of Stuff (Book). 4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi 5. Small is Beautiful - E. F Schumacher. 6. Slow is Beautiful - Cecile Andrews 7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal 9. Rediscovering India - by Dharampal 10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

SEMESTER II

Theme: Chemotherapy, therapeutics, experimental pharmacology, bioassay and drug-analysis methods.

Code	Course	Credits	Practical Hrs/Wk	Marks IA+UE
MPH-505	Chemotherapy of Microbial and Parasitic Diseases	4	—	30+70=100
MPH-506	Antineoplastic Agents, Immunomodulators and Therapeutics	4	—	30+70=100
MPH-507	Vitamins, Heavy Metals, Ocular, Dermatological and Recent Advances	4	—	30+70=100
MPH-508	Experimental Pharmacology and Bioassay	4	—	30+70=100
MPH-509	Drug Analysis and Instrumentation	4	—	30+70=100
MPH-526	Experimental and Analytical Pharmacology Practical	6	12	30+70=100
	Semester II Total	26	12	600

MPH-505: Chemotherapy of Microbial and Parasitic Diseases

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Explain principles of selective toxicity, antimicrobial resistance and rational chemotherapy.
- Discuss antibacterial, antiviral, antifungal, antiprotozoal and anthelmintic agents.
- Apply antimicrobial stewardship principles.

Detailed course content

Unit I – Principles

- Selective toxicity, therapeutic index, antimicrobial resistance, mechanisms of resistance and combination therapy.

Unit II – Antibacterial drugs

- Major antibacterial classes, mechanisms, spectrum, clinical uses, adverse effects and resistance.

Unit III – Antiviral and antifungal drugs

- Major antiviral classes and mechanisms; systemic and topical antifungal agents.

Unit IV – Antiprotozoal therapy

- Major antiprotozoal agents, indications, mechanisms and adverse effects.

Unit V – Anthelmintic therapy

- Major anthelmintics, mechanisms, clinical uses and safety considerations.

Course learning outcomes

- Select rational antimicrobial therapy.
- Explain resistance mechanisms.
- Compare major antimicrobial classes.
- Discuss antimicrobial stewardship.

Recommended books / references

- Goodman & Gilman.
- K.D. Tripathi.
- Katzung, Basic & Clinical Pharmacology.

MPH-506: Antineoplastic Agents, Immunomodulators and Therapeutics

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Explain principles of cancer chemotherapy and immunomodulation.
- Discuss anti-inflammatory and metabolic pharmacotherapy.
- Recognize major toxicities and monitoring requirements.

Detailed course content

Unit I – Principles of cancer chemotherapy

- Cell cycle, tumor selectivity, combination therapy, resistance and principles of treatment.

Unit II – Anticancer drugs

- Alkylating agents, antimetabolites, natural products, targeted agents and hormonal approaches; toxicities.

Unit III – Immunopharmacology

- Immunosuppressants, immunomodulators and therapeutic applications in autoimmune/inflammatory disorders.

Unit IV – Metabolic pharmacology

- Antidiabetic drugs, treatment principles and adverse effects; antihyperlipidemic therapy.

Unit V – Anti-inflammatory and antipyretic therapy

- NSAIDs and related drugs, anti-inflammatory strategies, adverse effects and contraindications.

Course learning outcomes

- Explain mechanisms of anticancer and immunomodulatory drugs.

- Discuss therapeutic strategies and toxicity.
- Apply rational metabolic and anti-inflammatory therapy.

Recommended books / references

- Goodman & Gilman.
- K.D. Tripathi.
- Katzung.

MPH-507: Vitamins, Heavy Metals, Ocular, Dermatological and Recent Advances

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Describe pharmacology of vitamins and chelating agents.
- Explain basic ocular and dermatological pharmacology.
- Discuss selected emerging areas of pharmacology.

Detailed course content

Unit I – Vitamins

- Water- and fat-soluble vitamins, deficiency states, therapeutic uses and toxicity.

Unit II – Heavy metals

- Heavy metal toxicity and principles of chelation/antagonism.

Unit III – Ocular pharmacology

- Drugs used in glaucoma and selected ocular conditions.

Unit IV – Dermatopharmacology

- Drugs used in common inflammatory, infectious and other selected skin disorders.

Unit V – Recent advances

- Free radical biology and antioxidants; bisphosphonates; melatonin; therapeutic gases; gene therapy; selected recent developments in pharmacology.

