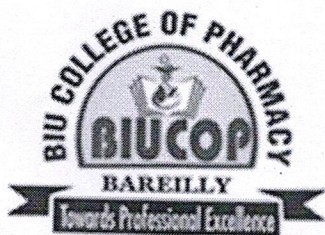




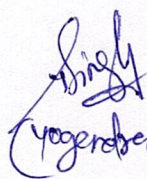
**BAREILLY INTERNATIONAL UNIVERSITY,
BAREILLY**

BIU COLLEGE OF PHARMACY

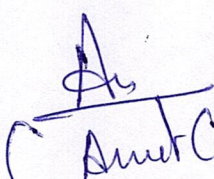


**ORDINANCE
M. PHARM (PHARMACOLOGY)**

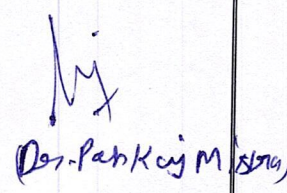
[APPLICABLE W.E.F. ACADEMIC SESSION-2023-24 TILL REVISED]
[As per CHOICE BASED CREDIT SYSTEM (CBCS) guidelines given
by UGC]


(Yogendra Singh)

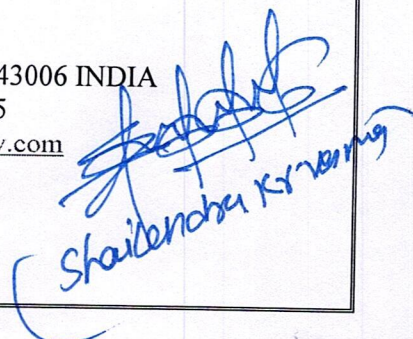

(Dr. Pushpendra Yadav)


(Anurag Kumar)


(Dr. P. K. Kumar)


(Dr. Pardeep Kumar)

Rohilkhand Medical College Campus, Pilibhit by Pass Road, Bareilly. (U.P) – 243006 INDIA
Phone: - 0581-2526011, 2526012 (EPABX) Fax: 2526054, 2303345
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(Shailendra Kumar)

BAREILLY INTERNATIONAL UNIVERSITY

Ordinance effective from session 2023-24

Master of Pharmacy (M. Pharm)

Pharmacology

This ordinance shall apply to the program leading to Master of Pharmacy degree.

Eligibility for admission:

A Pass in the following examinations

1. B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks
(aggregate of 4 years of B.Pharm.)
2. There shall be reservation of seats for the students belonging to the scheduled Castes, Scheduled Tribes and other backward classes in accordance with the instruction issued by the central Government/state Government/Union Territory Administration, as the case may be, from time to time.
3. For SC/ST candidates the prescribed percentage of marks will be 50% of the maximum marks (aggregate of four years of B. Pharm).
4. For candidates having not less than 5 years professional experience, after passing B. Pharm course, there shall be a relaxation in pass percentage from 55% to 50% for admission to M. Pharm programme.
5. Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

Duration of the program:

The program of study for M. Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy

Council of India, New Delhi & Bareilly International University, Bareilly.

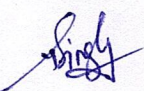
Medium of instruction and examinations:

Medium of instruction and examination shall be in English.

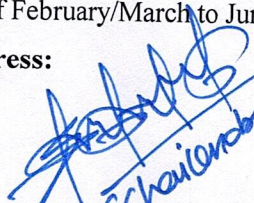
Working days in each semester:

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of August/September to January/February and the even semesters shall be conducted from of February/March to June/July in Academic calendar year -

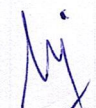
Attendance and progress:


(Yogendra Singh)


(Dr. Pushpendra Yadav)


(Shailendra K. Verma)


(Anurag Choudhary)


(Dr. Pankaj Mishra)


(Dr. P. Kanhojia)

- A candidate is required to put in at least 75% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations. In special circumstances, short-fall in attendance can be condoned on case's merit to the extent of 5% by the Principal. If the short-fall is more than 5%, but not more than 10%, the Principal may recommend on case's merit to the Vice Chancellor for condonation. The order of Vice Chancellor shall be final.

Program/Course credit structure:

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

Credit assignment

Theory and Laboratory courses

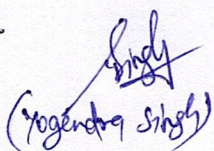
Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of

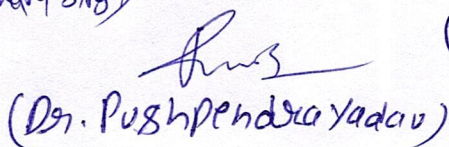
4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

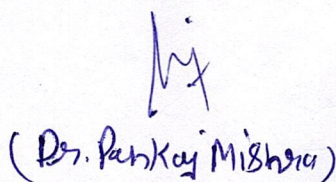
The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

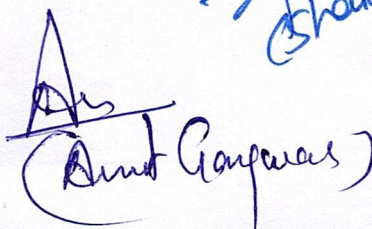
Minimum credit requirements

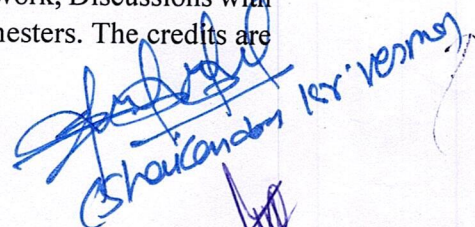
The minimum credit points required for the award of M. Pharm. degree is 95. However, based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments, Research work, Discussions with the supervisor, Co-Curricular activities over the duration of 6 semesters. The credits are distributed semester-wise as shown in Table-1


(Yogendra Singh)


(Dr. Pughendra Yadav)


(Dr. Pankaj Mishra)


(Dr. Anand Gargwal)


(Dr. P. K. Verma)

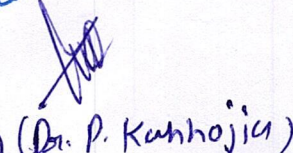

(Dr. P. K. Verma)

Table-1: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*
Total Credit Points	Minimum=95 Maximum=100*

Academic work:

Course of study:

Table -2.1: Course of study for M. Pharm. (Pharmacology)

~~Shalendra Kr. Verma~~

(Dr. Pankaj Mishra)

Ans (Auf C) $\frac{1}{2}$

(Dr. P. Kannejia)

(Dr. Pushpendra Yadav)

~~Shingh~~
(Yogendra Singh)

M. Pharm. (Pharmacology) Semester I						
Category	Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
CC-1	17141	Modern Pharmaceutical Analytical Techniques	4	4	4	100
CC-2	17150	Advanced Pharmacology-I	4	4	4	100
CC-3	17151	Pharmacological and Toxicological Screening Methods-I	4	4	4	100
CC-4	17152	Cellular and Molecular Pharmacology	4	4	4	100
SEC-1	17788	Pharmacology-I	12	6	12	150
SEC-2	17802	Seminar & Assignment	7	4	7	100
Total			35	26	35	650

