Baba Farid University of Health Sciences

Ordinances & Syllabus
M.Sc. in Pharmacology
(2 Years' Degree Course)

Faridkot -151203

Ordinances
(M.Sc. Course in Pharmacology)

1. **Duration of Course:**

   Duration of Master of Science in Pharmacology shall be two years.

2. **Eligibility for admission**

   a) This course shall be open to a candidate who have passed regular MBBS / BDS / B.V.Sc. / B.Pharmacy degree with 50% or above marks from any College/Institution/University recognized by Baba Farid University of Health Sciences, Faridkot

   <div align="center">OR</div>

   b) Any other examination recognized by the Board of Management of this University as an equivalent course / examination thereto, from time to time.

3. **Medium of Instructions**

   The medium of instruction during the course and examinations shall be English.

4. **Examination Schedule:**

   4.1 The examination shall be held twice a year in the months of May/June and November/December or on such other dates as may be decided by the Board of Management on the recommendation of Faculty of Medical Sciences and Academic Council.

   4.2 Normally, the University shall conduct not more than two examinations in a year, for any subject, with an interval of not less than four and not more than six months between the two examinations.

   4.3 The last date by which examination forms and fee must reach the Controller of Examinations/Registrar shall be as follows : -

Examinations	without late fee	with late fee of Rs.200/-	with late fee of Rs.500/-	with late fee of Rs.1500/-
May/June	March 1	March 15	March 31	April 15
Nov./Dec.	Sept. 15	Sept. 30	Oct. 15	Oct. 31

Note: Vice-Chancellor may permit acceptance of examination form and fee ten days before the commencement of examination with a late fee of Rs.2000/-. The fee structure is revisable by the University from time to time.

5. **First year M.Sc. Pharmacology**

a) The First Year M.Sc. Pharmacology shall be open to a person who has been enrolled for one academic year preceding the examination in a Colleges/Institutions affiliated to this University.

b) The First Year M.Sc. Pharmacology shall be conducted by the Head of the Department in the following subjects:-

Sr. No.	Paper	Max. Marks		Total
		Theory	Practical	
MSCP-01/ Paper-I	**Paper – I** General pharmacology principles and allied sciences	50		
MSCP-02/ Paper-II	**Paper – II** Systemic pharmacology, chemotherapy and therapeutics	50	100	200

Note: The awards will be retained by the Heads of the Department for the purpose of calculating Internal Assessment in the Second Year.

6. **Thesis**

i) Every candidate shall submit a thesis plan to the University within six months from the date of admission.

ii) Every candidate shall carry out work on an approved research project under the guidance of a recognized PG Teacher, the results of which shall be written up and submitted in the form of a thesis by the candidate.

iii) Thesis shall be submitted to the University six months before the commencement of the Second Year Theory Examinations i.e. by 30th November of the preceding year for May/June examinations.

iv) The Vice-Chancellor may allow a candidate to submit the thesis within one month after the date fixed for the purpose with the prescribed late fee.

v) The thesis shall embody the results of the candidate's own research and/or experience and shall contain precise reference to the publications quoted, and must attain a good standard and shall be satisfactory in literary presentation and in other respects and should end with a summary embodying conclusions arrived at by the candidate. The thesis shall be typewritten on one side of the paper (size 11" x 8 ½") with margins of 1½" on each side, bound, indicating on the outside cover its title and the name of the candidate.

vi) The thesis shall be examined by a minimum of two examiners, one internal and one external examiner. Ordinarily, this examiner will not be appointed the External Examiner for theory and Clinical/Practical examination. The candidates who have submitted the thesis in University will be allowed to appear in the final examination. However, the result shall be declared only on receipt of the thesis acceptance from both the examiners.

vii) The internal examiner shall send only report to the University after evaluation of thesis and the evaluated copy will be deposited in the college library for reference of the students. The external examiner shall also send copy of the thesis along with the report to the University. The University shall keep two copies in the University Library for reference of the students.

7. **Second Year M.Sc. Pharmacology**

The Second Year M.Sc. Pharmacology shall be open to a person

a) who has been enrolled for two academic year preceding the examination in a Colleges/Institutions affiliated to this University.

b) has submitted his/her name to the Controller of Examination/Registrar by the Principal of the College/Institutions with the following certificates:-

   i) of having attended separately in theory and practical/clinical not less than 75% percent of the lectures delivered and practicals conducted in each of the subjects prescribed for the examination provided that deficiency in the number of lectures delivered and practicals conducted may be condoned by the Principal to the extent of 10% of the lectures delivered.

   ii) of having secured at least 35% marks of the total marks fixed for internal assessment in each subject, separately, in order to be eligible to appear in all University examinations.

   iii) Must have submitted the thesis.

   iv) of good moral character.

