

DEPARTMENT OF PHARMACEUTICAL SCIENCES
INDIRA GANDHI UNIVERSITY, MEERPUR, REWARI



Ph.D. Course Work Syllabus

&

Scheme of Examination

Under Credit System

w.e.f. Session 2025-26

Ph.D. (PHARMACEUTICAL SCIENCES)

[Signature]

[Signature]

[Signature]

[Signature]
25/02/26

[Signature]
27/2/26

COURSE WORK SCHEME & SYLLABUS 2025-26

1. Ph.D. COURSE WORK

1.1 Course Design

The Ph.D. programme is designed in accordance with UGC guidelines and Ph.D. ordinance of Indira Gandhi University.

1.2 Duration and Credits

The Ph.D. coursework shall be of one semester.

The coursework will have a total of 12 credits distributed as follows:

Course Code	Type of Course	Course	Credit	Marks distribution
25L8.0-PHR-101	Compulsory	Research Methodology	4	70 Theory + 30 Internal Assessment
25L8.0-PHR-102(A)	Elective	Pharmaceutical Sciences	4	70 Theory + 30 Internal Assessment
25L8.0-PHR-102(B)	Elective	Drug Design, Discovery & Regulatory Affairs	4	70 Theory + 30 Internal Assessment
25L8.0-RPE-103	Compulsory	Research & Publication Ethics	2	40 Theory + 10 Internal Assessment
25L8.0-PHR-104	Compulsory	*Review of Literature & Seminar	2	50 Marks (Internal)

*Students must review 15-20 research papers in their area of interest. Seminar in thrust area/Research Assignment/Literature/Survey, etc will be evaluated by DRC.

The courses having an internal assessment of 30 marks will comprise one written test (10 marks), one written assignment (10 marks) and one presentation (10 marks). The Internal assessment of Research and Publication Ethics will comprise of one written assignment of 10 marks.

1.3 Minimum Passing Marks shall be

- (a) 50% marks in each course and internal assessment separately.
- (b) 55% marks in aggregate for all papers.

27/12/26

COURSE WORK SCHEME & SYLLABUS 2025-26

Schemes for internal assessments and end semester examinations

Course Code	Name of Course	Internal Assessment					End-Semester Exam		Total Marks
		Presentation	Written assignment	Written test Marks	Duration	Total Marks	Marks	Duration	
25LS.0-PHR-101	Research Methodology	10	10	10	1 Hr	30	70	3	100
25LS.0-PHR-102(A)	Pharmaceutical Sciences	10	10	10	1 Hr	30	70	3 Hr	100
25LS.0-PHR-102(B)	Drug design, Discovery & Regulatory Affairs	10	10	10	1 Hr	30	70	3 Hr	100
25LS.0-RPE-103	Research & Publication Ethics	-	10	-	1 Hr	10	40	-	50
25LS.0-PHR-104	*Review of Literature & Seminar	-	-	-	-	50	-	50	50

DEPARTMENT OF PHARMACEUTICAL SCIENCES, IGU MEERPUR, REWARI

3

Qm

Qm

Qm

Sanjay 21/2/2026

25L8.0-PHR-101:RESEARCH METHODOLOGY

L+T+P	: 4+0+0	Internal Assessment	: 30
Credits	: 4	End-semester Exam	: 70
Contact hours	: 60		

Course Content

Unit I: Introduction 10 hours

Scope and Meaning of Research, Types of Research: Historical research, Descriptive research, Fundamental research, Application oriented research, Pure research, Applied research, Action research, Evaluation research and Concepts of invention & innovation, Research funding agencies and National and International Research awards.

Unit II: Technical Writing 15 hours

Types of technical documents: Full length research paper, Short/Brief communications, Letters to editor, Book chapter, Review, Conference report, Project proposal Components of a full length research paper: Title/Topic statement, Abstract/key words, Aims and objectives, Hypothesis building, Rationale of the paper, Work plan, Materials and methodology, Results and discussion, Key issues and arguments, Acknowledgement, Conflict of interest statement, bibliography. Technical Resumes & Cover Letters Components of a research proposal: Project summary, Key words, Origin of the proposal, Major Objectives, Methodology, Instrument facility available in the PI's department, Overview of status of Research and Development in the subject, Importance of the proposed project in the context of current status, Bibliography

Unit III: Analysis and data presentation 15 hours

Using graphs, presenting data in tables, Hints for solving numerical problems, Descriptive statistics, choosing and using statistical tests, drawing chemical structures, computational chemistry. Plagiarism: concepts, importance and tools. Impact factor and its importance, h-index, citation, Fundamentals of Intellectual property rights, patents, copy rights, trade marks.

