TEERTHANKER MAHAVEER UNIVERSITY
(Established under Govt. of U. P. Act No. 30, 2008)
Delhi Road, Moradabad (U.P.)

PhD PROGRAMME

SYLLABUS FOR DISCIPLINE-SPECIFIC COURSE

PHARMACY

Course Code: **PDS240103**		**L**	**T**	**P**	**C**
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Objective:	The primary objective of the syllabus is to equip research scholars with advanced knowledge and skills in pharmaceutical research methodologies, including drug development, pharmacological screening, phytopharmacognosy, sustainable practices in drug development, and advanced pharmacy practice approaches. It emphasizes critical thinking, regulatory compliance, ethical considerations, and innovative approaches to address contemporary challenges in pharmaceutical sciences.				
Course Outcomes:	On completion of the course, the research scholars will be able to:				
CO 1:	understand recent advancements in novel drug delivery systems, drug stability studies, and intellectual property rights, focusing on patenting processes and components.				
CO 2:	describe the OECD guidelines for toxicity studies, blood collection techniques in laboratory animals, and screening methods for various pharmacological activities.				
CO 3:	describe the regulatory guidelines and techniques for quality assessment of herbal medicines and the extraction and isolation of phytoconstituents.				
CO 4:	apply the principles and examples of green chemistry, techniques for structure elucidation, and the basic steps of sustainable drug development.				
CO 5:	apply the principles of pharmaceutical care, pharmacoepidemiology, pharmacoeconomics, and health-related quality of life				
Course Content:					
Unit 1:	**Drug Development and IPR:** Recent developments in novel drug delivery systems and development process for new drugs. Pharmaceutical stability: accelerated stability assays. Intellectual property rights (IPR) considerations: patenting methods in India, components of patent applications, claims.				
Unit 2:	**Pharmacological and Toxicological Screening:** Acute and Subacute toxicity as per OECD guidelines. Techniques of blood collection in laboratory animals. Screening methods for Analgesic, antipyretic anti-inflammatory, Antihypertensive, psychotropic, and neurotropic activity, antiulcer, antidiarrhoeal, hepatoprotectives, anti-diabetic activity, and anticancer.				
Unit 3:	**Phytopharmacognosy:** WHO guidelines for the assessment of herbal medicines for quality				

	safety and efficacy. Techniques involved in Extraction, Isolation, and Separation of Phytoconstituents.
Unit 4:	**Sustainable Drug Development and Evaluation:** Principles of green chemistry, salient examples of green chemistry and its prospects. Introduction of advanced spectroscopic (e.g. UV, IR, NMR, and Mass) and microscopic techniques (SEM, TEM, etc.). Basic steps involved in Drug Development.
Unit 5:	**Advanced Pharmacy Practice:** Drug-associated risk tools (DART), improving medication adherence, antimicrobial stewardship, medication error, patient education and counseling techniques, and drug interactions. Objectives, types, and processes of DUR. Concepts and principles of pharmacoeconomic analysis, cost-effectiveness, cost-benefit, and cost-utility analysis. Instruments and measurements related to health-related quality of life.
Textbooks:	1 Blass, Benjamin E (2021). Basic Principles of Drug Discovery and Development. Netherlands, Academic Press. 2 Edward Elgar (2011). Intellectual Property, Pharmaceuticals, and Public Health: Access to Drugs in Developing Countries. United Kingdom. 3 Mehdi, Bikash, and Prakash, Ajay (2016). Practical Manual of Experimental and Clinical Pharmacology. India, Jaypee Brothers Medical Publishers Pvt. Limited. 4 Kamal Kishore Maheshwari (2015). Drug Screening Techniques. Vallabh Prakashan, Delhi 5 SB Gokhale, CK Kokate, AP Purohit (2009). A text book of Pharmacognosy. Nirali Prakashan, Pune, India 6 Shakner P Day, Nayim Sepay (2022). A textbook of Green Chemistry, Techno World 7 Kristian Stromgaard, Ulf Madsen, Povl Krogsgaard-Larsen (2009). Textbook of Drug Design and Discovery. United Kingdom, CRC Press. 8 Evans, William Charles (2009). Trease and Evans' Pharmacognosy. Netherlands, Saunders Limited. 9 Bruce J. Berne, Robert Pecora (2013). Dynamic Light Scattering: With Applications to Chemistry, Biology, and Physics, Courier Corporation 10 Ford JL & Timmins P (1989). Pharmaceutical Thermal Analysis: Techniques and Applications, Ellis Horwood Ltd., England 11 Ford J L (1995). Special Issue: Pharmaceuticals and Thermal Analysis. Thermochimica Acta, 248, 1-360. 12 Blaine R L, Schoff, C K (1984). Purity Determinations by Thermal Methods. 13 X-ray diffraction crystallography: Introduction, examples and solved problems, Yoshio Waseda, Eiichiro Matsubara, Kozo Shinoda 14 Peter J. Goodhew, John Humphreys, Richard Beanland (2000). Electron Microscopy and Analysis, 3rd Edition. 15 Karen Rascati (2020). Essential Pharmacoeconomics. 3rd Edition, Wolters Kluwer Health 16 Parthasarathi G, Nyfort-Hansen Karin, Nahata Milap C (2012). A textbook of clinical pharmacy practice: Essential concepts and skills, 2nd edition, University Press

