



UNIVERSITY OF SARGODHA
OFFICE OF THE REGISTRAR
(ACAD BRANCH)

NOTIFICATION

On the recommendations of Academic Council made in its 22nd (3/2024) meeting held on 30.09.2024, the Syndicate in its 69th (1/2025) meeting held on 17.01.2025 approved the curriculum of M.Phil Pharmacognosy for implementation w.e.f Spring 2025 (Annex-‘A’).

(WAQAR AHMAD)

Additional Registrar (General)

Dated: 20.03.2025

No. SU/Acad/25/ 348

Distribution:

- Principal, College of Pharmacy
- Controller of Examinations
- Director Academics

C.C:

- Dean, Faculty of Pharmacy
- Director, QEC
- Additional Registrar (Affiliation & Registration)
- Secretary to the Vice-Chancellor
- PA to Registrar
- Notification File

ANNEXURE-VIII



UNIVERSITY OF SARGODHA
Faculty of Pharmacy, College of Pharmacy

1. Nomenclature of the Programs:

- Master of Philosophy in Pharmacognosy

2. Department Brief:

The College of Pharmacy, Faculty of Pharmacy, offers postgraduate programs in various disciplines of Pharmacy. Master of Philosophy in Pharmacognosy is one of the major fields of Pharmaceutical Research. The learning objective of this program is to provide bases to students about current advances in the field of Pharmacognosy, various modern techniques for extraction and isolation of phytochemicals, analysis and standardization of phytomedicines and commercial and industrial applications of natural products.

3. Program Structure:

Duration	Minimum 2-Years (4-Semesters), Maximum 4-Years (8-Semesters)
Entry Requirements:	Candidates having minimum 2 nd division in annual system or CGPA 2.0/4.0 in Pharm.D. or B.Pharm. degree in semester system /annual system from HEC recognized Institutions. Departmental Test (50% qualifying marks)
Intra and Inter-disciplinary fields allowed for admission	<i>Intra-disciplinary admissions are allowed only for Pharm.D. graduates as per PCP policy</i>
Degree Completion Requirements:	Total Credit Hours of Course Work: 24 Total Credit Hours of Research and Thesis: 06 Total Credit Hours of Program: 30
Program Mode (select one)	Thesis Track

4. List of Deficiency Courses of Level-6: (*Intra-disciplinary deficiency courses are not required as per the uniform syllabus and policy of the council. Inter-disciplinary admissions are not being offered in this field*)

Sr. No.	Course Code	Course Title	Credit Hours	Prerequisite
I.	N/A	N/A	N/A	N/A

5. List of Mandatory/Compulsory/Core Courses for Semester 1:

Sr. No.	Course Code	Course Title	Credit Hours	Prerequisite
1.	PHRM-7501	Biostatistics ✓	3(3-0)	Enrollment as per regulations of the University and PCP
2.	PHRM-7502	Drug Design and Development ✓	3(3-0)	--do--
3.	PHRM-7503	Pharmaceutical Analytical Techniques ✓	3(3-0)	--do--
4.	PHRM-7504	Research Methodology	3(3-0)	--do--

6. List of Mandatory/Compulsory/Core Courses for Semester 2:

Sr. No.	Course Code	Course Title	Credit Hours	Prerequisite
1.	PHRM-7505	Advanced Pharmacognosy ✓	3(3-0)	Enrollment as per regulations of the University and PCP
2.	PHRM-7506	Biosynthesis of Phytochemicals ✓	3(3-0)	--do--
3.	PHRM-7507	Plant Toxicology ✓	3(3-0)	--do--
4.	PHRM-7508	Clinical Pharmacognosy ✓	3(3-0)	--do--

M/A

Scheme of Studies

Master of Philosophy in Pharmacognosy

Course Code	Course Title	Credit Hour
SEMESTER-1		
PHRM-7501	Biostatistics	3 (3-0)
PHRM-7502	Drug Design and Development	3 (3-0)
PHRM-7503	Pharmaceutical Analytical Techniques	3 (3-0)
PHRM-7504	Research Methodology	3 (3-0)
Total Credit Hours in Semester-1		12
SEMESTER-2		
PHRM-7505	Advanced Pharmacognosy	3 (3-0)
PHRM-7506	Biosynthesis of Phytochemicals	3 (3-0)
PHRM-7507	Plant Toxicology	3 (3-0)
PHRM-7508	Clinical Pharmacognosy	3 (3-0)
Total Credit Hours in Semester-2		12
SEMESTER-3 to 4		
PHRM-7509	Research & Thesis	06