Note: 1) Internal Assessment shall be submitted to the University at least two weeks before the commencement of theory examinations or within one week from the issuance of Roll Numbers by the University. All the colleges shall adopt uniform criteria for Internal Assessment as follows:-

   a) Attendance above 90% to be acknowledged with 10% extra weight-age for Internal Assessment.

   b) At least two tests to be held in each year in addition to the pre-final (send up) examination. The Internal Assessment should be the average of all awards of these tests taken together.

   c) **Criteria for calculation of Internal Assessment**

i) House Examinations	- 80%
ii) Attendance (above 90%)	- 10%
iii) Subject assessment (candidate's conduct and extra curricular participation)	- 10%

   d) Additional mandatory requirement for Internal Assessment to be observed by all colleges.

   i) All test marks obtained by candidates will be displayed on Notice Boards of respective departments as and when they are awarded.

   ii) All computations of Internal Assessment of the entire class made by the HOD of the department shall be displayed on the notice board of the department showing individual test marks, advantage of all tests, attendance advantage and subjective assessment and the total Internal Assessment thus derived for at least one week before sending the awards to the Principal's office.

   iii) Professor Incharge/HOD preparing Internal Assessment shall certify that the detailed assessment of the entire class has

been displayed on the department Notice Board for at least one week prior to its being submitted for onward transmission to the University and that adequate opportunity has been given to all the students to file any objections and that the same have been addressed satisfactory.

iv) The Principal forwarding the Internal Assessment to the University shall countersign the above referred certificate of the HOD/Professor Incharge preparing the Internal Assessment.

e) The re-appear/fail students will be re-assessed every time for the purpose of Internal Assessment.

2) If a candidate fulfils the condition laid down in clause 7 above may be allowed to take the examination.

3) Every candidate before appearing in Second Year Examination must have cleared House Examination securing at least 50 percent marks in both theory as well as practical separately.

c) The Second Year M.Sc. Pharmacology Annual Examination shall be held in May/June and the supplementary within six months of the Annual Examination.

d) The Second Year M.Sc. Pharmacology examination shall be held in the following subjects and candidate shall be required to pass all the subjects:-

Subject code/ Paper	Subject	Theory				Practical			Grand Total
		Marks	Int. Assessment	Viva	Total	Marks	Int. Assessment	Total	
MSCP-01/ Paper-I	General pharmacology principles and allied sciences	80							
MSCP-02/ Paper-II	Systemic pharmacology, chemotherapy & therapeutics	80							
MSCP-03/ Paper-III	Experimental pharmacology, bioassay and pharmacokinetics	80	80	120	520	200	80	280	800
MSCCP-04/ Paper-IV	Research Methodology and Recent Advances	80							

i) Each theory paper shall be of three hours duration.

ii) The minimum number of marks to pass the examination shall be 50% in theory & practical separately.

iii) The candidate who will absent himself/herself from the examination will be deemed to have been failed in the examination.

iv) The candidate who has completed his/her training of two years and has failed in the examination may appear again in a subsequent examination without further training and without submitting a new thesis.

v) The candidate must pass the examination in a maximum of three (1+2) attempts +1 (mercy chance on the discretion of Vice-Chancellor) failing which, he/ she will not be allowed to continue his studies.

8. **Number of Examinations**

The examination shall be conducted twice a year in May/June and November/December or on such dates as determined by the University from time to time.

9. **Grace Marks:**

There shall be no provision for grace marks.

10. **Board of Examiners**

i) There shall be four examiners – two internal and two external.

ii) Professor & Head of the Department shall be the Convener and first examiner. The second Internal Examiner will be appointed by annual rotation from amongst the Professors/Associate Professors/Assistant Professor who fulfills the criteria of PG teacher. In case of non-availability of Professors/Associate Professors/Assistant Professor in the department the teacher who fulfils the minimum requirements to be an examiner may be appointed as Internal Examiner.

iii) The examiners shall be appointed by the University from the teachers working in the Medical Colleges affiliated to it, preferably from the colleges where this course is being run, on the recommendations of the Board of Studies in Medical Sciences and Faculty of Medical Sciences.

11. **Paper setting and moderation of Question Papers:**

The University may get each paper set from External Examiner only. The moderation of question papers may be got done under the directions of the Vice-Chancellor, if necessary.