CC- Core Course, SEC-Skill Enhancement Course,

Semester II						
Category	Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
CC-5	17153	Advanced Pharmacology-II	4	4	4	100
CC-6	17154	Pharmacological and Toxicological Screening Methods-II	4	4	4	100
CC-7	17155	Principles of Drug Discovery	4	4	4	100
CC-8	17156	Clinical Research and Pharmacovigilance	4	4	4	100
SEC-3	17789	Pharmacology Practical-II	12	6	12	150
SEC-4	17803	Seminar & Assignment	7	4	7	100
Total			35	26	35	650

Table-2.2: Course of study for M. Pharm (Pharmacology) III Semester

M. Pharm. III Semester				
Category	Course Code	Course	Credit Hours	Credit Points
CC-9		Research Methodology and Biostatistics*	4	4
SEC-7		Journal Club	1	1
SEC-8		Discussion / Presentation (Proposal Presentation)	2	2
SEC-9		Research Work	28	14
Total			35	21

* Non-University Exam

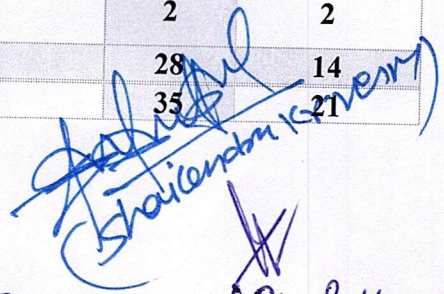
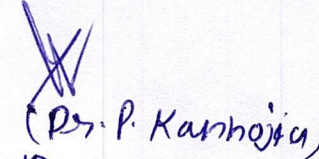
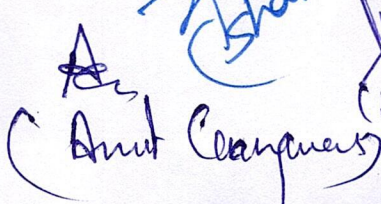
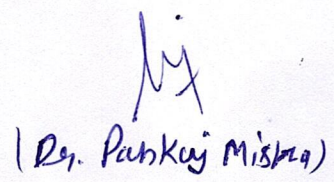
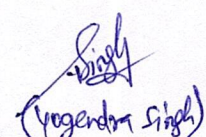
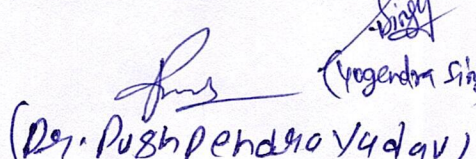

 (Dr. P. Karthikeyan)

 (Dr. P. Karthikeyan)

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 (Dr. P. Karthikeyan)

 (Dr. P. Karthikeyan)

Table 2.3: Course of study for M. Pharm. (Common for All Specializations)

M. Pharm. IV Semester				
Category	Course Code	Course	Credit Hours	Credit Points
SEC-10		Journal Club	1	1
SEC-11		Discussion / Presentation (Final Presentation)	3	3
SEC-12		Research Work & Colloquium	31	16
	Total		35	20

Table 2.4: Guidelines for Awarding Credit Points for Co-curricular Activities(Attending Conference, Scientific Presentations and Other Scholarly Activities)

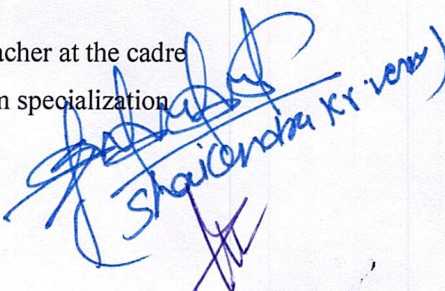
Name of the Activity	Maximum Credit Points Eligible / Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	1
Participation in international Level Seminar/Conference/Workshop/Symposium Training Programs (related to the specialization of the student)	1
Academic Award/Research Award from State Level/National Agencies	2
Academic Award/Research Award from International Agencies	1
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	1
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science) [The editorial Board outside India]	2

*International Journal: The Editorial Board outside India.

*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.
2. The composition of the Programme Committee shall be as follows: A teacher at the cadre of Professor shall be the Chairperson; One Teacher from each M. Pharm specialization

 (Dr. Pashpendra Yadav)
  (Dr. Pankaj Mishra)
  (Yogendra Singh)
  (Anil Kumar)
  (Dr. P. Kumbhaja)

and four student representatives (two from each academic year), nominated by the Head of the institution.

3. Duties of the Programme Committee:

- Periodically reviewing the progress of the classes.
- Discussing the problems concerning curriculum, syllabus and the conduct of classes.
- Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
- Communicating its recommendation to the Head of the institution on academic matters.
- The Programme Committee shall meet at least twice in a semester preferably at the end of each sessional exam and before the end semester exam.

Examinations/Assessments

The schemes for internal assessment and end semester examinations are given in Table- 8,9 & 10.

- End semester examinations: The End Semester Examinations for each theory and practical course through semesters I to IV shall be conducted by the respective university except for the subject with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Table – 3.1: Scheme internal assessment and end semester examinations of M. Pharm (Pharmacology)

Category	Course Code	Course	Internal Assessment			Total	End Semester Exam		Total Marks
			Continuous Mode	Sessional Exam			Marks	Duration	
				Marks	Duration				
Semester I									
CC-1	17141	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
CC-2	17150	Advanced Pharmacology-I	10	15	1 Hr	25	75	3 Hrs	100
CC-3	17151	Pharmacological and Toxicological Screening Methods-I	10	15	1 Hr	25	75	3 Hrs	100
CC-4	17152	Cellular and Molecular Pharmacology	10	15	1 Hr	25	75	3 Hrs	100
SEC-1	17788	Pharmacology-I	20	30	6 Hrs	50	100	6 Hrs	150
SEC-2	17802	Seminar & Assignment	-	-	-	-	-	-	100
Total									650

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(Dr. Pankaj Mishra)

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(Anurag Agrawal)

(Signature)
(Dr. P. Kanna) (Dr. P. Kanna)

(Signature)
(Vijendra Singh)

Table – 3.2: Scheme internal assessment and end semester examinations of M. Pharm (Pharmacology)

Semester II									
CC-5	17153	Advanced Pharmacology-II	10	15	1 Hr	25	75	3 Hrs	100
CC-6	17154	Pharmacological and Toxicological Screening Methods-II	10	15	1 Hr	25	75	3 Hrs	100
CC-7	17155	Principles of Drug Discovery	10	15	1 Hr	25	75	3 Hrs	100
CC-8	17156	Clinical Research and Pharmacovigilance	10	15	1 Hr	25	75	3 Hrs	100
SEC-3	17789	Pharmacology Practical-II	20	30	6 Hrs	50	100	6 Hrs	150
SEC-4	17803	Seminar & Assignment	-	-	-	-	-	-	100
Total									650

Table – 3.3: Scheme internal assessment and end semester examinations of M. Pharm (Pharmacology)