	17 Philip Wiffen, Marc Mitchell, Melanie Snelling. Oxford Handbook of Clinical Pharmacy. 2nd edition, Oxford University Press.
Reference Books:	1 Handbook of Stability Testing in Pharmaceutical Development: Regulations, Methodologies, and Best Practices. United Kingdom, Springer New York, 2008. 2 Franz J. Hock (2015). Drug Discovery and Evaluation: Pharmacological Assays. Germany, Springer International Publishing. 3 Harborne, Jeffrey B (2012). Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. Netherlands, Springer Netherlands. 4 Bashir Ahamd Dar (2019). Fundamentals of Green Chemistry, 1st Edition, https://womengovtcollegevisakha.ac.in/departments/fundamentals-of-green-chemistry.pdf 5 Donald Pavia, Gary Lampman, George Kriz, James Vyvyan. Introduction to Spectroscopy. 5the Edition, Brooks/Cole Publisher. 6 Willard (2004) Instrumental Methods of Analysis. 7th Edition. Sterling Book Centre. 7 Cullity BD and Stock SR. Elements of X-Ray Diffraction, 3rd Edition, Pearson Education Limited. 8 Claire L. Preston (2019). Stockley's Drug Interactions: A Source Book of Interactions, Their Mechanisms, Clinical Importance and Management. 12th Revised edition, Pharmaceutical Press 9 Renée J.G. Arnold (2020). Pharmacoeconomics: From Theory to Practice, 2nd edition, CRC Press. 10 Brian L. Strom, Stephen E. Kimmel, Sean Hennessy (2013). Textbook of Pharmacoepidemiology2nd Edition, Wiley-Blackwell. 11 Jasneth Mullings, Sage Arbor, Medhane Cumbay (2022). Health-Related Quality of Life - Measurement Tools, Predictors and Modifiers, Ist edition, IntechOpen.
Additional Electronic Reference Material:	1 https://www.ema.europa.eu/en/ich-q1a-r2-stability-testing-new-drug-substances-drug-products-scientific-guideline 2 OECD guidelines: https://www.oecd-ilibrary.org/environment/oecd-guidelines-for-the-testing-of-chemicals-section-4-health-effects_20745788 3 https://www.who.int/publications/i/item/9290611103 4 https://www.who.int/publications/i/item/9789241594448 5 https://ayush.gov.in/resources/pdf/quality_standards/Drugs-and-Cosmetics-Act-Rules.pdf 6 https://ccras.nic.in/wp-content/uploads/2024/07/CCRAS_Guideline-of-Drug-Development.pdf 7 Introduction to Drug Utilization Research. https://iris.who.int/bitstream/handle/10665/42627/924156234X.pdf