List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Pharmacy*

Programme Name : *M. Pharm. (Pharmaceutics)*

Academic Year: 2019-20

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	101	Modern Research Methods
02.	101P	Modern Research Methods
03.	102	Pharmaceutical Biotechnology
04.	102P	Pharmaceutical Biotechnology
05.	103	Drug Regulatory Affairs & Quality Assurance
06.	104	Product Development
07.	104P	Product Development
08.	201	Advanced Pharmaceutics
09.	202	Biopharmaceutics & Pharmacokinetics
10.	203	Controlled & Novel Drug Delivery System
11.	204	Pharmaceutical Packaging
12.	205	Practical
13.	206	Synopsis and Viva Voce
14.	301	Seminar & Viva Voce
15.	401	Thesis Report
16.	402	Seminar & Viva-voce

HEAD
S.L.T. Institute of Pharm. Sciences
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.)

List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Pharmacy*

Programme Name : *M. Pharm. (Pharmaceutical Chemistry)*

Academic Year : 2019-20

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	101	Modern Research Methods
02.	101P	Modern Research Methods
03.	102	Pharmaceutical Biotechnology
04.	102P	Pharmaceutical Biotechnology
05.	103	Drug Regulatory Affairs & Quality Assurance
06.	104	Stereochemistry & Reaction Mechanisms
07.	104P	Stereochemistry & Reaction Mechanisms
08.	201	Advanced Pharmaceutical Chemistry-I
09.	202	Advanced Pharmaceutical Chemistry-II
10.	203	Advanced Medicinal Chemistry
11.	204	Drug Design
12.	205	Practical
13.	206	Synopsis and Viva Voce
14.	301	Seminar & Viva Voce
15.	401	Thesis Report
16.	402	Seminar & Viva Voce

HEAD
S.L.T. Institute of Pharm. Sciences
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.)

List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Pharmacy*

Programme Name : *M. Pharm. (Pharmacology)*

Academic Year : 2019-20

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	101	Modern Research Methods
02.	101P	Modern Research Methods
03.	102	Pharmaceutical Biotechnology
04.	102P	Pharmaceutical Biotechnology
05.	103	Drug Regulatory Affairs & Quality Assurance
06.	104	Basic And Molecular Pharmacology
07.	104P	Basic And Molecular Pharmacology
08.	201	General Pharmacology and Toxicology
09.	202	Recent Advances & Emerging Trends in Pharmacological Sciences
10.	203	Pharmacological Screening Methods
11.	204	Clinical Pharmacology
12.	205	Practical
13.	206	Synopsis and Viva Voce
14.	301	Seminar & Viva Voce
15.	401	Thesis Report
16.	402	Seminar & Viva Voce [synopsis]

HEAD
S.L.T. Institute of Pharm. Sciences
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.)

Scheme and Syllabus

M. Pharm. (Pharmaceutics)

Course Code	Course	Credit Hours	Credit Points	Hrs./w k	Marks
		Semester I			
101	Modern Research Methods	4	4	4	100
101P	Modern Research Methods	4	2	4	100
102	Pharmaceutical Biotechnology	4	4	4	100
102P	Pharmaceutical Biotechnology	4	2	4	100
103	Drug Regulatory Affairs & Quality Assurance	4	4	4	100
104	Product Development	4	4	4	100
104P	Product Development	4	2	4	100
	Total	28	22	28	700
		Semester II			
201	Advanced Pharmaceutics	5	5	5	100
202	Biopharmaceutics & Pharmacokinetics	5	5	5	100
203	Controlled & Novel Drug Delivery System	5	5	5	100
204	Pharmaceutical Packaging	5	5	5	100
205	Practical	18	9	18	200
206	Synopsis and Viva Voce		4		100
	Total	38	33	38	700
		Semester III			
301	Seminar on Research Progress				100
	Total		4	32	100
		Semester IV			
401	Thesis Report		8		200
402	Seminar & Viva-voce		8		200
	Total		16	32	400