Category	Course Code	Course	Continuous Mode	Internal Assessment		Total	End Semester Exams		Total Marks
				Sessional Exams			Marks	Duration	
				Marks	Duration				
SEMESTER III									
CC-9		Research Methodology and Biostatistics*	10	15	1 Hr	25	75	3 Hrs	100
SEC-7		Journal club	-	-	-	25	-	-	25
SEC-8		Discussion / Presentation (Proposal Presentation)	-	-	-	50	-	-	50
SEC-9		Research work*	-	-	-		350	1Hr	350
Total									525

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(Dr. P. Kanhojia)

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(Dr. Pushpendra Yadav)

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(Anil Gargwal)

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(Yogendra Singh)

Table – 3,4: Scheme internal assessment and end semester examinations of M. Pharm (Pharmacology)

SEMESTER IV									
SEC-10		Journal club	-	-	-	25	-	-	25
SEC-11		Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75
SEC-12		Research work and Colluvium	-	-	-		400	-	400
Total									500

*Non-University Examination

Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table 4: Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria	Maximum Marks
Attendance	8
Student – Teacher interaction	2
Total	10
Practical	
Attendance	10
Based on Practical Records, Regular viva voce, etc.	20

Table - 5: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95-100	8	10
90-94	6	7.5
85-89	4	5
80-84	2	2.5
Less than 80	0	0

Sessional Exams

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical

(Signature)
Shailendra Kr. Verma

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(Dr. Pushpendra Yadav)

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(Dr. Parikaj Mishra)

(Signature)
(Yogendra Singh)

(Signature)
(Anil Kumar)

(Signature)
(Dr. P. Khatija)

Singh
(Dr. Pankaj Mishra)

Ans
(And Campuses)

F. Shauk

(Dr. P. Kanhaiya)

Singh
(Yogendra Singh)

Letter grades and grade points allocations: Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table — 14.

Table7- Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 - 100	O	10	Outstanding
80.00 - 89.99		9	Excellent
70.00 - 79.99		8	Good
60.00 - 69.99	c	7	Fair
50.00 - 59.99		6	Average
Less than 50		0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses(Theory/Practical) in a semester with credits C₁, C₂, C₃ and C₄ and the student's grade points in these courses are G₁, G₂, G₃ and G₄, respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4}{C_1 + C_2 + C_3 + C_4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example, if a learner has a F or ABS grade, the SGPA shall then be computed as:

$$SGPA = C_1G_1 + C_2G_2 + C_3G_3 + C \cdot \text{Zero}$$

(Dr. Shailendra K. Verma)

(Dr. Pushpendra Yadav)

(Dr. Pardeep Mishra)
(Yogendra Singh)

(Dr. Anand Agarwal)

(Dr. P. Kanhoji)

$$C_1 + C_2 + C_3 + C_4$$

Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the IV semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all IV semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$SGPA = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4}{C_1 + C_2 + C_3 + C_4}$$

where C1, C2, C3.... is the total number of credits for semester I, II, III.... and S1, S2, S3, is the SGPA of semester I, II, III.

Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	CGPA of 7.50 and above
First Class	CGPA of 6.00 to 7.49
Second Class	CGPA of 5.00 to 5.99

Duration for completion of the program of study

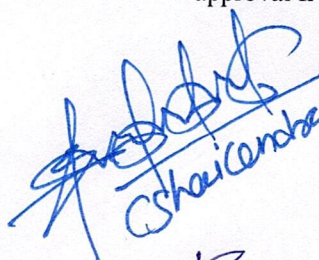
The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

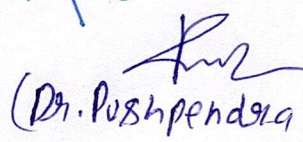
Revaluation/Retotaling of answer papers

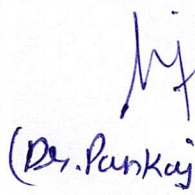
There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for retotaling by paying prescribed fee.

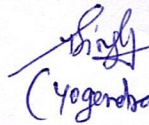
Re-admission after break of study

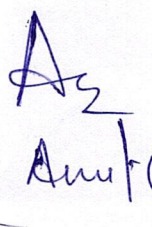
Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

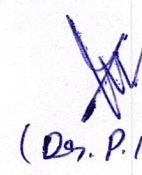

(Dr. P. K. Verma)

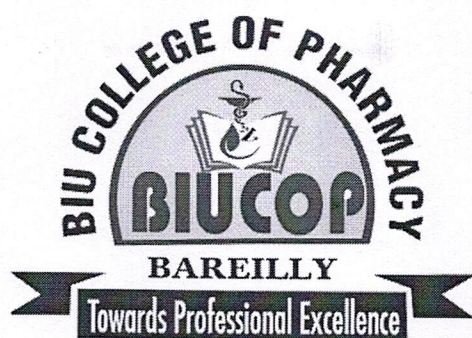

(Dr. P. K. Verma)


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(Dr. P. K. Verma)


(Dr. P. K. Verma)


(Dr. P. K. Verma)



BIU COLLEGE OF PHARMACY

Syllabus

M. Pharm

(Pharmacology)

[Applicable w.e.f. Academic Session - 2023-24]

Choice Based Credit System, (CBCS)



BAREILLY INTERNATIONAL UNIVERSITY

Rohilkhand Medical College and Hospital, Pilibhit

Bypass Road Bareilly, Uttar Pradesh-243006

Website: www.biu.edu.in

- 1

(Dr. Ashwendra Yadav) (Dr. Yogendra Singh) (Dr. Pankaj Mishra) (Dr. P. Kanna) (Dr. Anil Kumar)

PROGRAM SPECIFIC OUTCOMES: M. PHARM (PHARMACOLOGY)

After completion of the course the students will be

PSO-1: Understanding the application of pharmacological information of active chemical entity (Drug) present in a medicine that is used for diagnosis, prevention, treatment/cure of a disease.

PSO-2: Illustrating pharmacodynamic and pharmacokinetic investigation to evaluate the efficacy and safety of drugs in animal models.

PSO-3: Demonstrating mechanism of action of drug in preclinical research involved in Neurotransmission and Neurohumoral transmission apply in biomedical research.

PSO-4: Practicing animals handling of different species / strains along with their breeding and maintenance as per CPCSEA/international Guidelines/Good laboratory practice (GLP).

PSO-5: Identifying the *in vivo*, *in vitro*, and other possible animal alternative models for screening of new substances.

PSO-6: Developing the core concept of establishing toxicological profile of a new drug while evaluating during research.