Course learning outcomes

- Explain therapeutic uses and toxicities of vitamins.
- Discuss chelation principles.
- Describe ocular and dermatological pharmacotherapy.
- Summarize selected recent advances.

Recommended books / references

- Goodman & Gilman.
- K.D. Tripathi.
- Rang & Dale.

MPH-508: Experimental Pharmacology and Bioassay

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Understand in vivo, in vitro and ex vivo approaches in drug discovery.
- Understand animal handling, experimental design, screening models and bioassay.
- Apply ethical principles to animal research.

Detailed course content

Unit I – Experimental methodology

- In vivo, in vitro and ex vivo models; controls, randomization, blinding, reproducibility and data recording.

Unit II – Animal care and ethics

- Animal handling, care, restraint, blood collection, anaesthesia and humane euthanasia; institutional ethical requirements.

Unit III – Drug screening

- Models for anti-inflammatory, analgesic, antidiabetic, antihypertensive, antiulcer, antidepressant, antiepileptic and related screening.

Unit IV – Additional screening

- Antimicrobial, antifungal, anthelmintic, antiviral and selected endocrine/cardiovascular models.

Unit V – Toxicity and bioassay

- LD50/ED50 concepts, acute/subacute/chronic toxicity, organ toxicity, teratogenicity/carcinogenicity principles and bioassay methods.

Course learning outcomes

- Design a basic experimental pharmacology study.
- Explain ethical requirements.
- Interpret dose-response and bioassay data.
- Select appropriate experimental controls.

Recommended books / references

- D.R. Laurence, Clinical Pharmacology.
- Goodman & Gilman.
- Relevant institutional animal ethics and laboratory manuals.

MPH-509: Drug Analysis and Instrumentation

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Explain principles of analytical techniques used in drug analysis.
- Interpret spectroscopic and chromatographic data.
- Understand analytical validation and good laboratory practice.

Detailed course content

Unit I – Basic analysis

- Qualitative testing, titrimetric analysis and Beer-Lambert law.

Unit II – Spectroscopy

- Colorimetry, UV-visible spectroscopy, atomic absorption, fluorescence, NMR and mass spectrometry.

Unit III – Chromatography I

- Partition, adsorption, ion-exchange, paper, column and thin-layer chromatography.

Unit IV – Chromatography II

- HPTLC, HPLC, gas chromatography and immuno-adsorbent chromatography.

Unit V – Bioanalysis and validation

- Radioimmunoassay, biological sample processing, calculations, GLP and validation parameters.

Course learning outcomes

- Explain principles of major analytical instruments.
- Select suitable analytical methods.
- Interpret chromatographic and spectroscopic outputs.
- Explain validation and GLP.

Recommended books / references

- A. C. Moffat et al., Clarke's Analysis of Drugs and Poisons.
- Skoog et al., Principles of Instrumental Analysis.
- ICH analytical validation guidance.

MPH-526: Experimental and Analytical Pharmacology Practical

Credits: 10 | Theory: 0 hours/week | Practical/Clinical: 10 hours/week

Course objectives

- Develop practical competence in experimental pharmacology, bioassay, spectrophotometry and chromatography.
- Record, analyse and interpret experimental data appropriately.

Detailed course content

Unit I – Experimental pharmacology

- Demonstration/simulation of selected screening models where permitted; ethical and alternative methods should be preferred when appropriate.

Unit II – Bioassay

- Dose-response curves, standard/unknown comparison and four-point bioassay calculations using validated demonstrations/simulations.

Unit III – Spectrophotometry

- Drug estimation using colorimetric/UV-visible methods; calibration curves and concentration calculations.

Unit IV – Chromatography

- TLC/HPTLC/HPLC/GC demonstrations; retention behavior and basic chromatogram interpretation.

Unit V – Laboratory documentation

- GLP, validation exercises, calculations, data sheets, practical record and report writing.

Course learning outcomes

- Perform/interpret basic analytical procedures.
- Calculate drug concentrations.
- Construct and interpret dose-response curves.

- Maintain appropriate laboratory records.

Recommended books / references

- Laboratory practical manuals.
- Skoog et al.
- Clarke's Analysis of Drugs and Poisons.

SEMESTER III

Theme: Clinical pharmacology, pharmacokinetics, regulation, research methods and medical education.

