M.Pharm Pharmacognosy Syllabus

उत्तर प्रदेश प्राविधिक विश्वविद्यालय, लखनऊ, भारत
Uttar Pradesh Technical University, Lucknow, India

Syllabus M.Pharm
(Pharmacognosy)
# STUDY AND EVALUATION SCHEME

**Course: M. Pharm. (Pharmacognosy) 2008 – 09**

**Semester-I**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Subject</th>
<th>Period (hours/week)</th>
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<th>ESE</th>
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**Total** | 700 |

T- Theory, P- Practical, IA- Internal Assessment, ESE- End Semester Examination

Note: Duration of ESE- Theory exam is 3 hours and Practical exam is 6 hours.
## STUDY AND EVALUATION SCHEME

### Course: M. Pharm. (Pharmacognosy)  
#### Semester-II

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**Practical**

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**Total** 600

T- Theory, P- Practical, IA- Internal Assessment, ESE- End Semester Examination
Note: Duration of ESE- Theory exam is 3 hours and Practical exam is 6 hours.
## STUDY AND EVALUATION SCHEME

### Course: M. Pharm. (Pharmacognosy)  
**Semester-III & IV**

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T- Theory, P- Practical, IA- Internal Assessment, ESE- End Semester Examination
M. Pharm (Pharmacognosy)  
(First Semester)

PHAR-511 Modern Analytical Techniques

Unit - 1  

Unit - 2  
Infrared Spectroscopy: Infrared radiation and its interaction with organic molecules, vibrational mode of bonds, instrumentation and applications, effect of hydrogen bonding and conjugation on absorption bands, interpretation of IR spectra. FTIR and ATR, X-ray diffraction methods.

Unit - 3  
Nuclear magnetic resonance spectroscopy: Magnetic properties of nuclei, field and precession, chemical shift concept, isotopic nuclei, reference standards and solvents. $^1$H NMR spectra, chemical shifts, multiplicity, coupling constants, integration of signals, interpretation of spectra, decoupling-double resonance and shift reagent methods. Principles of FT-NMR with reference to $^{13}$C NMR, free induction decay, average time domain and frequency domain signals. Spin-spin and spin-lattice relaxation phenomenon. Protein noise decoupled spectra. Nuclear overhauser enhanced $^{13}$C NMR spectra, their interpretation and application. APT and DEPT techniques. Introduction of 2D NMR techniques, COSY, with application.

Unit - 4  
Mass spectrometry: Basic principles and brief outline of instrumentation. Ion formation, molecular ion, metastable ion, fragmentation process in relation to molecular structure and functional groups. Relative abundance of isotopes, chemical ionization, FAB, ESI, Maldy, GC-MS and other recent advances in mass spectrometry.

Unit - 5  
PHAR-511 P  Modern Analytical Techniques

Practicals based on theory syllabus.

Books Recommended:

10. Gordy, W., Theory & Applications of Electron Spin Resonance, Willy.
14. Beckett and Stenlake, Practical Pharmaceutical Chemistry, CBS.
16. Giddings, J.C., Principles and Theory- Dynamics of Chromatography, Marcel Dekker.
20. Gross - Mass Spectrometry
24. Haffmann, Chromatography.
25. Sethi and Charcgankar, Identification of Drugs in Pharmaceutical Formulations by TLC.
29. George, S., Steroid Analysis in Pharmaceutical Industry.
30. Higuchi, Pharmaceutical Analysis.
31. Bidingmeyer, Practical HPLC Methodology and Applications.
33. Scott, Techniques and Practice of Chromatography.
34. Wilkins, Identification of Microorganism by Mass Spectrometry.

PHAR-512  Pharmaceutical Biostatistics and Computer Applications

Unit - 1
Methods of collection of data, classifications and graphical representation of data. Binomial and normal probability distribution. Polygon, histogram, measure of central tendency. Significance of statistical methods, probability, degree of freedom, measures of variation - Standard deviation, Standard error.

Unit - 2
Sampling, sample size and power. Statistical inference and hypothesis. Tests for statistical significance: student t-test, Chi-square test, confidence level, Null hypothesis.

Unit - 3
Linear regression and correlation. Analysis of Variance (one way and two way). Factorial designs (including fraction factorial design). Theory of probability, Permutation and Combination, Ratios, Percentage and Proportion. Two way ANOVA and Multiple comparison procedures.

Unit - 4
Non-parametric tests, Experimental design in clinical trials, Statistical quality control, Validation, Optimization techniques and Screening design. Correlation and regression, least square method, significance of coefficient of correlation, nonlinear regression.