(Yogendra Singh)


(Dr. Pankaj Mishra)


(Dr. K. S. Verma)


(Dr. Pushpendra Yadav)


(Dr. Anurag Kumar)


(Dr. P. K. Khatwalia)

CourseCode: 17141	M. Pharm- Semester-I Modern Pharmaceutical Analytical Techniques	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1.	Understanding the basic concepts and advances in analytical techniques and theoretical skills of the analytical instruments.	
CO2.	Applying advanced analytical instrumental techniques for identification, characterization and quantification of drugs.	
CO3.	Performing quantitative & qualitative analysis of drugs using various analytical instruments in single and combination dosageforms	
CO4.	Evaluating given samples with respect to official standards.	
Course Contents:		
Unit-1	a) UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. b) 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. c) Spectro fluorimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer. d) Flame emission spectroscopy and atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.	10Hrs
Unit-2	NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³ C NMR. Applications of NMR spectroscopy.	10Hrs
Unit-3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy	10Hrs
Unit-4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: - Paper chromatography - Thin Layer chromatography - Ion exchange chromatography - Column chromatography - Gas chromatography - High-Performance Liquid chromatography - Affinity chromatography HPTLC	10Hrs
Unit-5	a) Electrophoresis: Principle, Instrumentation, working conditions, factors affecting separation and applications of the following: - Paper electrophoresis - Gel electrophoresis	10Hrs

(Dr. Poshpendra Yadav)
(Ajendra Singh)

(Dr. Pankaj Mishra)

(Dr. P. K. Kumbhar)

(Dr. P. K. Kumbhar)

	iii) Capillary electrophoresis iv) Zone electrophoresis v) Moving boundary electrophoresis vi) Isoelectric focusing b) 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. c) Immunological assays: RIA (Radio immuno assay), ELISA, Bioluminescence assays.	
	a) Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. b) Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. c) Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.	10Hrs

Reference Books:

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
- Pharmaceutical Analysis- Modern methods - Part B - J W Munson, Volume 11. Marcel Dekker Series
7. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley eastern Ltd., Delhi.
8. Textbook of Pharmaceutical Analysis, KA. Connors, 3rd Edition, John Wiley & Sons, 1982.

(Dr. Chaitanya Kr. Varma)

(Dr. Pankaj Mishra)

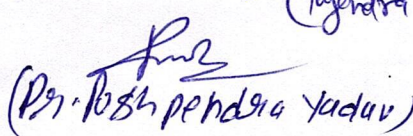
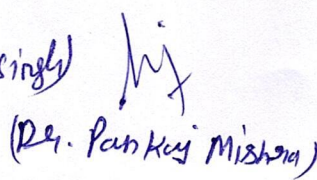
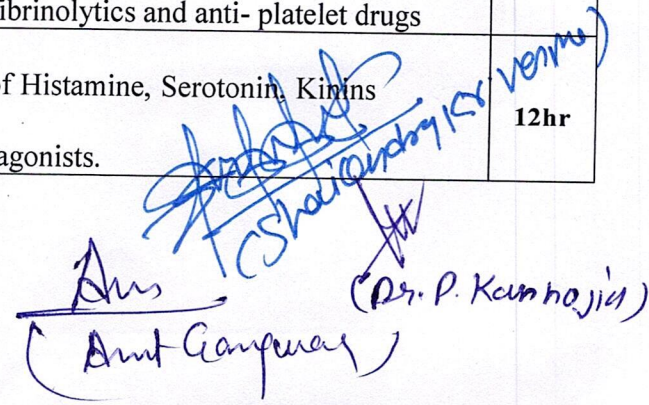
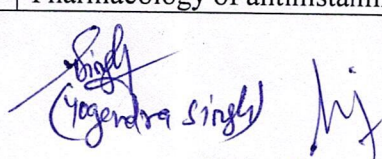
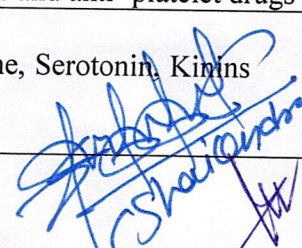
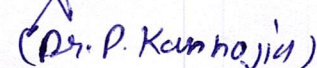
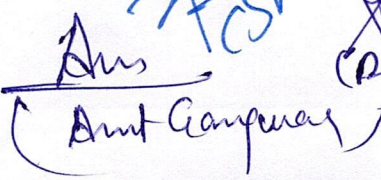
(Anurag Chandra)

(Dr. P. Kanhaiah)

(Dr. Rishpendra Yadav)

(Yogendra Singh)

Course Code: 17150	M. Pharm- Semester-I ADVANCED PHARMACOLOGY - I (MPL102T)	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be		
CO1	Understanding the basic knowledge in the field of pharmacology pertaining to the drugs and its therapeutic applications for the treatment of various diseases.	
CO2	Analyzing the mechanism of drug actions at cellular and molecular level.	
CO2	Evaluating the adverse effects, contraindications and clinical uses of drugs used in treatment of various diseases	
Course Contents:		
Unit-1:	General Pharmacology - Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding. - Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors, quantitation of drug receptors interaction and elicited effects.	12hr
Unit-2:	Neurotransmission - General aspects and steps involved in neurotransmission. - Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetyl choline). - Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and glycine). - Non adrenergic non cholinergic transmission (NANC). Co-transmission Systemic Pharmacology - A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems Autonomic Pharmacology - Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction	12hr
Unit-3:	Central nervous system Pharmacology - General and local anaesthetics - Sedatives and hypnotics, drugs used to treat anxiety. - Depression, psychosis, mania, epilepsy, neurodegenerative diseases. - Narcotic and non-narcotic analgesics.	12hr
Unit-4:	Cardiovascular Pharmacology Diuretics, antihypertensives, antiischemics, anti- arrhythmics, drugs for heart failure and hyperlipidemia. Hematinics, coagulants, anticoagulants, fibrinolytics and anti- platelet drugs	12hr
Unit-5:	Autocoid Pharmacology The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autocoids. Pharmacology of antihistamines, 5HT antagonists.	12hr

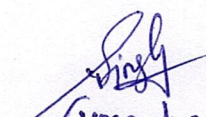
 (Dr. P. K. Yadav)
 (Dr. Pankaj Mishra)
 (Dr. P. K. Verma)
 (Dr. P. K. Singh)
 (Dr. P. K. Singh)
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 (Dr. P. K. Singh)

Text Books:

1. K D. Tripathi. Essentials of Medical Pharmacology.
2. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastava published by APC Avichal Publishing Company
3. Basic and Clinical Pharmacology by B.G Katzung.

Reference Books:

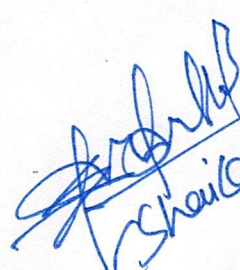
1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E
2. Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
4. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew
5. B.C.Yu. Graham Smith. Oxford textbook of Clinical Pharmacology. Avery Drug Treatment
6. Dipiro Pharmacology, Pathophysiological approach.
7. Green Pathophysiology for Pharmacists.
8. Robbins & Cortan Pathologic Basis of Disease, 9 th Ed. (Robbins Pathology)
9. Modern Pharmacology with Clinical Applications, Craig Charles R. & Stitzel Robert E., Lippincott Publishers.
10. Clinical Pharmacokinetics & Pharmacodynamics: Concepts and Applications
11. Malcolm Rowland and Thomas N. Tozer, Wolters Kluwer, Lippincott Williams & Wilkins Publishers.
12. Applied biopharmaceutics and Pharmacokinetics, Pharmacodynamics and Drug metabolism for industrial scientists.
13. Modern Pharmacology, Craig CR. & Stitzel RE, Little Brown & Company.