Unit IV: Information technology and library resources 10 hours

The Internet and World Wide Web, internet resources for chemistry, finding and citing information Importance of publications, Reputed Research journals of international and national level, Literature review: importance, sources of literature survey.



Unit V: Chemical safety and Disaster Management

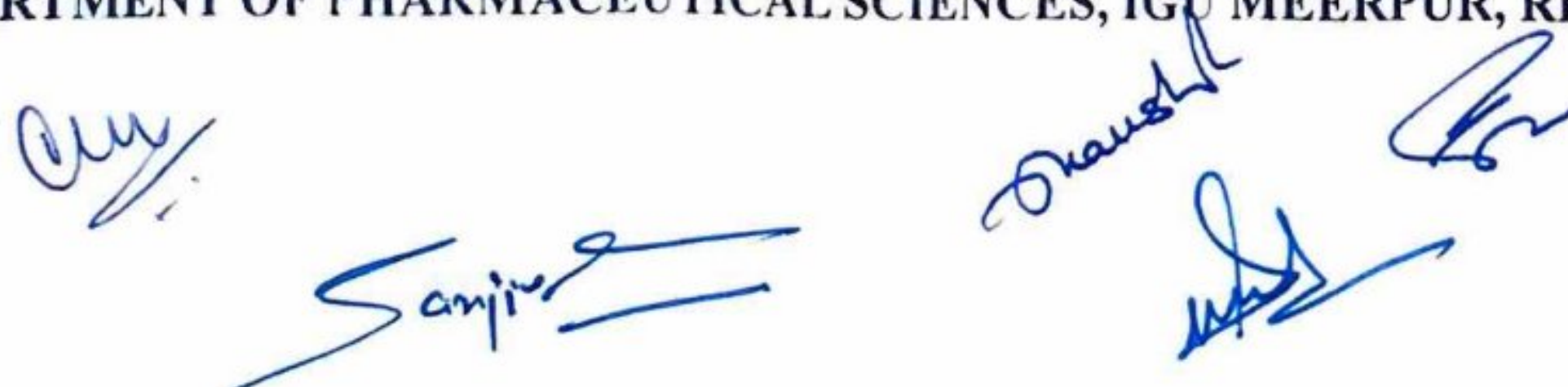
10 hours

Emergency response: Chemical spills, radiation spills, biohazard spills. leaking compressed gas cylinders, fires, medical emergency, accident reporting

General safety: General safety and operational rules, safety equipment, personal protective equipment, compressed gas safety, safety practices for disposal of broken glass wares, centrifuge safety, treated biomedical wastes and scientific ethics.

Suggested Readings

1. Research Methodology-Methods and Techniques Kothari CR New Age International 2nd Ed. (2004)
2. Research Methodology: A Step by Step Guide for Beginners R Kumar Pearson Education 2nd Ed. (2005)
3. Research Methodology in the Medical and Biological Sciences Laake P. Benestad H & Olsen BElsevier 1st ed. (2007)
4. Research Methodology, C. Murthy, Vrinda Publications 1stEd. (2009)
5. Research Methodology For Biological Sciences Gurumani N MJP Publishers 1st Ed. (2013)
6. Business Research Methods, William G. Zikmund, 2003 Edition, Cengage Learning India Pvt. Ltd, New Delhi.
7. Practical Skills in Chemistry, J. R. Dean, A. M. Jones, D. Holmes, R. Reed. J. Weyers and A Jones, Pearson Education Ltd., Prentice Hall (2002)



25L8.0-PHR-102(A):PHARMACEUTICAL SCIENCES

L+T+P : 4+0+0
Credits : 4
Contact hours : 60

Internal Assessment : 30
End-semester Exam : 70

Course Content

Unit I

17 hours

1. **Central Drug Standard Control Organisation (CDSCO):** Functions and responsibilities Investigational New Drug (IND): Need of an IND, content and format of an IND application, submission of an IND, FDA review of IND. New Drug Application (NDA), human pharmaco-kinetic and bioavailability testing requirements, Common technical document (CTD) for NDA, submission, review and maintenance of NDA.
2. **Drug Delivery Systems** focusing on formulation and characterization of Liposomes, Nanoparticles, Transdermal and Oral Controlled Drug Delivery System. Quality by Design and Stability Studies (as per ICH guidelines)