Note:

1. The Regulations related to MS/M.Phil. /M.Sc. (Hons) or equivalent approved by the Syndicate from time to time shall also be applicable.
2. Deficiency Courses are to be decided by the Graduate Program Committee at the start of each session.
3. The department can change the order of Core/Compulsory and Elective Courses as per the availability of resources or demand.
4. The department can change the course offering as per available resources but shall be uniform for one session.

Signature

FIRST SEMESTER (M.Phil. Pharmacognosy)

PHRM-7501 BIOSTATISTICS ✓

Cr. Hr. 03

1. Introduction and applications to Biological and Pharmaceutical Sciences. Samples and Population, Various Types of Sampling.
2. Measures of Central Tendencies and Dispersion, Arithmetic mean, standard deviation, Standard error of the mean, Median, Mode, Range, Variance
3. Test of Hypothesis and Significance: Chi-square, Student 't' and 'F' distribution and their Testing. Analysis of Variance (ANOVA), its classification. P-value and LSD tests.
4. Statistical Analysis and Interpretation of Data with various software
5. Experimental Designs & their Significance: (Advantages & Disadvantages), their Principles Completely Randomized Complete Block Designs (RCB-designs), Latin square Designs (LS-Designs), Computer Methods of Statistical Evaluation.
6. Correlation / Regression Analysis
7. Statistical approaches in developing formulations.
8. Software: Uses of software like GraphPad prism, referencing software like Endnote, Zotero and Mendeley, Microsoft Excel, Analysis of data using the above software

Recommended Books:

1. Daniel WW. Bio-Statistics: Foundation for Analysis in Health Science. 9th Ed. Wiley Publishers; 2009.
2. Nilton JS. Statistical Methods in Biological and Health Sciences. 3rd Ed. McGraw Hill; 1998.
3. Hoel PG, Port SC, Stone CJ. Introduction to Statistical Theory. 1st Ed. Brooks Cole; 1972.
4. Samuels M. Statistics for the life sciences. 3rd Ed. Dellen Publishers co; 2002. 5. Zar JH. Biostatistical analysis. 4th Ed. Francis Hal
5. Stanton, A.G (2001) Primer of Biostatistics. McGraw Hill, New York, USA

PHRM-7502 DRUG DESIGN AND DEVELOPMENT ✓

Cr. Hr. 03

1. Drug design and development, principles and applications
2. Introduction and approaches of Drug discovery, design and development process (steps involved and structure)
3. Molecular modelling techniques in drug design
4. Drug design to Biological Evaluations (including Clinical trials)
5. Computer-aided drug design (CADD), CADD with Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL) technologies
6. Latest trends in drug discovery, design and development (students will explore through the latest research articles).

Recommended Books:

1. Textbook of Drug Design and Discovery, Edited by Kristian Stromgaard, Povl Krogsgaard-Larsen, Ulf Madsen, 5th Edition, 2017.
2. Basic Principles of Drug Discovery and Development, Benjamin E. Blass, 2015.
3. Modern methods of drug discovery, Alexander Hillisch, Rolf Hilgenfeld, 2003.
4. Real World Drug Discovery: A Chemist's Guide to Biotech and Pharmaceutical Research, Robert M. Rydzewski, 2008.

Analytical techniques (listed below) must be discussed because of the evaluation requirement of drug delivery systems. Only necessary details of the following techniques (Working Principle and Application) should be included to fulfil the conceptual requirement of the postgraduate students.