(Yogendra Singh)


(Dr. Pankaj Mishra)


(Anurag Chandra)


(Dr. Poshpendra Yadav)


(Shailendra K. Verma)


(Dr. P. Kanheja)

Course Code: 17151	M. Pharm- Semester-I PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS - I	L-4 T-0 P-0 C-4
Course Outcomes On completion of the course, the students will be:		
CO1	Understanding and evaluating the recent experimental techniques in the drug discovery and development.	
CO2	Understanding the maintenance of laboratory animals as per the guidelines, and various in-vitro and in-vivo preclinical evaluation processes.	
CO3	Applying the various screening methods involved in the drug discovery process	
Course Contents:		
Unit-1:	Laboratory Animals Common laboratory animals: Description, handling and applications of different species and strains of animals. Transgenic animals: Production, maintenance and applications Anaesthesia and euthanasia of experimental animals. Maintenance and breeding of laboratory animals. CPCSEA guidelines to conduct experiments on animals Good laboratory practice. Bioassay-Principle, scope and limitations and methods	12 hr
Unit-2:	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. General principles of preclinical screening. CNS Pharmacology: behavioural and muscle co-ordination, CNS stimulants and depressants, anxiolytics, anti-psychotics, anti-epileptics and nootropics. Drugs for neurodegenerative diseases like Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on Autonomic Nervous System.	12hr
Unit-3:	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Respiratory Pharmacology: anti-asthmatics, drugs for COPD and anti allergies. Reproductive Pharmacology: Aphrodisiacs and antifertility agents Analgesics, anti-inflammatory and antipyretic agents. Gastrointestinal drugs: anti-ulcer, anti - emetic, anti- diarrheal and laxatives.	12 hr
Unit-4:	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Cardiovascular Pharmacology: antihypertensives, antiarrhythmics, antianginal, antiatherosclerotic agents and diuretics. Drugs for metabolic disorders like anti-diabetic, antidyslipidemic agents. Anti-cancer agents. Hepatoprotective screening methods.	12hr
Unit-5:	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Immunomodulators, Immunosuppressants and immunostimulants General principles of immunoassay: theoretical basis and optimization of immunoassay, heterogeneous and homogenous immunoassay systems. Immunoassay methods evaluation; protocol outline, objectives and preparation. Immunoassay for digoxin and insulin Limitations of animal experimentation and alternate animal experiments. Extrapolation of in vitro data to preclinical and preclinical to humans	12 hr

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(Dr. P. Kanhaiya)

Text Books:

1. Biological standardization by J.H. Burn D.J. Finney and I.G. Goodwin
2. Fundamentals of experimental Pharmacology by M.N.Ghosh
3. Preclinical evaluation of new drugs by S.K. Gupta

Reference Books:

1. Screening methods in Pharmacology by Robert Turner. A
2. Evaluation of drugs activities by Laurence and Bachrach
3. Methods in Pharmacology by Arnold Schwartz.
4. Pharmacological experiment on intact preparations by Churchill Livingstone Drug discovery and Evaluation by Vogel H.G.
5. Experimental Pharmacology by R.K.Goyal.
6. Handbook of Experimental Pharmacology, S. K. Kulkarni Practical Pharmacology and Clinical Pharmacy, SK.Kulkarni, 3 rd Edition.
7. David R.Gross. Animal Models in Cardiovascular Research, 2 nd Edition, Kluwer Academic Publishers, London, UK.
8. Screening Methods in Pharmacology, Robert A.Turner.
9. Rodents for Pharmacological Experiments, Dr.Tapan Kumar chatterjee.
10. Practical Manual of Experimental and Clinical Pharmacology by BikashMedhi (Author), Ajay Prakash (Author)

* Latest editions of all the suggested books are recommended.

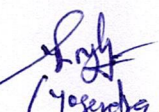

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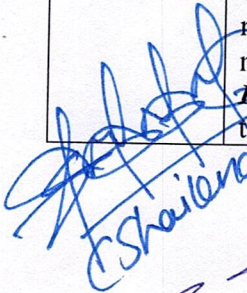
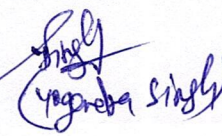

(Anurag Kumar)


(Dr. P. K. Kumbhakar)


(Dr. P. S. Pandey)


(Yogendra Singh)

Course Code: 17152	M. Pharm- Semester-I CELLULAR AND MOLECULAR PHARMACOLOGY	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO-1	Understanding the fundamental knowledge on the structure and functions of cellular components.	
CO-2	Appreciating the interaction of cellular components with drugs and applying the knowledge in drug discovery process.	
CO-3	They would have learnt to explain the molecular pathways affected by drugs	
CO-4	Applying the molecular pharmacology and biomarkers in drug discovery process.	
Course Contents:		
Unit-1:	Cell biology Structure and functions of cell and its organelles Genome organization. Gene expression and its regulation, importance of siRNA and micro-RNA, gene mapping and gene sequencing Cell cycles and its regulation. Cell death- events, regulators, intrinsic and extrinsic pathways of apoptosis. Necrosis and autophagy.	12 hr
Unit-2:	Cell signalling Intercellular and intracellular signalling pathways. Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors. Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1, 4, 5-trisphosphate, (IP3), NO, and diacylglycerol. Detailed study of following intracellular signalling pathways: cyclic AMP signalling pathway, mitogen-activated protein kinase (MAPK) signalling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signalling pathway	12 hr
Unit-3:	Principles and applications of genomic and proteomic tools DNA electrophoresis, PCR (reverse transcription and real time), micro array technique, SDS page, ELISA and western blotting, Recombinant DNA technology Basic principles of recombinant DNA technology-Restriction enzymes, various types of vectors. Applications of recombinant DNA technology. Gene therapy- Various types of gene transfer techniques, clinical applications and recent advances in gene therapy.	12 hr
Unit-4:	Pharmacogenomics Cloning of disease gene. Genetic variation and its role in health/ pharmacology Polymorphisms affecting drug metabolism Genetic variation in drug transporters Genetic variation in G protein coupled receptors Applications of proteomics science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics Immunotherapeutics: Types of immunotherapeutics, humanisation antibody therapy, Immunotherapeutic in clinical practice.	12 hr



 (Dr. P. K. Mishra) (Dr. P. K. Mishra) (Dr. P. K. Mishra) (Dr. P. K. Mishra) (Dr. P. K. Mishra)

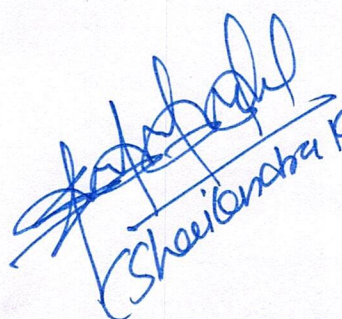
Unit-5:	a. Cell culture techniques Basic equipment's used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of cells and their application. b. Principles and applications of cell viability assays, glucose uptake assay, Calcium influx assays Principles and applications of flow cytometry c. Biosimilars	12
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Text Books:

1. The Cell, A Molecular Approach. Geoffrey M Cooper.
2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong

Reference Books:

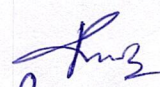
1. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
2. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
3. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L. Miller
4. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
5. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
6. Current protocols in molecular biology vol I to VI edited by Frederick M. Ausuvel et al.