Unit - 5
Bioassays-calculations of doses response relationships, LD$_{50}$, ED$_{50}$, probit analysis. Applications of software for statistical calculation viz. SPSS, foxtron. Application of computers in Pharmaceutical sciences.

Book Recommended:

9. Gauthaman, Biostatistics for Pharmacy students.
11. Liwan Po, Statistics for Pharmacist.

**PHAR-514 Drug Regulatory Affairs and Intellectual Property Rights**

**Unit - 1**
Drug & Cosmetics Act with special reference to schedule Y and M, schedule of medical devices.

**Unit - 2**
Concept of total quality management, requirements of GMP, GLP, GCP, Regulatory requirements of drugs and Pharmaceutical (USFD-NDA/ANDA)

**Unit - 3**
Documentation and Maintenance of records.

**Unit - 4**
Intellectual property rights patents, Trademarks, Copyrights, Patents Act.

**Unit - 5**
Environment protection Act, Pollution Control, Factories Act.

**Books Recommended:**
8. Bansol, IPR Guidelines for Pharm students and Researchers.

**PHAR-519 Evaluation of Drugs**
Unit – 1
Application of chromatographic techniques in separation and identification of natural products. Only interpretation of data UV, IR, NMR, $^1$H NMR, $^{13}$C NMR & Mass spectroscopy for purification and structural elucidation of phytoconstituents. Herbal fingerprint profile of single and multicomponent herbal drugs. Stability testing of natural products.

Unit - 2
Analysis of Ayurvedic Formulations and crude drugs with references to: Identity, purity and quality of crude drugs. Determination of pesticide residues, determination of arsenic and heavy metals, determination of microorganisms, determination of microbial load in crude drugs. Identification of aflatoxins in crude drugs. Quality assurance in herbal drug industry, concept of GMP and ISO-9000.

Unit – 3
A. Quantitative microscopy, including lycopodium spore method as applied to drug evaluation and pollen grain analysis. Principles and procedures of microtomy and advanced histological techniques as applied to Pharmacognosy.
B. Principle and procedure involved in biological test of the following:
   i. Presence of Mycobacterium tuberculosis
   ii. Living contaminants in vaccines
   iii. Determination of toxic elements

Unit – 4
Study of pharmacological screening methods of the following categories of drugs: Antiinflammatory, hypolipidemic, diuretics, cardiovascular, hepatoprotectives, anticancer, antidiabetics, antiulceratives, antioxidants, immunomodulators, antimalarial, antimicrobial, antiallergic and antifertility.

Unit - 5
Regulatory requirements for new drugs: Markers constituents- Definition, importance in crude drug standardization. Examples of Biomarkers. Standardization, quality, efficacy and safety requirements & assessment procedures for herbal medicines as per USFDA.
PHAR-519P  Evaluation of Drugs

Practicals based on theory.

Books Recommended:

2. Dhawan, B.N., Shrimal, R.C., Use of Pharmalogical Techniques for the Evaluation of Natural Products, CDRI, Lucknow.
3. Ayurvedic Formulary of India.
4. Ayurvedic Pharmacopoeia of India.
5. Indian herbal Pharmacopoeia.
23. Gordy, W., Theory & Applications of Electron Spin Resonance, Willy.
26. WHO Monographs on Selected Medicinal Plants, Vol. I & II.
27. WHO Quality Control Methods of Medicinal Plant Materials.
32. Wallis, T.E., Practical Pharmacognosy.
34. Wagner’s, Plant Drug Analysis, A Thin layer Chromatography, Atlas.
35. Bogers, Medicinal and Aromatic plants, Agricultural, Commercial, Ecological, Legal, Pharmacological and Social Aspects.

PHAR-520                             Advances in Pharmacognosy

Unit - 1
Biotechnological: mutation, polyploidy and hybridization to improve the quality of vegetable drugs and their constituents, chemical races.

Unit - 2

Unit - 3
Nutraceutical: A biochemical background of use of herbal products, anthocyanins, proanthocyanidins, flavanones and resveratrol.

Unit ---4
Antibacterial, antiviral, hypolipidemic, anti-inflammatory, anti-malarial, hepatoprotective, antidiabetics and anticancer drugs from natural origin, Their recent advances as reported in literature. Biological allergens and hallucinogens.

Unit - 5
Marine Pharmacognosy: Definition, present status, classification of important bioactive agents, their general methods of isolation and purification (where reported), study of important bioactive agents including their chemistry and uses.

Books Recommended:

10. Tyler, Brady and Robbers, Pharmacognosy.
12. PDR for Nutritional Supplements.
(Second Semester)

PHAR-529 Recent Developments in Pharmacognosy

Unit - 1
Immunity, Immunomodulatory drugs of plant origin.