Unit II

17 hours

1. **Drug Design:** History and development of QSAR. Hansch analysis, Free Wilson analysis, Computer aided drug design. Molecular docking. Concept of Pharmacophore, pharmacophore mapping, identification of Pharmacophore, Homology modeling Applications of computer aided drug design.
2. **Modern Analytical Techniques**
Introduction, Theory and Instrumentation associated with UV-Visible spectroscopy, IR spectroscopy, NMR spectroscopy, Mass Spectroscopy. Chromatography, DSC, SEM, TEM and X ray Crystallography

Unit III

13 hours

1. **Extraction:** Different techniques adopted for the extraction of phytoconstituents like Maceration. Percolation, Sonication, Soxhlet extraction, Ultrasound assisted extraction, Supercritical fluid extraction and Microwave assisted extraction.
2. Identification tests for various phytoconstituents

Unit IV

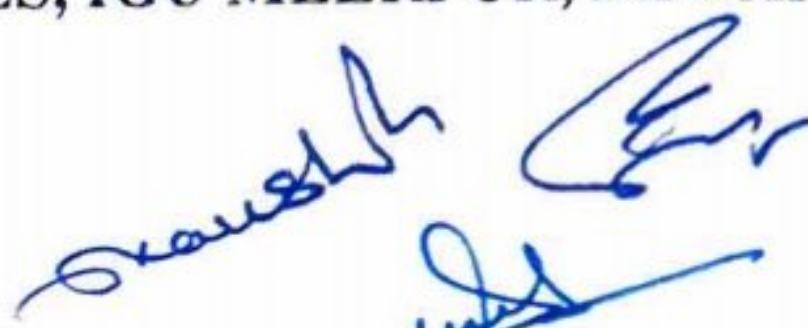
13 hours

1. Ethics in Animal Experimentation
2. Common animal models for selected categories of drugs: anti-hypertensive, anti-inflammatory, anti-diabetic, anti-ulcer, anti-oxidants.
3. Toxicity studies. CCSEA and OECD guidelines.



Suggested Readings

1. Silverman, R. B., Holladay, M. W. (2015). The Organic Chemistry of the Drug Design and Drug action. Academic Press.
2. Patrick, G. L. (2005). An Introduction to Medicinal Chemistry. Oxford University Press.
3. Trease, G. E., Evans, W. C. (2002). Trease and Evans' Pharmacognosy. W.B. Saunders Edinburgh, New York.
4. Central Drugs Standard Control Organization Guidance for Industry [http://cdsco.nic.in/CDSCOGuidance For Industry. pdf](http://cdsco.nic.in/CDSCOGuidanceForIndustry.pdf)
5. Vogel, H.G. (2002). Drug Discovery and Evaluation: Pharmacological Assays. Springer.
6. Principles of Instrumental Analysis- Douglas A Skoog. F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.



25L8.0-PHR-102(B):DRUG DESIGN, DISCOVERY & REGULATORY AFFAIRS

L+T+P : 4+0+0
Credits : 4
Contact hours : 60

Internal Assessment : 30
End-semester Exam : 70

Course Content

Unit I 15 hours

Modern tools/software for drug design and discovery- SwissADME, AdmetSAR, AutoDock Vina, PyMOL, PubChem, UniProt, Chemdraw, Mendeley Reference Manager

Principles and procedures involved in the use of the following reagents in pharmaceutical analysis.

- MBTH (3-methyl-2-benzothiazolone hydrazone) reagent.
- FC reagent
- 2,6 dichloroquinine monoamine reagent.
- 2, 3, 5-tri phenyl tetrazonium salt.
- PDAB (paramethyle aminobenzaldehyde) reagent
- PDACA (paradimethyleamino cinnamaldehyde) reagent.
- 2,4 dinitrophenyl hydrazine
- DPPH

Unit II 10 hours

Synthetic strategies: Introduction, target selection, disconnection approach, functional group inter conversions, synthons, reagents, retro synthesis, region selectivity, linear and convergent synthesis, synthesis of three, four, five and six membered rings.

Chemistry of protecting groups: Protection for alcohols, carbonyl groups, carboxylic groups and amino groups

Unit III 20 hours

Standardization of ISM formulations, problems faced and their solutions. Standardization of herbal formulations, storage and safety modifying of drugs of natural origin, Regulatory status of herbal medicines.



Application, formulation, development and characterization of novel drug delivery systems- nanoparticles, liposomes, solid lipid nanoparticles, polymer micelles, mucoadhesive and bioadhesive drug delivery systems, polymers used in drug delivery systems

Unit IV

15 hours

IPR & Research Ethics-Brief introduction to trademark protection and WHO Patents, IPR's and its types, major bodies regulating Indian pharmaceutical sector

Definition, need for patenting, types of patents, conditions to be satisfied by an invention to be patentable, introduction to patent search.