12. **Evaluation of Answer Books:**

The answer books shall be got evaluated by putting fictitious roll numbers thereon or spot evaluation (table marking) or any other method under the directions of the Vice-Chancellor.

11. **Declaration of Result and minimum pass marks:**

A candidate shall be declared successful only when his thesis has been accepted and the candidate has obtained a minimum of 50% in theory and practical separately.

A successful candidate on the basis of theory and practical marks taken together shall be classified as under: -

Second Class : A candidate obtaining 50% or more marks but less than 60% marks
First Class : A candidate obtaining 60% or more marks
First Class : A candidate obtaining 80% or more marks
with Distinction

12. **Award of Degree**

Each successful candidate shall be awarded a degree of M.Sc. Pharmacology.

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Syllabus

M. Sc. PHARMACOLOGY

OBJECTIVES:

The following self-learning sessions for PG students;

- Post graduate lectures in **systemic pharmacology** to update various aspects basic pharmacology and applied therapeutics
- **Therapeutic club**: To critically analyze the day to day development in new drugs
- **Journal club**: To familiarize research methodologies and application of statistics in experiments
- **Seminars:** To update newer developments in pharmacology/emerging trends/ novel mechanisms of drug action etc.
- **Practical exercises:** Once in a week, under the supervision of a faculty, with/without the help of animals, various principles/ mode of drug action/ screening of drugs/ drug analysis using various techniques should be performed to develop practical skills to conduct similar experiments in future.

SYLLABUS

M.Sc. Pharmacology

Instructions to Paper Setter

Note: 1) The question paper covering the entire course shall be divided into two sections. Each section to be attempted in a separate answer book and to be evaluated by separate examiners.

2) In each section there shall be 8 questions of 5 marks each and total weight-age being 40 marks

Section A   (Max. marks 40)

Section B   (Max. marks 40)

Paper- I (SUBJECT CODE: MSCP-01)

General pharmacological principles and allied sciences

A) **GENERAL PHARMACOLOGICAL PRINCIPLES AND APPLIED SCIENCES**

B) **TOXICOLOGY**

Antidotes in the management of poisoning. Applied analytical toxicology and toxicovigilance.

C) **MOLECULAR BIOLOGY IN PHARMACOLOGY**

Gene expression, Pharmacogenomics, Proteomics, techniques involved in studying receptor dynamics. PCR, Northern blot, Southern blot and Western blot. Protein purification. Mono. poly clonal antibodies. Molecular biology in receptor identification. Antisense oligonucleotides, molecular targets of drug action.

D) **ISOLATION OF COMPOUNDS FROM HERBAL SOURCES**

Basic constituents of plants (chemical classification). Isolation of active constituent from plant materials.

Percolation and maceration. Qualitative constituent characterisation techniques. Utilisation of HPTLC for the constituent analysis. Estimation of marker compound in biological fluid after crude plant material administration.

Practical skills: Isolation of active principles from medicinal plants

E) **WONDER DISCOVERIES IN PHARMACOLOGY**

Nobel laureates in Pharmacology and their revolutionary discoveries

SYLLABUS

M.Sc. Pharmacology

Paper-II (SUBJECT CODE: MSCP-02)

Systemic pharmacology, chemotherapy and therapeutics

SYSTEMIC PHARMACOLOGY

- Autonomic nervous system
- Central nervous system
- Autocoids
- Drugs affecting kidney function and Cardiovascular system
- Drugs affecting gastrointestinal and respiratory system
- Drugs affecting uterine motility
- Chemotherapy of parasite infections
- Chemotherapy of microbial diseases
- Antineoplastic agents
- Immunomodulators
- Drugs acting on blood and blood forming organs
- Hormones
- Miscellaneous:
Vitamins (water soluble and fat soluble vitamins). Heavy metals and heavy metal antagonists. Ocular and dermato-pharmacology . Recent developments in Pharmacology time to time. Gene therapy. Therapeutic gases. Free radical biology and antioxidants, pharmacology of biophosphonates, melatonin-therapeutic potential. Pharmacotherapy of migraine, Drug therapy in Alzheimer's disease and male sexual dysfuntion. Hormone replacement therapy.