Unit - 2
Ethnopharmacognosy / Ethnomedicine, its concept, scope and importance.

Unit - 3
Aromatic plant resources in India.
Screening: Chemical screening procedures of vegetable drugs of medicinal importance.

Unit - 4
Plant tissue culture techniques & its application in relation to phytopharmaceuticals: Techniques of initiation & maintenance of various types of cultures, Immobilized cell techniques (survey of recent advances), Germ plasm storage, biotransformation studies, recent advances in elicitor techniques and production of biological active constituents in static, suspension, multiple shoot cultures. Bioreactors for production of biologically active constituents and other applications of plant tissue culture techniques. Biosynthetic potential of tissue cultures and factors affecting production of secondary metabolites by tissue culture techniques.

Unit - 5
Comparative Phytochemistry, its history, concepts, applications and methods, DNA finger printing.

Books Recommended:

2. Textbook of Industrial Pharmacognosy by Dr. Kalia, A.N.
5. Medicinal and Aromatic Plant Abstracts (MAPA), CSIR, New Delhi.
15. Khan Irfan, A., Role of Biotechnology in Medicinal and Aromatic Plants Vol. I-VIII.
18. Kishore, Plant Tissue culture and Biotechnology.
20. PDR for Herbal Drugs.
22. Wiart, Ethnopharmacology of Medicinal Plants: Asia and the Pacific.

PHAR-530 Industrial Pharmacognosy

Unit - 1
Scope of plant drugs cultivation, factors affecting quality of plant and animal drugs. Substitution and adulteration of crude drugs.

Unit - 2
WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants.

Unit - 3
Problems and recent trends in pest management, scope of biological control and use of environment friendly pesticides especially plant derived products, Pyrethroids, pheromones and juvenile hormones.

Unit - 4

Unit - 5
Methods of preparation of herbal cosmetics for skin, hair and dental care. Determination of shelf life of raw drugs, powered drugs, extracts, fractions and finished products.
PHAR-530P  Industrial Pharmacognosy

Practicals based on theory.

Books Recommended:

4. Medicinal and Aromatic Plant abstracts (MAPA) CSIR, New Delhi.
5. Evans, W.C., Trease and Evans Pharmacognosy, W.B. Saundert & co., London.
7. Indian Herbal Pharmacopoeia.
13. Panda, Herbal Soaps and Detergents.

PHAR- 531  Phytopharmaceuticals

Unit - 1
Methods of investigation of biosynthetic pathways, tracer techniques and autoradiography.

Unit - 2
Drug Constituents and their biosynthesis:
Alkaloids: Ephedrine, Hyoscymamine, Quinine, Morphine, Ergometrine, Reserpine, Vincristine.
Glycosides: Digitoxin, Scillaren, Glycyrrhizin.

Steroids: Sitosterols, Hecogenin, Diosgenin.
Coumarin: Umbelliferone.

Flavones: Hesperidin, Myrecetin.
Antibiotics: Penicillin, griseofulvin, Tetracycline.

Unit -3
Distribution, Isolation, Purification and Characterization of bioactive chemical constituents as follows:
Steroids: Diosgenin, Hecogenin, guggulsterone and withanolides.
Alkaloids: Morphine, Ergometrine, Quinine, Reserpine, Strychnine, Vincristine, piperine, Berberine, Vasicine.
Glycosides: Digitoxin, Sennosides, Bacosides.
Volatile oils: Lemongrass oil, camphor, menthol, Eugenol.
Antibiotics: Penicillin, Streptomycin, Tetracycline.
Vitamins: Cyanocobalamine
Others: Taxol.

Unit - 4
Venom and antivenom, Antihaemophilics, Fibrinogen and Thrombin.

Unit - 5
Structural elucidation of natural products using conventional synthetic, degradative and spectral methods - an insight, giving examples.

PHAR-531 P

Phytopharmaceuticals

Practicals based on theory.

Books Recommended:

5. Vinod D. Rangari, Pharmacognosy and Phytochemistry, Career publication, Nashik.
11. Sim, S.K., Medicinal Plant Guidelines, University of Toronto Press.
12. Sim, S.K., Medicinal Plant Alkaloids, University of Toronto press.
15. Finar, I.L., Organic Chemistry, Stereochemistry and the Chemistry of Natural Products, U.S.A.
17. Agarwal, O.P., Chemistry of Organic Natural Products, Krishna Prakashan Media (P) Ltd., Meerut, India.
22. Dewick, Medicinal Natural Products, A Biosynthetic Approach.

(Third & Fourth Semester)

PHAR- 611   Dissertation
PHAR- 612   Presentation & Viva-Voce