(Shailendra Kr. Verma)


(Dr. Pankaj Mishra)


(Dr. Anurag Gangwar)


(Dr. P. K. Kanojia)


(Dr. Pushpendra Yadav)


(Dr. Yashendra Singh)

COURSE CODE: 17788	M. Pharm- Semester-I PHARMACOLOGY PRACTICAL - I	L-0 T-0 P-12 C-6
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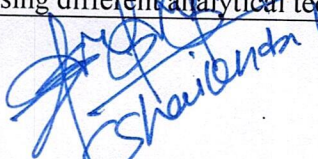
Course Outcomes:

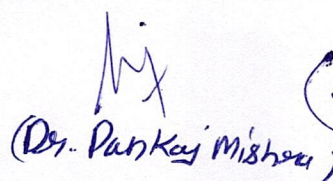
On completion of the course, the students will be:

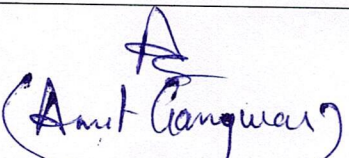
CO1:	Understanding the various handling techniques of laboratory animals	
CO2:	Practicing the technique of blood Sampling and route of drug administration	
CO3:	Analysing drugs and Pharmaceuticals	
CO4:	Evaluating drugs in various animal models	

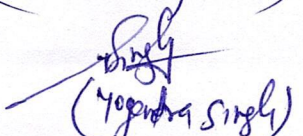
Course Content

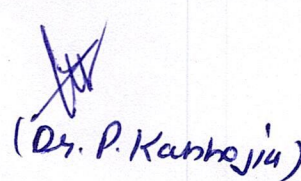
1. Analysis of pharmacopoeial compounds and their formulations by UV Visspectrophotometer.
2. Simultaneous estimation of multi component containing formulations by UVspectrophotometry.
3. Experiments based on HPLC.
4. Experiments based on Gas Chromatography.
5. Estimation of riboflavin/quinine sulphate by fluorimetry. Estimation of sodium/potassium by flame photometry.
1. Handling of laboratory animals.
2. Various routes of drug administration.
3. Techniques of blood sampling, anaesthesia and euthanasia of experimental animals.
4. Functional observation battery tests (modified Irwin test).
5. Evaluation of CNS stimulant, depressant, anxiogenics and anxiolytic, anticonvulsant activity.
6. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activity.
7. Evaluation of diuretic activity.
8. Evaluation of antiulcer activity by pylorus ligation method.
9. Oral glucose tolerance test.
10. Isolation and identification of DNA from various sources (Bacteria, Cauliflower, onion, Goat liver).
11. Isolation of RNA from yeast.
12. Estimation of proteins by Braford/Lowry's in biological samples.
13. Estimation of RNA/DNA by UV Spectroscopy.
14. Gene amplification by PCR.
15. Protein quantification Western Blotting.
16. Enzyme based in-vitro assays (MPO, AChEs, α amylase, α glucosidase).
17. Cell viability assays (MTT/Trypan blue/SRB).
18. DNA fragmentation assay by agarose gel electrophoresis.
19. DNA damage study by Comet assay.
20. Apoptosis determination by fluorescent imaging studies.
21. Pharmacokinetic studies and data analysis of drugs given by different routes of administration using software's.
22. Enzyme inhibition and induction activity.
23. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (UV).
24. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (HPLC).


 (Dr. Pushpendra Yadav)


 (Dr. Parikaj Mishra)

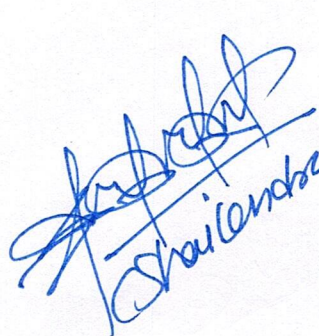

 (Anil Chandra)


 (Yogendra Singh)


 (Dr. P. Kanhojia)

Reference Books

1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
2. Fundamentals of experimental Pharmacology by M.N.Ghosh
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
4. Drug discovery and Evaluation by Vogel H.G.
5. Spectrometric Identification of Organic compounds - Robert M Silverstein,
6. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman,
7. Vogel's Text book of quantitative chemical analysis - Jeffery, Basset, Mendham, Denney,
8. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L. Mille
9. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
10. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
11. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

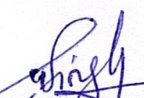

(Shailendra K. Verma)


(Dr. Pankaj Mishra)


(Dr. Pushpendra Yadav)


(Anurag Kumar)


(Dr. P. K. Khatwalia)


(Yogendra Singh)

COURSE CODE: 17153	M. Pharm- Semester-II ADVANCED PHARMACOLOGY – II	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding the basic knowledge in the field of pharmacology pertaining to the drugs and its therapeutic applications for the treatment of various diseases	
CO2:	Analysing the mechanism of drug actions at cellular and molecular level.	
CO3:	Evaluating the adverse effects, contraindications and clinical uses of drugs used in treatment of various diseases.	
Course Contents:		
Unit-1:	Endocrine Pharmacology Molecular and cellular mechanism of action of hormones such as growth hormone, prolactin, thyroid, insulin and sex hormones Anti-thyroid drugs, Oral hypoglycaemic agents, Oral contraceptives, Corticosteroids. Drugs affecting calcium regulation 2	12hr
Unit-2:	Chemotherapy Cellular and molecular mechanism of actions and resistance of antimicrobial agents such as β -lactams, aminoglycosides, quinolones, Macrolide antibiotics. Antifungal, antiviral, and anti-TB drugs.	12hr
Unit-3:	Chemotherapy Drugs used in Protozoal Infections Drugs used in the treatment of Helminthiasis Chemotherapy of cancer Immunopharmacology Cellular and biochemical mediators of inflammation and immune response. Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD. Immunosuppressants and Immunostimulants	12hr
Unit-4:	GIT Pharmacology Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheal and drugs for constipation and irritable bowel syndrome. Chronopharmacology Biological and circadian rhythms, applications of chronotherapy in various diseases like cardiovascular disease, diabetes, asthma and peptic ulcer.	12hr
Unit-5:	Free radicals Pharmacology Generation of free radicals, role of free radicals in etiopathology of various diseases such as diabetes, neurodegenerative diseases and cancer. Protective activity of certain important antioxidant Recent Advances in Treatment: Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus	12hr

Text Books

1. A Complete Textbook of Medical Pharmacology by Dr. S.K. Srivastava published by APC Avichal Publishing Company.
2. K.D. Tripathi. Essentials of Medical Pharmacology
3. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers

References Books

4. The Pharmacological basis of therapeutics- Goodman and Gilman's
5. Principles of Pharmacology. The Pathophysiologic basis of drug therapy by David E Golan et al.
6. Basic and Clinical Pharmacology by B.G. Katzung
7. Pharmacology by H.P. Rang and M.M. Dale.
8. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
9. Text book of Therapeutics, drug and disease management by E T. Herfindaland Gourley.
10. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C. Yu.
11. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists
12. Robbins & Cotran Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)