1. UV-visible spectroscopy: Principles and working phenomenon about analysis of pharmaceutical materials.
2. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of dispersive and Fourier -Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy
3. Thermal Analysis Techniques:(1) Thermogravimetry (TGA), (2) differential scanning calorimetry (DSC), (3) Differential thermal analysis (DTA).
4. Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization.
5. X-ray Crystallography: Production of X-rays, Different X-ray diffraction methods, Bragg's law, Rotating crystal technique, X-ray powder technique, Types of crystals and applications of X-ray diffraction.
6. Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: High-Performance Liquid chromatography (HPLC), Ultra Performance Liquid Chromatography (UPLC), Liquid Chromatography Mass Spectrometry (LCMS), Gas chromatography.
7. NMR spectroscopy: Principle, Instrumentation, types and its applications.
8. Miscellaneous techniques; PCR, Elisa and other latest techniques.

Recommended Books:

1. Ahu Ahuja S, Scypinski S. Handbook of modern pharmaceutical analysis. 2nd Ed. Academic Press; 2010
2. Armstrong NA, James KC. Understanding experimental design and interpretation in pharmaceuticals. 1st Ed. Taylor & Francis Publishers; 1990
3. Beckett AH, Stennlake JB. Practical Pharmaceutical Chemistry. 4th Ed. The Aulton Press; 2001.
4. Brittain HG. Spectroscopy of pharmaceutical solids. 1st Ed. Taylor & Francis; 2006.
5. Heftmann E. Chromatography. 6th Ed. Von Nostrand Reinheld Co; 2004
6. Kazakevich Y, LoBrutto R. HPLC for pharmaceutical scientists. 1st Ed. John Wiley and Sons; 2007.
7. Snyder LR, Kirkland JJ, Dolan JW. Introduction to modern liquid chromatography. 3rd Ed. John Wiley & Sons Inc; 2009.
8. Stahl E. Thin Layer Chromatography. 10th Ed. Berlin: Springer Verlag; 2011.

1. Principles and Theory of Research, Research Methods: Concepts and Fundamentals
2. Research ethics and ethical approval process
3. Research Proposal/Synopsis: Introduction, preparation and presentation
4. Literature Survey/Review: Basics & types, Literature review methods, Introduction to various Pharmaceutical Journals, Databases, Journals ranking
5. Writing Techniques of Thesis/Dissertation
6. Paper writing and publishing the paper, all components of thesis writing, Conflict of interest
7. Referencing: Introduction, referencing types/styles and methods. Reference tools/software (Endnote: Introduction & its practical application).

Recommended Books:

1. Shyama PM, A Guide to Research Methodology, 1st Edition CRC Press; 2019
2. Mukherjee S, A Guide to Research Methodology: An Overview of Research Problems, Tasks and Methods CRC Press, 2020.
3. Prabhat P, Research Methodology: Tools and Techniques, Bridge Center; 2015.
4. Vogel, Hans Gerhard. Drug Discovery and Evaluation: Pharmacological Assays. Springer-Verlag Berlin Heidelberg. 3rd edition, 2008.

SECOND SEMESTER (M.Phil. Pharmacognosy)**PHRM-7505 ADVANCED PHARMACOGENOSY ✓****Cr. Hr. 03**

1. Introduction of phytochemicals of natural origin, their screening and evaluation.
2. Alkaloids with pharmacological activity including morphine derivatives
3. Saponins with biological and pharmacological activity including tri-terpenoid and steroid saponins.
4. Mono, Sesquit- and Diterpenes with pharmacological and therapeutic activity.
5. Artemisinin derivatives from Artemisia
6. Cell Biotechnology: Plant tissue cultures as sources of herbal/natural drugs and medicinal compounds. Development of plant cell culture and recent approaches for high production of secondary metabolites. Elucidation and regulation of biosynthesis in cell cultures of plant species of strategic importance from both scientific and economic points of view.
7. Introduction to complementary and alternative systems of medicines. Variation in biological and geographical sources of alternative drugs. Alternative medicinal systems (Homeopathy, Aromatherapy, Auriculotherapy, Massage Therapy, Light Therapy, Hijama, Acupuncture, Chinese Traditional Medicines, Meditation, Yoga, Unani, Ayurveda, Siddha, Yin and Yang, The Five Elements, Zang Fu theory, Meridians and Collaterals. etc.). Concept and application as part of national health care system.