Parts of patents, filling of patents, essential elements of patent, guidelines for preparation of laboratory note book, non-obviousness in patent

Regulatory requirements for contract research organization, regulations for biosimilars

Suggested Readings

1. Some modern methods of organic synthesis. W. Carruthers Cambridge University Press. Cambridge.
2. Organic Reaction Mechanisms IVth Edth, VK Ahluwalia and RK Parashar, Narosa publishers.
3. A.I. Vogel text book of inorganic chemistry, 4th edition, ELBS publication, London
4. Pharmaceutical drug analysis by P.D. Seth
5. K.A. Connors text book of pharmaceutical analysis, 3rd edition, Wiley Interscience publication New York.
6. Instrumental methods of analysis by Willard, Merit, Dean, Settle.
7. Instrumental methods of analysis by Skoog.
8. Analysis by BK Sharma.
9. Spectrometric identification of organic compounds by Silverstein, Webster.
10. Introduction to principles of drug design by Smith and Williams, Harwood Academy press.
11. Organic Medicinal and Pharmaceutical Chemistry by Wilson and Gisvold.

25L8.0-RPE-103: RESEARCH AND PUBLICATION ETHICS

L+T+P	: 2+0+0	Internal Assessment	: 10
Credits	: 2	End-semester Exam	: 40
Contact hours	: 30		

OBJECTIVE:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on-sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Course Content

UNIT I: Philosophy And Ethics 4 hours

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgments and reactions

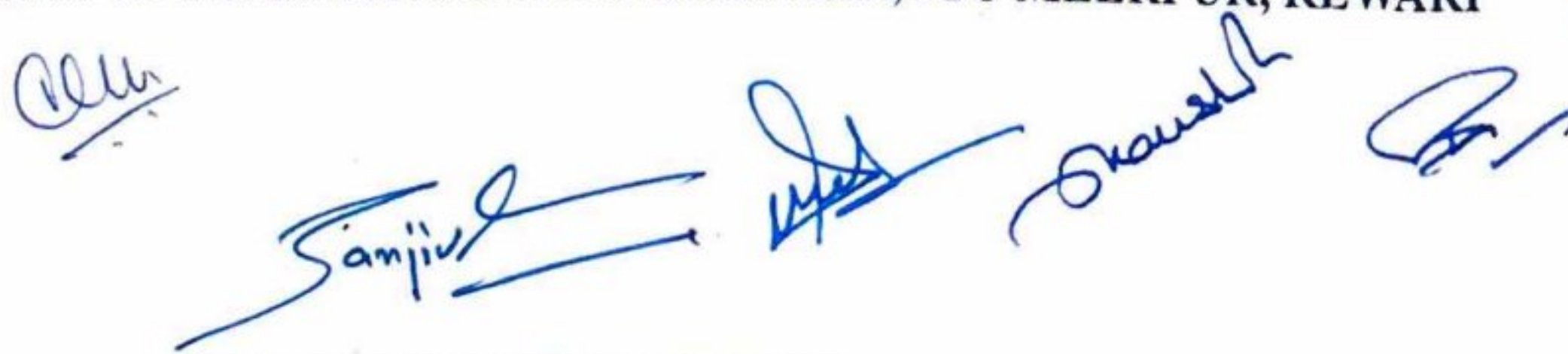
UNIT II: Scientific Conduct

4 hours

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

UNIT III: Publication Ethics 6 hours

1. Publication ethics: definition, introduction and importance
2. Best practices/standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest



4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice-versa, types
5. Violation of publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

UNIT IV: Open Access Publishing

4 hours

1. Open access publications and initiatives
2. SHERPA/ROMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

UNIT V: Publication Misconduct

5 hours

(A) Group Discussions (2 hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

(B) Software tools (2 hrs.):

Use of plagiarism software like Turnitin, Urkund and other open-sourcesoftware tools

UNIT VI: Databases and Research Metrics

7 hours

(A) **Databases** 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc.

(B) **Research Metrics** 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score

2. Metrics: h-index, g index, i10 index, altmetrics

Sanjiv

Sanjiv

Shankar

R.

25L8.0-PHR-104: *Review of Literature & Seminar

L+T+P : 0+0+2
Credits : 2
Contact hours : 30

Internal Assessment : 50

*Students must review 15-20 research papers in their area of interest and submit the report.
Seminar in thrust area/Research Assignment/Literature/Survey, etc. will be evaluated by DRC.