Phar

S.L.T. Institute of Pharmaceutical Sciences

Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmaceutics) COURSE

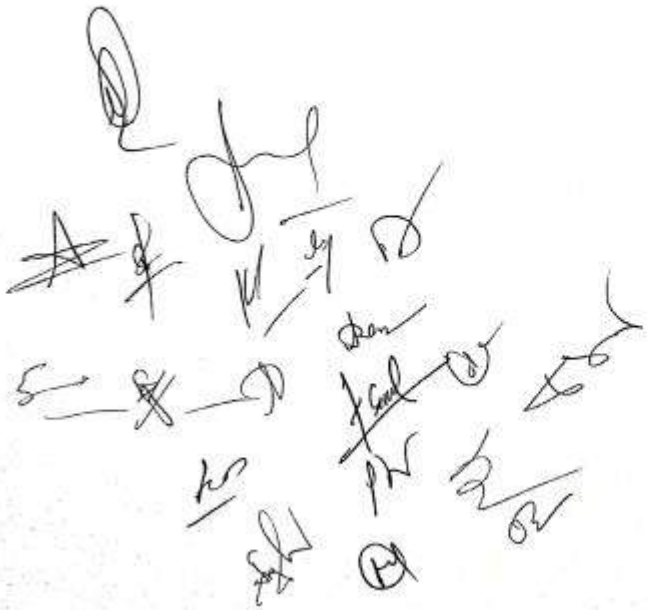
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits	
					TH	PR
M. Pharm. Semester-I	Core Course	Compulsory		Modern Research Methods	4	2
				Pharmaceutical Biotechnology	4	2
				Drug Regulatory Affairs & Quality Assurance	4	-
				Product Development	4	2
	Elective Course	Generic elective (discipline centric)		-		
		Open elective (unrelated discipline)		-		
	Foundation course	Compulsory foundation (for knowledge enhancement)		-		
		Elective Foundation (for value based and aimed at man working education)		-		
Credits					16	6
Total Credits					22	

S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmaceutics) COURSE
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits	
					TH	PR
M. Pharm. Semester-II	Core Course	Compulsory		Advanced Pharmaceutics	4+1	9
				Controlled & Novel Drug Delivery System	4+1	
				Biopharmaceutics & Pharmacokinetics	4+1	
				Pharmaceutical Packaging	4+1	-
				Synopsis and Viva Voce (Evaluated by Guide)	-	4
	Elective Course	Generic elective (discipline centric)		–		
		Open elective (unrelated discipline)		–		
	Foundation course	Compulsory foundation		-		
		Elective foundation		-		
Credits					20	13
Total Credits					33	



S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmaceutics) COURSE
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits	
					TH	PR
M. Pharm. Semester-III	Core Course	Compulsory		Seminar on Research Progress		4
	Elective Course	Generic elective (discipline centric)		–		
		Open elective (unrelated discipline)		–		
	Foundation course	Compulsory foundation		–		
		Elective foundation		–		
Credits						4
Total Credits					4	

S.L.T. Institute of Pharmaceutical Sciences

Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmaceutics) COURSE

Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits	
					TH	PR
M. Pharm. Semester-IV	Core Course	Compulsory		Thesis Report		8
				Seminar & Viva-voce		8
	Elective Course	Generic elective (discipline centric)		–		
		Open elective (unrelated discipline)		–		
	Foundation course	Compulsory foundation		–		
		Elective foundation		–		
Credits						16
Total Credits					16	

Total Credits of the M. Pharm. (Pharmaceutics) COURSE

S.N.	Semester	Total Credits
1.	I	22
2.	II	33
3.	III	04
4.	IV	16
Grand total (credits)		75

PHARMACEUTICS (MPH)
FIRST SEMESTER

MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER I: MODERN RESEARCH METHODS (THEORY)

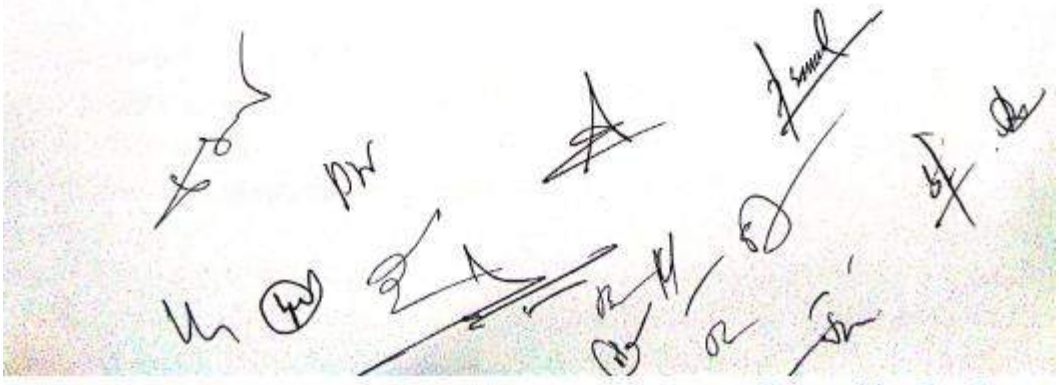
(4 hrs/week)

All topics will include instrumentation methodologies, techniques and applications to structural and quantitative analysis of drug and their methodologies.