Code	Course	Credits	Practical Hrs/Wk	Marks (IA+UE)
MPH-510	Clinical Pharmacokinetics and Pharmacodynamics	4	—	30+70=100
MPH-511	Drug Regulation, Drug Development and Therapeutic Drug Monitoring	4	—	30+70=100
IPR.550	Bioethics & Intellectual Property Rights	2	—	50
MPH-527	Clinical Pharmacology, PK and Regulatory Practical	6	12	30+70=100
MPH-599	Teaching Practice and Seminars	5	5	50
	Semester III Total	21	13	400

MPH-510: Clinical Pharmacokinetics and Pharmacodynamics

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Calculate major pharmacokinetic parameters.
- Interpret concentration-time profiles and compartment models.
- Explain PK/PD relationships and their clinical implications.

Detailed course content

Unit I – Basic PK

- Absorption, distribution, metabolism, excretion, bioavailability and first-pass effect.

Unit II – PK parameters

- Cmax, Tmax, t1/2, AUC(0–t), AUC(0–∞), Vd, Ke, Ka, clearance and related calculations.

Unit III – Compartment models

- One- and two-compartment models; intravenous and oral dosing; compartment fitting concepts.

Unit IV – Clinical applications

- Dose adjustment, loading/maintenance doses, accumulation and factors affecting pharmacokinetics.

Unit V – PK/PD

- Pharmacodynamic response models and integration of PK and PD information.

Course learning outcomes

- Calculate and interpret PK parameters.
- Interpret compartmental concentration-time data.
- Explain clinical dose adjustments.
- Relate PK to PD response.

Recommended books / references

- Rowland & Tozer, Clinical Pharmacokinetics and Pharmacodynamics.
- Goodman & Gilman.
- Applied Clinical Pharmacokinetics references.

MPH-511: Drug Regulation, Drug Development and Therapeutic Drug Monitoring

Credits: 4 | Theory: 4 hours/week | Practical/Clinical: 0 hours/week

Course objectives

- Describe the drug-development pathway from discovery to post-marketing.
- Explain Indian and international regulatory concepts.
- Apply TDM and bioequivalence principles.

Detailed course content

Unit I – Regulatory framework

- Drugs and Cosmetics Act and Rules; Drug Price Control Order; overview of regulatory authorities and submissions.

Unit II – IND/NDD and development

- Investigational New Drug and new drug discovery/development documentation; preclinical and clinical development stages.

Unit III – Bioequivalence and clinical research

- Bioequivalence principles, study design, PK endpoints, ethical issues, informed consent and participant protection.

Unit IV – GCP and ethics

- ICH-GCP, Helsinki principles, clinical trial responsibilities, documentation and quality systems.

Unit V – TDM and drug delivery

- Therapeutic index, trough monitoring, dosage adjustment; sustained-release, enteric-coated and liposomal delivery systems.

Course learning outcomes

- Explain major regulatory requirements.
- Describe IND/NDD documentation.
- Interpret bioequivalence concepts.
- Apply TDM principles to case scenarios.

Recommended books / references

- ICH-GCP.
- ICH E6 and relevant ICH guidelines.
- Indian regulatory guidance/current Drugs and Cosmetics framework.
- Goodman & Gilman.

Name of the Course	**BIOETHICS AND INTELLECTUAL PROPERTY RIGHT**
Course Code	**IPR.550**
Credit hours	**03**

Teaching Objective	Students will gain a comprehensive understanding of foundational ethical principles and their application to medicine and healthcare. They will learn to analyze and resolve complex ethical dilemmas in clinical and research settings, considering topics from patient rights and end-of-life care to emerging biomedical technologies. Additionally, students will develop a solid grasp of intellectual property rights (IPR), particularly patents in biotechnology, and learn to critically evaluate the ethical and legal conflicts surrounding IPR, such as access to medicine and biopiracy.
Learning Outcomes	By the end of this course, students will be able to: i. Apply ethical theories like utilitarianism and deontology to real-world healthcare scenarios. ii. Critically evaluate the four core principles of bioethics: autonomy, beneficence, non-maleficence, and justice. iii. Demonstrate a systematic approach to ethical decision-making in both clinical practice and medical research. iv. Analyze and navigate the legal and ethical landscape of intellectual property, including patenting biological materials and managing patent applications. v. Debate and articulate informed positions on major controversies at the intersection of bioethics and IPR, such as compulsory licensing and the protection of traditional knowledge.