Recommended Books:

1. E. Edwin Jerald, Sheja Edwin Jerald. Textbook of pharmacognosy and phytochemistry, Published by New Dehli: CBS Publisher & distribution, 6th edition, 2022.
2. Biren, Shah, Avenash Seth. Textbook of Pharmacognosy & Phytochemistry. Elsevier, 2nd Edition, 2019.
3. George E. Barreto, Amirhossein Sahebkar, Pharmacological Properties of Plant-Derived Natural Products and Implications for Human Health, Springer, 1st edition, 2021.
4. Mayuri Napagoda and Lalith Jayasinghe, Chemistry of Natural Products, De Gruyter, 1st edition, 2022.
5. Chun-Su Yuan, Eric J. Bieber, Brent Bauer. Textbook of Complementary and Alternative Medicine, Informa, 2nd Edition, 2020.
6. Steven B. Kayne, Textbook of Complementary and Alternative Medicine, Informa, 2nd Edition, Pharmaceutical Press, 2008.
7. A comprehensive overview of Artemisinin and its derivatives as anticancer agents, Pubmed, 2023.
8. Zi-Wei Zeng 1, Di Chen 1, Lei Chen 1, Bin He 2, Yan Li A. N. Kalia, Text Book of Industrial Pharmacognosy, Publisher CBS Publishers & Distributors, 2009.

1. Introduction to primary and secondary metabolites and their biosynthesis.
2. Different biosynthetic pathways i.e. shikimic acid pathway, acetate mevalonate pathway and acetate malonate pathway for the production of secondary metabolites.
3. Mechanism and biosynthetic formations of amino acids, polysaccharides, polypeptides, carotenoids and vitamin A, water-soluble vitamins.
4. Mechanism and biosynthetic formations of phenolic plant products, quinones, terpenes, and steroids.
5. Mechanism and biosynthetic formations of tannins, alkaloids and glycosides.

Recommended Books:

1. Zografos, A. L., from biosynthesis to total synthesis: strategies and tactics for natural products. John Wiley & Sons, New York, 1st edition, 2016.
2. Fabrice Rebeille, Roland Douce (Eds.), Advances in Botanical Research: Biosynthesis of Vitamins in Plants A; Vitamin A, B1, B2, B3, B5, Academic Press Elsevier, 1st edition, 2011.
3. Paul M. Dewick, Medicinal Natural Products: A Biosynthetic Approach. John Wiley & Sons, Ltd., Chichester, 3rd edition, 2009.
4. Alagarsamy, V., Pharmaceutical Chemistry of Natural Products, Published by, India: Reed Elsevier, 2012.
5. Joseph E. Pizzorno, Michael T. Murray. Textbook of Natural Medicine (4th ed.), Elsevier 2013.
6. E. Edwin Jerald, Sheja Edwin Jerald. Textbook of pharmacognosy and phytochemistry, Published by New Dehli: CBS Publisher & distribution, 6th edition, 2022.
7. Biren, Shah, Avenash Seth. Textbook of Pharmacognosy & Phytochemistry. Elsevier, 2nd Edition, 2019.

1. General introduction to Plant toxicology, definition, classification and chemical nature of plant toxins. Plant toxicities in humans and animals. Study of toxic plants with special reference to Pakistan. Treatment and prevention of plant toxicities.
2. Plant Toxins
Essential oils: Terpene (cineol, pine oil), Phenyl propane (apiol, safrole, myristicin), Monoterpene (thujone, mentha furan) Plant acids (oxalic acid, amino acid, resin acid), Glycosides (cardiotonic, cyanogenic), Alkaloids (imidazole, pyrrolizidine, tropane). Study of toxic plants causing CVS, GIT, CNS and liver disturbances.
3. Bacterial toxins
Staphylococcus aureus, *Clostridium botulinum*
4. Algal toxins
Microcystis aeruginosa, *Cyanobacteria*, *Gonyaulax cantenella*
5. Mycotoxins
Aspergillus spp., *Claviceps purpurea*, Mushrooms (*Amanita* spp.).
6. Plant allergens, types of allergens with examples and treatment of allergy by plant extracts.
7. Plant teratogens and biosynthetic compounds causing toxicity.