Unit	Content	Credit
1.	Gas chromatography, high pressure liquid chromatography, gel filtration, electrophoresis, ion-pair chromatography and HPTLC.	12
2.	Ultra violet, infra-Red (including FTIR), nuclear magnetic resonance (including ^{13}C-NMR) and mass spectroscopy, atomic spectroscopy and plasma emission spectroscopy, electron microscopy.	20
3.	Radio assaying, radioimmuno assaying and autoradiography.	6
4.	Computer aids in pharmaceutical analysis	4
5.	Statistical treatment of data, test for significance, analysis of variance, multivarient statistics.	6

Books Recommended:

1. J.R. Dyer, Application of absorption spectroscopy.
2. Nakanishi, Infrared absorption spectroscopy.
3. William Kemp, Organic spectroscopy.
4. P.S. Kalsi, Spectroscopy of organic compounds.
5. Silverstein and Bassler, Spectroscopy of organic compounds.
6. Dudley William, Ian Flemming, Spectroscopic methods in organic chemistry, Tata McGraw Hill.
7. Williard, Merrit, Dean, Instrumental methods of analysis.



PAPER I: MODERN RESEARCH METHODS (PRACTICAL)

Practical No.	Content	Credit
1.	To estimate the given sample of aspirin using UV spectroscopic method.	2
2.	To find out the effect of substituent in the absorption spectra of benzoic acid.	2
3.	To estimate the concentration of given sample of aspirin by colorimetric method.	2
4.	To estimate the given sample of ascorbic acid using visible spectroscopic method.	2
5.	To determine the percentage of acetyl salicylic acid in the given sample using back titration method.	2
6.	To determine the content of metronidazole in the given sample using UV spectroscopic method.	2
7.	To determine the total hardness of water of the given sample.	2
8.	To separate and identify the given amino acids using ascending paper chromatography.	2
9.	To study the kinetics of aspirin hydrolysis using visible spectrophotometric method.	2
10.	To separate and identify the given samples using thin layer chromatography.	2
11.	To perform the estimation of paracetamol using visible spectroscopic method.	2
12.	To determine the content of paracetamol in the given sample using UV spectroscopic method.	2

Books Recommended:

1. J.R. Dyer, Application of absorption spectroscopy.
2. Nakanishi, Infrared absorption spectroscopy.
3. William Kemp, Organic spectroscopy.
4. P.S. Kalsi, Spectroscopy of organic compounds.
5. Silverstein and Bassler, Spectroscopy of organic compounds.
6. Dudley William, Ian Flemming, Spectroscopic methods in organic chemistry, Tata McGraw Hill.
7. Williard, Merrit, Dean, Instrumental methods of analysis.

MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER II: PHARMACEUTICAL BIOTECHNOLOGY (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	**Introduction:** Biotechnology as an interdisciplinary area, traditional and modern biotechnology, technologies used in biotechnology, global impact of biotechnology on healthcare.	04
2.	**Recombinant DNA technology:** Physical and chemical nature of DNA, DNA replication in prokaryotes and eukaryotes, tools and techniques of genetic engineering, site directed mutagenesis, polymerase chain reaction and analysis of DNA sequences, gene library, advantages of producing biotechnological products by recombinant means, plants and transgenic animals as potential sources of recombinant biotechnological products, typical upstream and downstream process, product recovery, concentration and chromatographic purification, product stabilization and formulation, characterization and analysis, establishing purity and safety.	12
3.	**Biotechnology drugs:** Study of biotechnology derived products, their production, formulations, characterization, clinical use such as human insulin, interferons, human growth hormone, hepatitis B vaccines, erythropoietin, tissue plasminogen activators, interleukins etc.	05
4.	**Gene therapy:** Brief concept, gene delivery by viral and non viral vectors, applications in treatment of single gene disorders such as cystic fibrosis, ADA etc.	05
5.	**Immunology and immunological preparation:** Introduction to immunology, antigen antibodies, cells and organs of immune system, active and passive immunity, antigen antibody reactions and their applications, hypersensitivity, immunological tolerance, classification of immunologicals, typical manufacture techniques for vaccines and antisera, preparations, standardization and storage, adjuvants and their application in vaccine design, new generation vaccines such as sub-unit vaccines, DNA vaccines etc.	12
6.	**Hybridoma technology:** Formation and selection of hybrid cells, principles and productions of monoclonal antibodies, commercial, production, characterization, quality control and storage of monoclonal antibodies, advantages and applications of monoclonal antibodies.	05
7.	**Enzyme technology:** Different techniques of immobilization of enzymes and whole cells, advantages and disadvantages of immobilization, kinetics of immobilized enzymes, applications and future of immobilized enzyme technology.	05

Books Recommended:

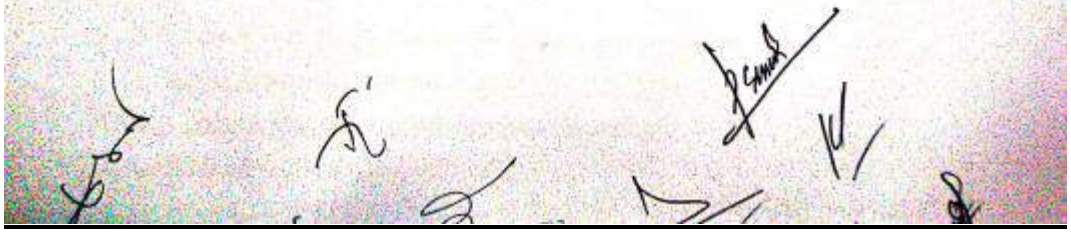
1. D.J.A. Crommelin, R.D. Sindelar, Pharmaceutical biotechnology, Taylor and Francis.
2. M.G. Grooves, Pharmaceutical biotechnology, Taylor and Francis.
3. G. Walsh, Pharmaceutical biotechnology – Concepts and applications, Willey Interscience Ltd.
4. S.P. Vyas and V.K. Dxit, Pharmaceutical biotechnology, CBS Publications.

PAPER II: PHARMACEUTICAL BIOTECHNOLOGY (PRACTICAL)

Practical No.	Content	Credit
1.	Colorimetric estimation of proteins (Biuret/Lowry/Bradford method).	2
2.	Changes in conformation of proteins by viscosity measurement.	2
3.	DNA isolation from onion/spleen/coconut endosperm and its characterization.	2
4.	DNA estimation by Diphenyl amine method.	2
5.	Electrophotetic (paper) separation of plasma proteins.	2
6.	Quantitative precipitation (Antigen-antibody) test.	2
7.	Agglutination (ABO blood group typing) test.	2
8.	Enzyme immobilization in alginate beads and its characterization.	2
9.	Enzyme immobilization by cross linking and its characterization.	2
10.	Solvent/salt precipitation of proteins.	2
11.	Dialysis and concentration of protein solutions.	2
12.	Freeze drying of given protein sample.	2

Books Recommended:

1. D.J.A. Crommelin, R.D. Sindelar, Pharmaceutical biotechnology, Taylor and Francis.
2. M.G. Grooves, Pharmaceutical biotechnology, Taylor and Francis.
3. G. Walsh, Pharmaceutical biotechnology – Concepts and applications, Willey Interscience Ltd.
4. S.P. Vyas and V.K. Dxit, Pharmaceutical biotechnology, CBS Publications.



MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER III: DRUG REGULATORY AFFAIRS AND QUALITY ASSURANCE (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Requirements of GMP, CGMP, GLP, USFDA, WHO guidelines and ISO 9000 series.	7
2.	Drugs and cosmetics acts and rules, drug regulatory affairs.	5
3.	Documentation: Protocols, forms and maintenance of records in pharmaceutical industry.	3
4.	Preparation of documents for new drug approval and export registration.	3
5.	Processing and its application intellectual property rights (patent, copyright and trade marks).	7
6.	Sewage disposal and pollution control.	3
7.	Concepts in validation, validation of manufacturing, analytical and process validation and its application.	4
8.	Basic concept of quality control and quality assurance systems, source and control of quality variation of raw materials, containers, closures, personnel, environment, etc.	5
9.	In process quality control tests, IPQC problems in pharmaceutical industries.	4
10.	Sampling plans, sampling and characteristic curves.	3
11.	Master formula generation and maintenance, standard operating procedure (SOP) for different dosage forms.	4

Books Recommended:

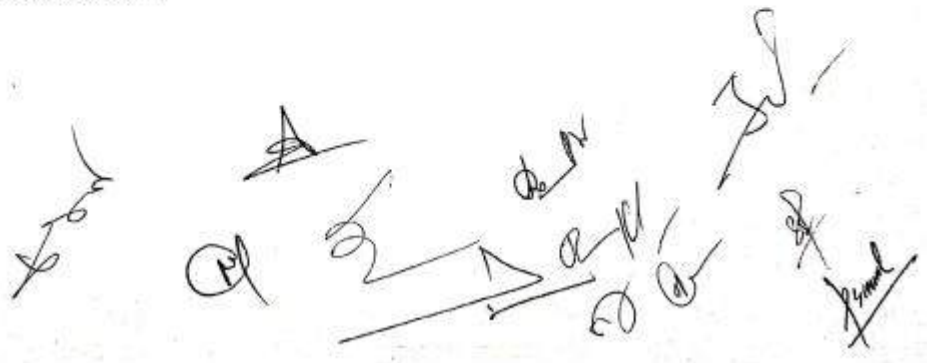
1. Willing, Tuckerman, Hitching, Good Manufacturing practices for pharmaceuticals.
2. Drugs and cosmetics acts and rules.
3. Bharathi, Drugs and pharmacy laws in India.
4. Patel, Industrial microbiology.
5. B.T. Loftus, R.A. Nash, Pharmaceutical process validation.
6. S. Bolton, Pharmaceutical statistics.
7. G.S. Banker, C.T. Rhodes, Modern pharmaceutics.
8. OPPI, Quality assurance.
9. Carletiori, Validation of aseptic pharmaceutical process.
10. Garfield, Quality assurance principles for analytical laboratories.
11. Indian pharmacopoeia.
12. British pharmacopoeia.
13. United State pharmacopoeia.