(Dr. Pooja Pendera Yadav) (Dr. Pankaj Mishra) (Dr. P. Kanharia)

COURSE CODE: 17154	M. Pharm- Semester-II PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-II	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding and evaluating the recent experimental techniques in the drug discovery, development and importance of ethical and regulatory requirements for toxicity studies.	
CO2:	Understanding the maintenance of laboratory animals as per the guidelines, and various in-vitro and in-vivo preclinical and toxicological evaluation processes.	
CO3:	Applying the various screening methods involved in the drug discovery process and Demonstrate the practical skills required to conduct the preclinical toxicity studies	
Course Contents:		
Unit-1:	Basic definition and types of toxicology (general, mechanistic, regulatory and descriptive) Regulatory guidelines for conducting toxicity studies OECD, ICH, EPA and Schedule Y OECD principles of Good laboratory practice (GLP) History, concept and its importance in drug development	12hr
Unit-2:	Acute, sub-acute and chronic- oral, dermal and inhalational studies as per OECD guidelines. Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity studies. Test item characterization- importance and methods in regulatory toxicology studies	12hr
Unit-3:	Reproductive toxicology studies, Male reproductive toxicity studies, female reproductive studies (segment I and segment III), teratogenicity studies (segment II) Genotoxicity studies (Ames Test, in vitro and in vivo Micronucleus and Chromosomal aberrations studies) In vivo carcinogenicity studies	12hr
Unit-4:	IND enabling studies (IND studies)- Definition of IND, importance of IND, industry perspective, list of studies needed for IND submission. Safety pharmacology studies- origin, concepts and importance of safety pharmacology. Tier1- CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2- GI, renal and other studies	12hr
Unit-5:	Toxicokinetic- Toxicokinetic evaluation in preclinical studies, saturation kinetics Importance and applications of toxicokinetic studies. Alternativemethods to animal toxicity testing.	12hr

References Books

1. Hand book on GLP, Quality practices for regulated non-clinical research and development (<http://www.who.int/tdr/publications/documents/glp-handbook.pdf>).
2. Schedule Y Guideline: drugs and cosmetics (second amendment) rules, n 2005, ministry of health and family welfare (department of health) New Delhi
3. OECD test guidelines.
4. Principles of toxicology by Karen E. Stine, Thomas M. Brown. Guidance for Industry M3(R2) Nonclinical Safety Studies for the Conduct of Human Clinical Trials and Marketing Authorization for Pharmaceuticals (<http://www.fda.gov/downloads/drugs/guidancecomplianceregulatoryinformation/guidances/ucm073246.pdf>)


(Yogendra Singh)

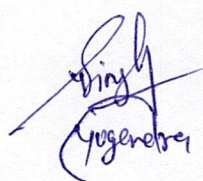

(Dr. P. K. Kantharia)

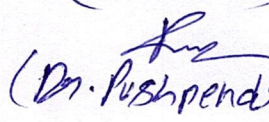

(Dr. Pankaj Mishra)

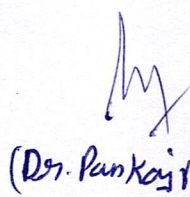

(Dr. Anil Kumar)

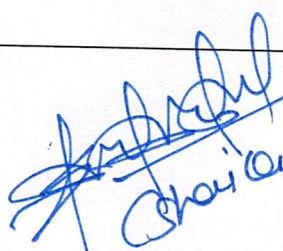
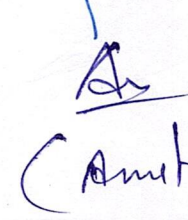

(Dr. P. K. Kantharia)

COURSE CODE: 17155	M. Pharm- Semester-II PRINCIPLES OF DRUG DISCOVERY	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding the importance of the role of genomics, proteomics and bioinformatics in drug discovery	
CO2:	Understanding and explain various targets for drug discovery.	
CO3:	Evaluation of various lead seeking method and lead optimization	
CO4:	The various computer aided drug design in drug discovery	
Course Contents:		
Unit-1:	An overview of modern drug discovery process: Target identification, target validation, lead identification and lead Optimization. Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.	12hr
Unit-2:	Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques, Assay development for hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modelling methods. Application of NMR and X-ray crystallography in protein structure prediction	12hr
Unit-3:	Rational Drug Design Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening,	12hr
Unit-4:	Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis and relationship between them.	12hr
Unit-5:	QSAR Statistical methods – regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design	12hr


(Yogendra Singh)


(Dr. Pushpendra Yadav)


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Anil Kumar

(Anurag Gangwar)


(Dr. P. Kumbhakar)

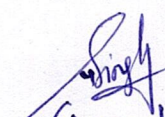
Text Books

1. Abby L .Parrill. M . Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
2. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley & Sons, Inc., New Jersey.

References Books

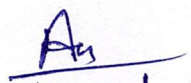
1. Mouldy Sioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targets and Treatment Options. 2007 Humana Press Inc.
2. Darryl León. Scott Markell. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC.
3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH.


(Shailendra Kr. Verma)


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(Anil Gangwar)


(Dr. P. Kanheja)

COURSE CODE: 17156	M. Pharm- Semester-II CLINICAL RESEARCH AND PHARMACOVIGILANCE	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding the regulatory requirements for conducting clinical trial.	
CO2:	Understanding the types of clinical trial designs and explain the responsibilities of key players involved in clinical trials.	
CO3:	Applying the safety monitoring, reporting and close-out activities in clinical trials	
CO4:	Evaluation Pharmacovigilance, detect new adverse drug reactions and their assessment, reporting of ADR.	
Course Contents:		
Unit-1:	Regulatory Perspectives of Clinical Trials: Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH- GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant Schedule Y, ICMR Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process	12 hr
Unit-2:	Clinical Trials: Types and Design Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management	12 hr
Unit-3:	Clinical Trial Documentation- Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. Predictability and preventability assessment, Management of adverse drug reactions; Terminologies of ADR.	12 hr
Unit-4:	Basic aspects; terminologies and establishment of Pharmacovigilance History and progress of Pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing Pharmacovigilance centres in Hospitals, Industry and National programmes related to Pharmacovigilance. Roles and responsibilities of Pharmacist, Community Pharmacist and Clinical Pharmacist in Pharmacovigilance	12 hr
Unit-5:	Methods, ADR reporting and tools used in Pharmacovigilance International classification of diseases, International Non-proprietary names for drugs, Passive and Active surveillance, Comparative observational studies, Targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety data.	12 hr
Unit-6:	Pharmacoepidemiology, pharmacoecomics, safety pharmacology	12 hr

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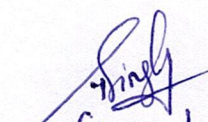
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Text books

1. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
2. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

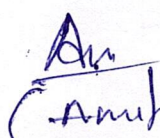
References Books

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice. E6; May 1996.
3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.