SYLLABUS

Paper-III (SUBJECT CODE: MSCP-03)
Experimental pharmacology, bioassay, statistics, pharmacokinetics and recent advances

A)   EXPERIMENTAL PHARMACOLOGY, BIOASSAY

Experimental methodologies involved in the discovery of drugs (*in vivo, in vitro, ex vivo*). Animal handling and animal care. Methods of anaesthetising animals and methods of euthanasia. Restraining and blood collecting methods. Drug screening methods involved in the evaluation of anti-ulcer, antidepressant, antianginal, antihypertensive, antiarrhythmic, antidiabetic, anticataract, anti-platelet, anticancer, antiinflammatory, antidiarrhoeal, antiepileptic, analgesic, antithyroid, antipyretic, antiglaucoma, antihyperlipidemic antiasthmatics drugs and cough suppressants. Drug screening methods used in screening antifungal, antihelminthic, antibacterial, antiviral agents, drugs for heart failure, posterior pitutary, adrenal steroid (gluco & mineralo corticoids), testicular, parathyroid, ovarian, thyroid hormones, Methods involved in testing teratogenicity, carcinogenicity and organ toxicities in animals.

Practical Skills**: Effect of antiinflammatory agents on caraagennan induced rat paw edema. Evaluation of analgesic activity of morphine using tail flick latency test. Evaluation of cardiotonic drugs on isolated rabbit heart (Langendroff isolated heart preparation). Demonstration of Dale's vasomotor reversal and nicotinic effect of acetylcholine on dog blood pressure. Effect of autonomic drugs on rabbit intestine. Demonstration of bronchodilation on guinea pig tracheal chain. Effect of sedatives on rodents (rotarod test).

Four point assay of histamine and acetylcholine on guinea pig ileum. Four point assay of 5HT on rat uterus. Estimation of PA2 value of atropine. Identification of unknown by evaluating its action on dog haemodynamic parameters. Assay of acetylcholine using rat fundus. Estimation of pressor agents on rat blood pressure.

B)   INSTRUMENTATION IN DRUG ANALYSIS

Qualitative testing, titrimetric analysis. Beer and Lambert's law. Basis and working principle of colorimeter, ultraviolet, atomic absorption spectrometers, Fluorescence spectroscopy, NMR and Mass Spectroscopy.

Basics of Chromatography. Partition, adsorption and ionexchange chromatography. Column chromatography, thin layer chromatography, paper chromatography, immunoabsorbant chromatography, high performance thin layer chromatography, high performance liquid chromatography and gas Chromatography. Radio immunoassay. Processing of biological materials for drug analysis. Calculations in drug analysis. Good laboratory practice. Validation of analytical procedure.

Practial skills: Spectrophoto & flurimetric estimations of drugs in biological fluids.

C) PHARMACOKINETICS

Basics of pharmacokinetics, calculation of pharmacokinetic estimates (C-max, Tmax, T1/2, AUC (0-n), AUC(0-μ), Vd, Ke, Ka etc.) Compartment models used in pharmacokinetics (oral and intravenous). Compartment fitting (one comp. & two comp.). Pharmcodynamic /pharmacokinetic (PK/PD) correlation.

Practical skills: Calculation of Pharmacokinetic estimates from given concentration vs time data.

D) DRUG REGULATIONS

Drugs and Cosmetics Act, Drug Price Control order, Application for Investigational New Drug (IND), Application for New Drug Discovery (NDD) according to Indian Control Authority & USFDA guidelines.

Conducting bio-equivalence studies. Ethical considerations in utilizing human subjects for drug discovery process. Helsinki's declaration. ICH-GCP Guidelines. Ethical guidelines in utilising animals for experimental purposes.

Practical skills: Draft an IND and NDD application for the approval of a numbered compound.

E) DRUG DEVELOPMENT PROCESS

Methods involved in the development of new drugs. Preclinical toxicological studies. Calculation of LD50 & ED50. Acute, subacute and chronic toxicity studies. Irwin profile test, Pre-clinilcal pharmacokinetic and dynamic studies. Lipinski's rule for drug like molecule. High throughput screening (*invitro and invivo*) for pre-clinical pharmacokinetic and pharmacodynamic studies.

F) DRUG DEVELOPMENT PROCESS

Methods involved in the development of new drugs. Preclinical toxicological studies. Calculation of LD50 & ED50. Acute, subacute and chronic toxicity studies. Irwin profile test, Pre-clinilcal pharmacokinetic and dynamic studies. Lipinski's rule for drug like molecule, High throughput screening (*invitro and invivo*) for pre-clinical pharmacokinetic and pharmacodynamic studies.

G) THERAPEUTIC DRUG MONITORING

Basic principles of TDM. Therapeutic index. Trough level monitoring and dosage adjustments.