PAPER IV: ELECTIVE FOR PHARMACEUTICS BRANCH
PRODUCT DEVELOPMENT (PRACTICAL)

Practical No.	Content	Credit
1.	To perform the preformulation study of given sample.	3
2.	To determine the particle size of given sample by photomicroscope and particle size analyzer.	3
3.	To prepare tablets and perform film coating and enteric coating.	3
4.	To prepare and evaluate emulsion of given drug sample using various type of emulsifying agents.	3
5.	To prepare and evaluate suspension of given drug sample using various types of suspending agents.	3
6.	To prepare and evaluate microcapsules of given drug.	3
7.	To prepare and evaluate dispersible tablets of given drug.	3
8.	To prepare and evaluate floating tablets of given drug.	3

Books Recommended

1. L. Lachmann, H.A. Liberman, J.I. Kanig, The theory and practice of industrial pharmacy, Lea and Febiger, Philadelphia.
2. G.S. Banker, C.T. Rhodes, Modern pharmaceutics, Marcel Dekker Inc., New York and Basel.
3. S. Turco, R.E. King, Sterile dosage forms, Lea and Febiger, Philadelphia.
4. H.S. Bean, A.H. Beckett, J.E. Carless, Advances in pharmaceutical sciences, Academic Press, London and New York.
5. N.K. Jain, Controlled and novel drug delivery, CBS Publishers, New Delhi.
6. J.R. Robinson, V.H.L. Lee, Controlled drug delivery, Marcel Dekker, New York and Basel.
7. Y.W. Chien, Novel drug delivery systems, Marcel Dekker, New York and Basel.
8. N.K. Jain, Product development, CBS Publishers, New Delhi.
9. N.K. Jain, Controlled and novel drug delivery, CBS Publishers, New Delhi.
10. S.P. Vyas, R.K. Khar, Targeted and controlled drug delivery: Novel carrier systems, CBS Publishers, New Delhi.



MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER
PAPER IV: ELECTIVE FOR PHARMACEUTICS BRANCH
PRODUCT DEVELOPMENT (THEORY)

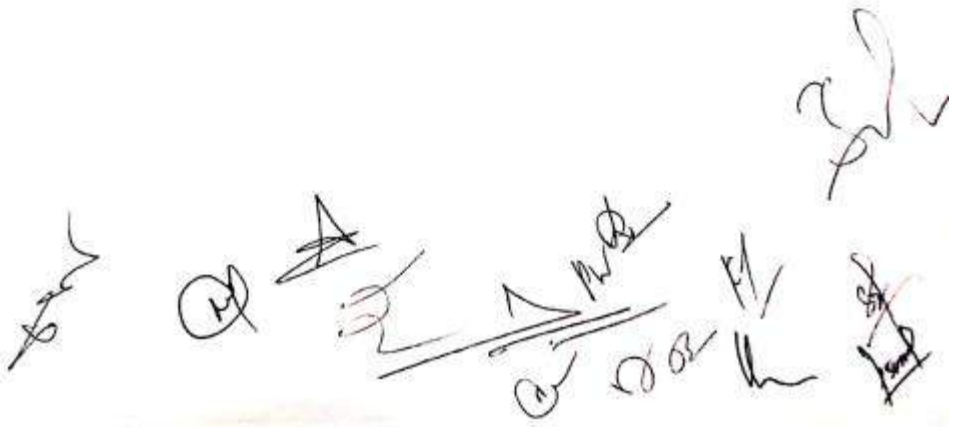
(4 hrs/week)