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(Dr. Shailendra Kumar)

COURSE CODE: 17789	M. Pharm- Semester-II PHARMACOLOGY PRACTICAL – II	L-0 T-0 P-12 C-6
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Course outcomes

On Completing the Course, the student will be:

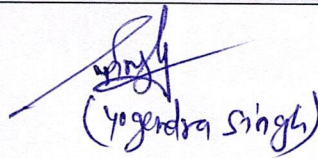
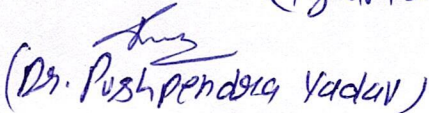
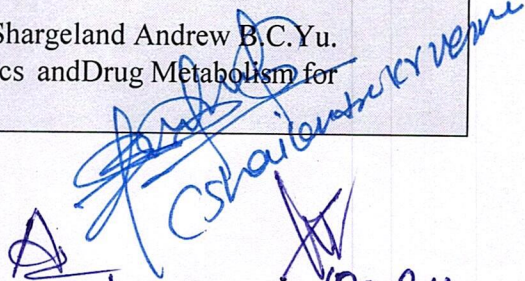
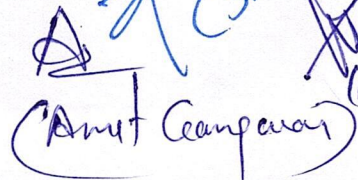
CO1:	Understanding the concept of bioassay in experimental pharmacology	CO2:	
CO2:	Applying various techniques to determine the strength of drugs in isolated tissues		
CO3:	Predicting the dose toxicity studies		
CO4:	Evaluating the various effect of drugs on different animal models		

Course Content

1. To record the DRC of agonist using suitable isolated tissues preparation.
2. To study the effects of antagonist/potentiating agents on DRC of agonist using suitable isolated tissue preparation.
3. To determine the strength of unknown sample by matching bioassay by using suitable tissue preparation.
4. To determine the strength of unknown sample by interpolation bioassay by using suitable tissue preparation.
5. To determine the strength of unknown sample by bracketing bioassay by using suitable tissue preparation.
6. To determine the strength of unknown sample by multiple point bioassay by using suitable tissue preparation.
7. Estimation of PA₂ values of various antagonists using suitable isolated tissue preparations.
8. To study the effects of various drugs on isolated heart preparations.
9. Recording of rat BP, heart rate and ECG.
10. Recording of rat ECG.
11. Drug absorption studies by averted rat ileum preparation.
12. Acute oral toxicity studies as per OECD guidelines.
13. Acute dermal toxicity studies as per OECD guidelines.
14. Repeated dose toxicity studies- Serum biochemical, haematological, urine analysis, functional observation tests and histological studies.
15. Drug mutagenicity study using mice bone-marrow chromosomal aberration test.
16. Protocol design for clinical trial. (3 Nos.)
17. Design of ADR monitoring protocol.
18. In-silico docking studies. (2 Nos.)
19. In-silico pharmacophore-based screening.
20. In-silico QSAR studies.
21. ADR reporting

Reference Books

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. Text book of in-vitro practical Pharmacology by Ian Kitchen
4. Bioassay Techniques for Drug Development by Atta-ur-Rahman, Iqbal Choudhary and William Thomsen
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists.

 (Yogendra Singh)
 (Dr. Pankaj Mishra)
 (Dr. Pushpendra Yadav)
 (Dr. R. Kanheja)
 (Anurag)

COURSE CODE: MRM301T	M. Pharm- Semester-III RESEARCH METHODOLOGY & BIOSTATISTICS	L-4 T-0 P-0 C-4
Course Outcomes:		
On completion of the course, the students will be:		
CO1.	Understanding the basic concept of research methodology	
CO2.	Applying skills in qualitative and quantitative data analysis and presentation	
CO3.	Understanding and applying the maintenance of laboratory animals of laboratory animals	
Course Contents:		
UNIT 1	General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.	12 hr
UNIT 2	Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxon rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.	12 hr
UNIT 3	Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.	12 hr
UNIT 4	CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anaesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.	12 hr
UNIT 5	Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care.	12 hr

Text books

- Cooper & Schindler, Business Research Methods, Tata McGraw Hill.
- Saunders, Research Methods for Business Students, Pearson Education
- Allen T Harrell, New Methods in Social Science Researches, Praeger Publishers, New York
- Beri, G.C., Statistics for Management, Tata MacGraw-Hill
- Chandan J. S., Statistics for Business and Economics, Vikas Publications.
- Broota, K.D., Experimental Designs in Behavioural Research, New Age International
- Singh A. K., Test Measurement and Research Methods in Behaviours Sciences, Bharti Bhawan
- Joyce Cox & Polly Urban, Microsoft Office, Galgotia Publishing
- Sinha P.K., Computer Fundamentals, BPB Publishing.

*Latest editions of all the suggested books are recommended.

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Chandana K. S.

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(Dr. Pushpendra Yadav)

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(Dr. Pankaj Mishra)

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(Anurag Gangwar)

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(Dr. P. K. Kanwar)

PAPER CODE:
BAREILLY INTERNATIONAL UNIVERSITY, BAREILLY
MASTER OF PHARMACY (M.PHARM)
University Examination:
Subject Name:

Time: 03 Hours

M.M: 75

Question No. – 1

(10 x 2 = 20)

Note: Attempt all questions. (Very Short Questions)

- a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

Question No. – 2

(5 x 7 = 35)

Note: Attempt any seven questions. (Short Questions)

- a)
b)
c)
d)
e)
f)
g)
h)
i)

Question No. – 3

(10 x 2 = 20)

Note: Attempt any two questions. (Long Questions)

- a)
b)
c)

Singh
(Yogendra Singh)

Rizvi
(Dr. Rizvi Mehdi Yadoo)

Mishra
(Dr. Parkash Mishra)

As
(Anil Gargwal)

Sharma
(Dr. P. K. Sharma)

PAPER CODE:

BAREILLY INTERNATIONAL UNIVERSITY, BAREILLY

MASTER OF PHARMACY (M.PHARM)

Non - University Examination:

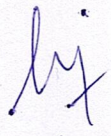
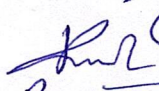
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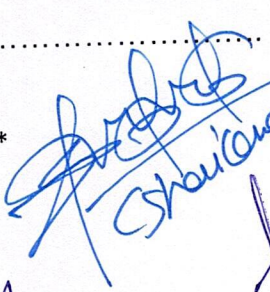
Time: 03 Hours

M.M: 75

Note: Answer any Five Questions. All Questions Carry Equal Marks.

1. a) (10+5)
b) (15)
2. a) (15)
3. a) (10+5)
b) (10+5)
4. a) (10+5)
b) (10+5)
5. a) (10+5)
b) (10+5)
6. a) (10+5)
b) (10+5)
7. a) (10+5)
b) (10+5)
8. a) (10+5)
b) (10+5)


(Yogendra Singh)

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(Shri Anshu Kr. Verma)

(Dr. P. K. Khatwani)

(Anil Garg)