Unit No.	Content	Lectures
1.	**Introduction to ethics**: Exploration of fundamental ethical concepts, theories (like utilitarianism and deontology), and their application to medicine and healthcare. **Core principles of bioethics**: In-depth analysis of the four central principles: autonomy (respect for the patient's right to choose), beneficence (the duty to do good), non-maleficence (the duty to do no harm), and justice (the fair distribution of benefits and burdens). **Historical context**: Study of significant historical events that shaped modern bioethics, such as the Nuremberg Code and the Tuskegee syphilis study. **Ethical decision-making**: Training in systematic approaches for resolving ethical dilemmas in clinical and research settings.	8
2.	**Ethical issues in clinical practice:** **Patient rights**: Understanding patient rights, informed consent, truth-telling, and confidentiality. **Beginning-of-life issues**: Discussion of ethical considerations related to reproductive technologies, abortion, contraception, and genetic screening. **End-of-life care**: Moral and legal issues surrounding euthanasia, physician-assisted suicide, advance directives, and organ transplantation. **Doctor-patient relationships**: Exploration of the power dynamics, trust, and communication necessary for therapeutic relationships.	7
3.	**Ethical issues in medical research** **Human experimentation**: Ethical guidelines for clinical trials, research involving vulnerable populations (e.g., children, prisoners), and the use of placebos. **Biomedical technology**: Ethical analysis of emerging technologies such as stem cell research, genetic engineering, cloning, and artificial intelligence in medicine. **Animal rights**: Debate surrounding the ethical use of animals in research and testing.	5

	Biobanking: Ethical issues involved in the collection, storage, and use of human biological samples for research.	
4.	**Introduction to IPR** **Fundamentals of IPR**: Definition and rationale behind intellectual property, including its role in incentivizing innovation in the healthcare industry. **Types of IP**: Overview of the main forms of IPR, including patents, copyrights, trademarks, and geographical indications, with relevance to the life sciences. **International framework**: Study of international agreements like the World Intellectual Property Organization (WIPO) and the TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights). Indian Position on WTO Regime. General Agreement on Trade and Tariff (GATT).	10
5.	**Patents in biotechnology and medicine** **Patentability criteria**: Detailed examination of the requirements for patenting biotechnological inventions, including novelty, inventive step (non-obviousness), and industrial applicability. **Patenting biological materials**: Analysis of patenting issues related to genes, microorganisms, and other life forms, referencing landmark court cases such as *Diamond v. Chakrabarty*. **Indian patent law**: Indian Patent Act 1970 (Patent Amendment Acts-1999, 2002 and 2005) **Patent process**: Practical guidance on drafting and filing patent applications and managing a patent portfolio.	5
6.	**Ethical and legal controversies in IPR** **Biopiracy and traditional knowledge**: Investigation of the appropriation of traditional knowledge and biological resources by pharmaceutical companies, Patent Case study: Basmati Case, Neem Controversy, Turmeric Case **Access to medicine**: Examination of the ethical conflict between a company's patent rights and the public's need for affordable medicines. This includes discussions on compulsory licensing. **Data and privacy**: IPR issues related to medical data, digital technologies, and the protection of patient information. **Case studies**: Use of real-world cases to explore conflicts between patent protection, patient welfare, and global health priorities.	10
	Total	**45**

Suggested Books:

Important Links
http://www.w3.org/IPR/ http://www.wipo.int/portal/index.html.en http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html www.patentoffice.nic.in www.iprlawindia.org/ - 31k - Cached - Similar page http://www.cbd.int/biosafety/background.shtml http://www.cdc.gov/OD/ohs/symp5/jyrtext.htm http://web.princeton.edu/sites/ehs/biosafety/biosafetypage/section3.html Bioethics - by Ellen Frankel Paul , Fred D. Miller, Jeffrey Paul , Fred Dycus Miller http://www.accessexcellence.org/RC/AB/IE/#Anchor-Bioethics-6296 www.bioethics.net Bioethics & Science http://www.americanprogress.org/issues/domestic/science?_kk=bioethics&_kt=21a1e10d-48e4-44bc-8b39- 21c695383746 **The Stem cell debate** http://www.billmuehlenberg.com/2005/09/02/the-stem-cell-debate/

MPH-527: Clinical Pharmacology, PK and Regulatory Practical

Credits: 8 | Theory: 0 hours/week | Practical/Clinical: 8 hours/week

Course objectives

- Apply PK calculations to real or simulated datasets.
- Interpret statistical and bioequivalence data.
- Prepare academic regulatory documents and TDM case solutions.