Unit	Content	Credit
1.	Pre-formulation: Consideration of physico-chemical characteristics of medicinal agents in their dosage form. Physical characteristics: Particle size, polymorphism, crystal form, solubility, interfacial tension, salt formation, wetting of solids, flow characteristics, compressibility, rheology, partition coefficient. Chemical characteristics: Degradation- Hydrolytic, oxidative, reductive, photolytic. Biopharmaceutical characteristics: Liquid solubility, dissociation constant, dissolution rate, bulk solubility and diffusibility in diffusion layer, drug stability in G.I. tract, complexation.	08
2.	Designing of pharmaceuticals: Tablet formulation, coating of tablets, evaluation of tablets, equipments and problems in tablet.	06
3.	Liquids: Formulation consideration of oral liquids, suspensions, emulsions, parenteral, ophthalmic, depot products, large volume and small volume parenterals, environmental control and quality assurance in parenteral drug manufacturing.	10
4.	Introduction to controlled and novel drug delivery systems, sustained release dosage forms, prodrug concept, nanoparticles, liposomes, resealed erythrocytes, transdermal and other novel drug delivery systems.	11
5.	Stability testing of solid and liquid dosage forms: Difference in approaches for stability testing of solid and liquids, kinetic principles, physical and chemical stability testing of pharmaceutical dosage forms and packages.	07
6.	Pilot plant scale-up techniques: Evaluation of formula, equipments, raw materials, process, stability, uniformity, techniques related to tablets including coating, capsules, liquid dosage forms and semi-solid dosage forms.	06

Books Recommended

1. L. Lachmann, H.A. Liberman, J.I. Kanig, The theory and practice of industrial pharmacy, Lea and Febiger, Philadelphia.
2. G.S. Banker, C.T. Rhodes, Modern pharmaceutics, Marcel Dekker Inc., New York and Basel.

3. S. Turco, R.E. King, Sterile dosage forms, Lea and Febiger, Philadelphia.
4. H.S. Bean, A.H. Beckett, J.E. Carless, Advances in pharmaceutical sciences, Academic Press, London and New York.
5. N.K. Jain, Controlled and novel drug delivery, CBS Publishers, New Delhi.
6. J.R. Robinson, V.H.L. Lee, Controlled drug delivery, Marcel Dekker, New York and Basel.
7. Y.W. Chien, Novel drug delivery systems, Marcel Dekker, New York and Basel.
8. N.K. Jain, Product development, CBS Publishers, New Delhi.
9. S.P. Vyas, R.K. Khar, Targeted and controlled drug delivery: Novel carrier systems, CBS Publishers, New Delhi.



PHARMACEUTICS (MPH)
SECOND SEMESTER

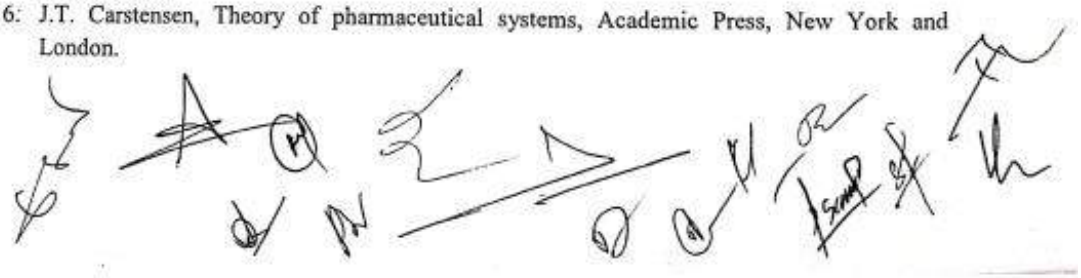
MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER
PAPER I: ADVANCED PHARMACEUTICS (THEORY)
(4 hrs/week)

Unit	Content	Credit
1.	Recent advances in tablet technology, parenteral technology and microencapsulation.	6
2.	Process automation on pharmaceutical manufacturing role of GMP, quality assurance and validation.	5
3.	Formulation development of vitamin and antibiotics products.	3
4.	Disperse systems: Molecular dispersion, solubilization theory, methods of solubility enhancement, factors influencing solubility.	5
5.	Coarse dispersion: Physical stability of suspensions and emulsions, role of zeta potential in stability of coarse dispersions, theory of emulsification, micro and multiple emulsions, rheology of suspensions and emulsions, drug kinetics in coarse disperse systems, drug diffusion in coarse dispersion systems.	9
6.	Stability indicating assays.	4
7.	Advances in polymer sciences and its applications in pharmacy.	4
8.	Radio pharmaceuticals: Production, control and its applications.	4
9.	Collection and classification of experimental data and its statistical treatment, method of least squares, correlation coefficient and multiple regression test of significance and student test.	5
10.	Statistical quality control, process control, control chart, acceptance sampling plans.	3

Books Recommended

1. L. Lachmann, H.A. Liberman, J.I. Kanig, Pharmaceutical dosage forms: Tablets, Volume I, II and III.
2. L. Lachmann, H.A. Liberman, J.I. Kanig, Pharmaceutical dosage forms: Parenteral medication, Volume I and II.
3. S. Turco, R.E. King, Sterile dosage forms, Lea and Febiger, Philadelphia.
4. Remington's pharmaceutical sciences.
5. A.N. Martin, J. Swarbrick, A. Cammarata, Physical pharmacy, Lea and Febiger, Philadelphia.
6. J.T. Carstensen, Theory of pharmaceutical systems, Academic Press, New York and London.