Drug delivery systems: sustained release, enteric coated formulations and liposome etc. **Pharmacovigilance, Pharmacoeconomics, Pharmacogenetics And Drug Information**

Books recommended

1. Goodman Gillman's 'The Pharmacological basis of therapeutics'. (2012 Ed. 12th Hardman JG, Limbird LE (Tenth Edition) McGraw Hill press New York.
2. Applied biopharmaceutics and pharmacokinetics (1999) Ed. Sargel L. (IV Edition) Prentice-Hall International, London.
3. Fundamentals of experimental pharmacology. (1984) Ed.Ghosh MN. Scientific book agency, Calcutta.

4. Practical Manual of Pharmacology. (2008) Badyal D. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd;
5. Text book of receptor pharmacology. Eds. Forman JC, Johansen TJ CRC Press, New York 1996.
6. Drug Discovery and Evaluation –Pharmacological assays. (1997) Ed.Vogel HG & Vogel WH. Springer- New York.

Journals to be referred

Trends in Pharmacological Sciences, Annual Review of Pharmacology, Pharmacological Reviews, Indian Journal of pharmacology, Indian Journal of Physiology and Pharmacology, Annals of Pharmacotherapy, Pharmacology and Experimetnal Therapeutics, Journal of Ethnopharmacology, Nature, Science, European Journal of Clinical Pharmacology, BJCP and other pharmacology related journals.

**PRACTICAL EXERCISE USING ANIMAL EXPERIMENTS IS SUBJECT TO ETHICAL APPROCAL.

*Practical Examination will be two days;
  One exercise on intact animals**
  One exercise on isolated organ**
  One chemical pharmacology exercise
Oral examination:
1) Thesis presentation and discussion
2) General Viva

**Practical Exercise using Animal experimentation is subject to ethical approval from Institutional the Animal Ethical Committee

M.Sc. Pharmacology

MSCP-04 PAPER – IV
Research Methodology and Recent Advances

Objectives

To enable the students to :
  understand the importance of Research.
  learn about the various applications of statistics in the research.
  familiarize on writing the project report.

PART – A (RESEARCH METHODOLOGY)

UNIT-I

Meaning of research, Types of research, Objectives of research, Collection of Data - Methods of collecting data. Primary and Secondary data - Sources of Primary and Secondary data, Editing the data and precautions used in the use of data. Different types of research tools for collecting research data, defining and determining a problem.

UNIT-II

Sampling Design - Census and sampling survey. Methods of sampling - Probability and non-probability sampling methods size of the sample, Merits & Demerits of each sampling method, Sampling errors and methods of Reducing the error.

UNIT-III

Classification and Tabulation of Data - Meaning, Objective, Types of Classification. Formation of frequency distribution. Tabulation of data - Schemes general rules, Types of tables and preparation of tabular forms. Representation of data - Diagramatic and Graphic significance, Types of diagrams, Types of graphs.

UNIT-IV

Measures of central tendency - Mean, Median, Mode, their relative advantages and disadvantages. Measures of dispersion - mean deviation, standard deviation, Quartile deviation, Co-efficient of variation, percentile, Association of attributes, Contingency table, correlation - coefficient of correlation and its interpretation, Rank correlation, Regression equation and predictions.

UNIT-V

Probability - Theorems, Simple Problems, Distributions - Binomial Poisson distribution, normal distribution, their properties and simple problems. Testing of significance - Large and Small sample tests - 't' test, Chi square test, and 'F' test - simple problems. Writing a research report - format of thesis writing with eg.

PART – B (RECENT ADVANCES IN PHARMACOLOGY)

1) Novel agents for the treatment management of diabetes mellitus
2) Novel agents for the management of AIDS.

M.Sc. Pharmacology

PRACTICAL - MSCP-04 PAPER – IV
Research Methodology and Recent Advances

1. Collection of Primary and Secondary data

   i. Direct personal Interview - schedule
   ii. Drafting questionnaire
   iii. Pilot study for validating

2. Sampling Techniques

   i. Judgement Sampling
   ii. Quota Sampling
   iii. Convenience Sampling
   iv. Random Sampling
   v. Stratified Sampling

3. Classification of data

4. Formation of frequency distribution

5. Tabulation of data - Types of Tables (eg)

6. Diagrammatic Representation of data

   i. Graphs - Different types
   ii. Bar diagrammes
   iii. Pie diagram
   iv. Histogram

7. Calculation of Mean. Median, Mode and SD

8. Correlation Analysis

9. 't' test and chi-square test

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