Detailed course content

Unit I – PK calculations

- Cmax, Tmax, AUC, t1/2, Vd, Ke and Ka calculations.

Unit II – Statistical analysis

- Paired/unpaired t-tests and ANOVA using pharmacological datasets; interpretation of p-values and confidence intervals.

Unit III – Bioequivalence

- Interpret concentration-time profiles and basic bioequivalence parameters.

Unit IV – Regulatory exercises

- Draft an academic IND/NDD application for a numbered compound; identify essential sections and supporting documents.

Unit V – TDM and literature

- Dose adjustment exercises and critical appraisal of clinical pharmacology papers.

Course learning outcomes

- Perform PK calculations.
- Interpret statistical results.
- Explain bioequivalence findings.
- Prepare structured regulatory exercises.

Recommended books / references

- Rowland & Tozer.
- ICH-GCP and relevant regulatory documents.
- Goodman & Gilman.

MPH-599: Teaching Practice and Seminar

Credits: 6 | Theory: 0 hours/week | Practical/Clinical: 6 hours/week

Course objectives

- Plan and conduct postgraduate-level teaching.
- Demonstrate communication, questioning, learner engagement and feedback skills.
- Present a scientific seminar using evidence-based sources.

Detailed course content

Unit I – Lesson planning

- Learning objectives, content selection, lesson plan and teaching aids.

Unit II – Teaching delivery

- Lecture, small-group, case-based or other appropriate method; questioning and learner interaction.

Unit III – Educational resources

- Slides, handouts, diagrams, digital resources and demonstration materials.

Unit IV – Feedback and reflection

- Student feedback, peer review, self-reflection and improvement plan.

Unit V – Seminar

- Scientific literature search, critical appraisal, presentation, discussion and response to questions.

Course learning outcomes

- Deliver a structured teaching session.
- Use appropriate teaching aids.
- Obtain and respond to feedback.
- Present and defend a scientific topic.

Recommended books / references

- Dent & Harden.
- Swanwick.
- Selected current medical education literature.

SEMESTER IV – DISSERTATION / RESEARCH WORK

Semester IV shall be devoted exclusively to supervised research. A student shall undertake an approved dissertation/research project under a recognized supervisor. The project may be laboratory-based, clinical, pharmacological, analytical, pharmacokinetic, pharmacovigilance, regulatory, educational or another approved area relevant to medical pharmacology.

Code	Component	Credits	Contact / Work	Marks
MPH-600A	Dissertation / Research Project	24	Full-time supervised research	100
MPH-600B	Research Seminar and Progress Presentation	2	Seminar	100
MPH-600C	Dissertation Submission and Viva-Voce	4	Thesis + viva	100
	Semester IV Total	30		300

14. Dissertation Process

Stage	Activity	Expected output
1	Topic selection and supervisor allocation	Approved research topic
2	Literature review and research question	Background, rationale and objectives
3	Protocol development	Research protocol with methodology and statistical plan
4	Ethical/regulatory approval	Approval from relevant institutional committee(s), where applicable
5	Data/experimental work	Completed observations/data
6	Data analysis	Statistical analysis, tables and figures
7	Interpretation	Results, discussion, limitations and conclusions
8	Dissertation writing	Final thesis
9	Seminar	Oral research presentation
10	Viva voce	Final defense and evaluation

Suggested Dissertation Structure

- Title page
- Certificate/declaration as prescribed by the University
- Acknowledgements
- Abstract
- Introduction and rationale
- Review of literature
- Aim and objectives
- Materials and methods
- Ethical considerations

- Statistical analysis
- Results
- Discussion
- Strengths and limitations
- Conclusion and recommendations
- References
- Annexures/appendices

15. Dissertation Evaluation Rubric

Domain	Suggested marks
Research question, rationale and literature review	15
Methodology and ethical compliance	20
Data collection/experimental execution	15
Statistical analysis and interpretation	15
Results, discussion and scientific reasoning	15
Dissertation presentation and organization	10
Seminar/viva voce	10
Total	100