Recommended Books

1. A Guide to the Toxicology of Select Medicinal Plants and Herbs of Eastern North America by Rebecca S. Linger and Dennis K. Flaherty, 2020.
2. Bertold Hock, Erich F. Elstner Plant Toxicology, 4th Edition, Taylor & Francis Group, 2018.
3. Dobkin de Rios M, Hallucinogen, Cross-cultural perspective Waveland Press IL. USA, 2016.



4. Handbook of Natural Toxins: Toxicology of Plant and Fungal Compounds by R. F. Keeler, 2024.

PHRM-7508 CLINICAL PHARMACOGNOSY ✓

Cr. Hr. 03

1. Introduction to clinical Pharmacognosy. Pharmacological approaches to natural products, screening and evaluation, recent experimental and clinical data concerning GIT, nervous, renal and CVS, respiratory, skin disorders, immune, and musculoskeletal agents. Problems and prospects of discovering new drugs from natural sources. Secondary metabolites with biological and pharmacological activity.
2. Nutraceuticals: Introduction, classification, chemistry, role in the healthcare system, toxicity and side effects. Regulatory and market aspects of nutraceuticals derived from natural sources.
3. Role of Flavonoids, Carotenoids, Polysaccharides and Fixed oils as nutraceuticals:
 - Flavonoids and isoflavones (Kaempferol, Quercetin, Myricetin, Hesperetin, Naringenin Genistein and Glycitein)
 - Carotenoids (Lycopene, Lutein, Zeaxanthin and Capsanthin)
 - Fixed oils (Flax seed oil, Fish oil and Olive oil)
 - Polysaccharides (Carrageenan, Chitosan and Chitin)
4. Role of herbs, Amino acids, dietary supplements, minerals and probiotics as nutraceuticals:
 - Herbs and extracts (tea, garlic, cranberry, ginseng and Linum usitatissimum)
 - Amino acid (Carnitine, Taurine, L-arginine, L-theanine and L-tryptophan)
 - Dietary supplements (Glucosamine, Chondroitin, Royal jelly and Shark cartilage)
 - Pro- and pre-biotics (Fructo oligosaccharides, Fructan, Yogurt, Inulin and Kefir)
 - Minerals (Fluoride, Zinc, Calcium, Potassium and Selenium)
5. Cosmeceuticals, classification, chemistry, toxicity symptoms and emergency method of treatment, regulatory and market aspects of cosmeceuticals derived from natural sources. Role of rosemary, pomegranate, lavender, liquorice, chamomile, cinnamon, aloe, henna, jojoba, apricot, ginger, olives, coconut, turmeric, thyme, walnut, carrot, cucumber, onion, oats, hibiscus and honey used commercially as cosmeceuticals.

Recommended Books:

1. Gunnar Samuelson, Lars Bohlin, Drugs of Natural Origin: A Treatise of Pharmacognosy. Swedish Pharmaceutical Press, 7th Edition, 2017.
2. E. Edwin Jerald, Sheja Edwin Jerald. Textbook of pharmacognosy and phytochemistry, Published by New Dehli: CBS Publisher & distribution, 6th edition, 2022
3. Biren, Shah, Avenash Seth. Textbook of Pharmacognosy & Phytochemistry. Elsevier, 2nd Edition, 2019.
4. George E. Barreto, Amirhossein Sahebkar, Pharmacological Properties of Plant-Derived Natural Products and Implications for Human Health, Springer, 1st edition, 2021.
5. Kerry Bone, Simons Mills, Principle and Practice of Phytotherapy: Modern Herbal Medicine, Churchill Livingstone, 2013.
6. Amitava Dasgupta, Herbal Supplements: Efficacy, Toxicity, India John Wiley & Sons, 2011
7. Subramayam Vemulpad, Joanne Jamie, Recent Advances in Plant-based, Traditional and Natural Medicine. CRC Press, 2014.
8. Rizwani, Ghazala H. Naturoclinical Approach of Chromopharmacy, and Published by, Karachi: Offset plate marker, 2017.
9. Cosmeceuticals, Edited by Michael H. Gold; Jody Comstock; Michael H. Gold; Jody Comstock, Aesthetic Dermatology, 2021.