16. Practical Examination Framework

Area	Suggested components
Experimental pharmacology	Experimental design, ethical considerations, data recording, dose-response analysis, interpretation
Drug analysis	Sample preparation, calibration, spectrophotometric/chromatographic calculations, interpretation
Clinical pharmacology	PK calculations, concentration-time profiles, TDM case, bioequivalence interpretation
Statistics	Choice and application of statistical test, calculation/interpretation, graph/table preparation
Prescription skills	Prescription writing, prescription audit, rational drug selection
Teaching practice	Lesson plan, teaching delivery, teaching aid, learner interaction, feedback and reflection

17. Suggested Theory Question Paper Blueprint

Section	Suggested pattern	Marks
A	Multiple Choice questions (MCQ)	10
B	Filling in the blanks	10
C	Short-answer/very short-answer questions	10 × 2 = 20
D	Long-answer/essay questions	3 × 10 = 30
	Total	70

The exact question pattern may be modified by the University. Questions should assess knowledge, understanding, application, interpretation and problem-solving rather than recall alone.

18. Internal Assessment Framework

Activity	Suggested contribution within 30 internal marks
Periodic written tests	10
Seminar / presentation	5
Assignment / literature appraisal	5
Practical record / continuous performance	5
Attendance, participation and professionalism	5
Total	30

For practical/teaching courses, a separate continuous-assessment rubric should be used for laboratory performance, record maintenance, viva, teaching delivery and professional conduct.

19. Recommended Core Textbooks

Book	Primary use
Goodman & Gilman's The Pharmacological Basis of Therapeutics	Core pharmacology and therapeutics reference.
K.D. Tripathi – Essentials of Medical Pharmacology	Primary Indian textbook for systematic and clinical pharmacology.
Rang & Dale's Pharmacology	Mechanisms and integrated pharmacology.
Katzung – Basic & Clinical Pharmacology	Clinical and mechanism-based pharmacology.
Rowland & Tozer – Clinical Pharmacokinetics and Pharmacodynamics	Clinical PK/PD.
Daniel – Biostatistics: A Foundation for Analysis in the Health Sciences	Biostatistics and statistical reasoning.
Altman – Practical Statistics for Medical Research	Medical statistics and interpretation.
Dent & Harden – A Practical Guide for Medical Teachers	Medical education and teaching practice.
Swanwick – Understanding Medical Education	Advanced medical education principles.
Clarke's Analysis of Drugs and Poisons	Drug analysis and analytical toxicology.
Skoog et al. – Principles of Instrumental Analysis	Analytical instrumentation.

20. Recommended Regulatory and Research Documents

- ICH Good Clinical Practice (E6) and other applicable ICH guidelines.
- Declaration of Helsinki and applicable national ethical guidance.
- Current Indian regulatory requirements for drugs and clinical research.
- Applicable institutional ethics committee and animal ethics committee requirements.
- Good Laboratory Practice principles.

- Current national/institutional guidelines for bioequivalence and clinical research.
- Relevant pharmacovigilance and adverse-drug-reaction reporting guidance.

21. Teaching-Learning Methods

- Interactive lectures
- Small-group teaching
- Case-based learning
- Problem-solving exercises
- Journal clubs and critical appraisal
- Seminars and student presentations
- Laboratory demonstrations and practical exercises
- Computer-based data analysis
- Simulation and virtual demonstrations where appropriate
- Self-directed learning
- Research-based learning

22. Professional and Research Ethics

- Patient confidentiality and responsible handling of clinical data.
- Informed consent and respect for research participants.
- Ethical approval before applicable human/animal research.
- Humane and scientifically justified use of animals; replacement, reduction and refinement principles.
- Research integrity, avoidance of fabrication, falsification and plagiarism.
- Responsible authorship and publication practices.
- Conflict-of-interest disclosure and transparent reporting.
- Data security, reproducibility and appropriate record retention.

23. Proposed Academic Progression

Stage	Competency progression
Semester I	Knowledge → understanding of basic/systemic pharmacology → prescription and basic practical skills
Semester II	Application → chemotherapy and therapeutics → experimental, bioassay and analytical skills
Semester III	Integration → clinical PK/PD, regulation, statistics and teaching → advanced applied competence
Semester IV	Independent/supervised research → analysis → scientific writing → dissertation and defense

24. Curriculum Governance and Revision

The curriculum should be reviewed periodically by the Board of Studies/Departmental Curriculum Committee. Revision should consider developments in drug discovery, precision medicine, pharmacogenomics, pharmacovigilance, clinical trials, regulatory requirements, digital health,

data science and medical education. Changes in statutory or regulatory requirements should be incorporated as applicable.