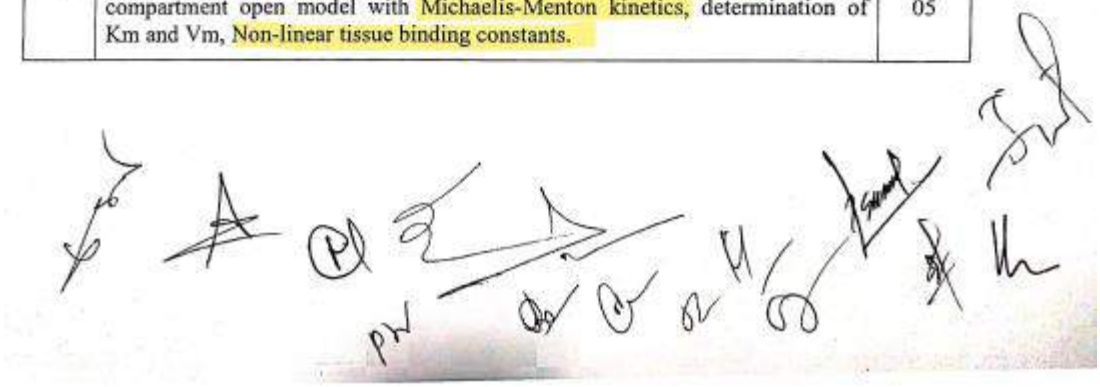
MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

PAPER II: BIOPHARMACEUTICS AND PHARMACOKINETICS (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Transport of drugs through membranes and barriers other than GI tract. Buccal absorption, salivary excretion of drugs, excretion of drugs via swet, excretion of drugs in to milk, penetration of drugs in to eye, transfer across placenta, passage of drugs in to and out of cerebrospinal fluid and brain.	06
2.	Measurement and interpretation of *in vitro* rates of dissolution, intrinsic rates of dissolution of drugs from solid dosage forms, various modern methods and models for testing dissolution rate, factors and kinetics of dissolution.	06
3.	Bioavailability and bioequivalence: Bioequivalence and its determination, study design for the assessment of bioavailability and bioequivalence, factors influencing bioavailability and bioequivalence, correlation of *in vitro* dissolution and *in vivo* bioavailability, statistical concepts in estimation of bioavailability and bioequivalence.	06
4.	Pharmacokinetics: Consideration of one two and multiple compartment models on intravenous administration, intravenous infusion and first order absorption of single dose, kinetics of multiple dosing, dosage regimens, loading and maintenance doses, one and two compartment models on intravenous administration and first order absorption of single dose. Kinetics of reversible pharmacological effects – direct and indirect effects.	10
5.	Clinical pharmacokinetics: Concept, absorption, distribution and renal clearance and elimination, disposition and absorption kinetics, intravenous dose, constant i.v. infusion, extravascular dose, metabolite kinetics, therapeutic regimens, therapeutic response and toxicity, dosage regimens, clinical trial studies.	07
6.	Physiologic pharmacokinetic model: Concepts, physiologic pharmacokinetic models with binding blood flow – limited versus diffusion – limited model, applications and limitations of physiologic pharmacokinetic models, mean residence time (MRT), statistical moments theory, mean absorption time (MAT), mean dissolution time (MDT).	08
7.	Non-linear pharmacokinetics: Recognition of non linearity one and two compartment open model with Michaelis-Menton kinetics, determination of Km and Vm, Non-linear tissue binding constants.	05



Books Recommended

1. M. Gibaldi, D. Perrier, Pharmacokinetics, Marcel Dekker Inc., New York.
2. H.N. Abdou, Dissolution, bioavailability and bioequivalence, Mack Publishing Co., Easton, PA.
3. Remington's: The science and practice of pharmacy, 20th edition, Lipincott Williams and Wilkins.
4. L. Shargel, A. Yu, Applied biopharmaceutics and pharmacokinetics, Appleton and Large, Norwalk, CT.
5. J.C. Wagner, Fundamentals of clinical pharmacokinetics, Drug Intelligence Pub, Hamilton III.
6. R.V. Smith, J.T. Stewart, Text book of biopharmaceutical analysis, Lea and Febiger, Philadelphia.
7. P.G. Welling, F.S. Tse, S.V. Dighe, Pharmaceutical bioequivalence, Marcel Dekker Inc., New York.
8. M. Rowland, T.N. Tozer, Clinical pharmacokinetics – Concept and application, Lea and Febiger, USA.
9. R.E. Hotari, Biopharmaceutics and clinical pharmacokinetics, Marcel Dekker Inc., New York and Basel.

MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

PAPER III: CONTROLLED AND NOVEL DRUG DELIVERY SYSTEMS (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Fundamentals of controlled release drug delivery: Influence of drug properties and routes of drug administration on the design of sustained and controlled release system, pharmacokinetic/pharmacodynamic basis of drug delivery, dosing considerations and bioavailability assessment, regulatory assessment.	12
2.	Design and fabrication of oral controlled release drug delivery systems, parenteral products, implantable products, transdermal therapeutic system, prodrugs as sustained chemical delivery systems.	12
3.	Biochemical and molecular approach to controlled drug delivery: Liposomes, niosomes, microspheres, resealed erythrocytes, nanoparticles, osmotic pumps.	12
4.	Targeted drug delivery: Definition, concept, target-drug interactions, delivery systems.	06
5.	Advances in controlled and novel drug delivery including cosmetics.	06

Books Recommended

1. J.R. Robinson, V.H.I. Lee, Controlled and novel drug delivery, Marcel Dekker, New York and Basel.
2. N.K. Jain, Controlled and novel drug delivery, CBS Publishers, New Delhi.
3. N.K. Jain, Advances in novel and controlled drug delivery, CBS Publishers, New Delhi.
4. Y.W. Chien, Novel drug delivery systems, Marcel Dekker, New York and Basel.
5. T.J. Roseman, Controlled release drug delivery systems, Marcel Dekker, New York.
6. S.D. Bruck, Controlled drug delivery, Volume I and II.
7. R.L. Juliano, Drug delivery systems.
8. S.P. Vyas, R.K. Khar, Targeted and controlled drug delivery: Novel carrier systems, CBS Publishers, New Delhi.
9. W.J. S. Wede, J.T. Dipiro, R.A. Blouin, Concepts in clinical pharmacokinetics, 6th edition, American Society of Health System Pharmacist, Maryland.

MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

PAPER IV: PHARMACEUTICAL PACKAGING (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	An introduction to pharmaceutical packaging	3
2.	The packaging function: management, development and product shelf life.	4
3.	Regulatory aspects of pharmaceutical packaging.	4
4.	Specifications and quality.	3
5.	Paper and board based packaging materials and their use in pack security systems.	4
6.	Glass containers.	4
7.	Plastics: An introduction, development and approval of a plastic pack.	5
8.	Films, foils and laminations (combination materials)	3
9.	Metal containers.	3
10.	Closures and closure systems.	3
11.	Sterile products and the role of rubber components.	3
12.	Blister, strip and sachet packaging.	4
13.	Warehousing, handling and distribution.	3
14.	Printing and decoration.	2

Books Recommended

1. D.A. Dean, E.R. Evans, I.H. Hall, Pharmaceutical packaging technology, Taylor and Francis.
2. K. Harburn, Quality control of packaging materials in the pharmaceutical industry, Informa Healthcare.
3. A.L. Brody, K.S. Marsh, Encyclopedia of packaging technology, John Wiley and Sons, New York.
4. Quality assurance of pharmaceuticals: A compendium of guidelines and related materials, 2nd edition, World Health Organization.
5. L.K. Styres, Modern packaging encyclopedia, Packaging Catalog Corporation Publications.
6. S.E.M. Selke, Understanding plastic packaging technology, Hanser Verlag Publications.

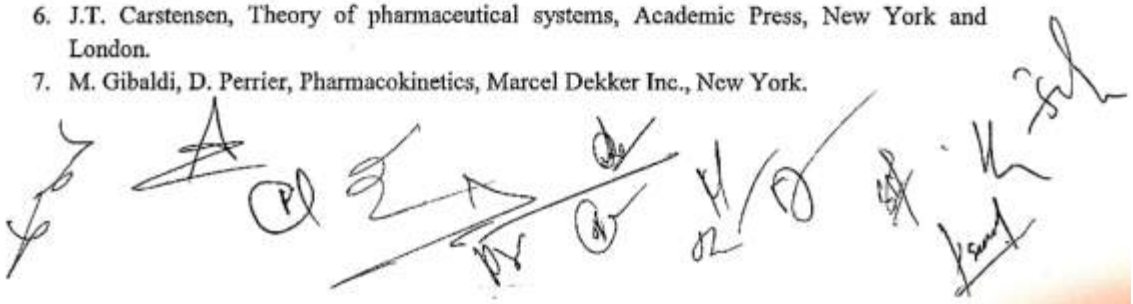
MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER
PHARMACEUTICS (PRACTICAL)

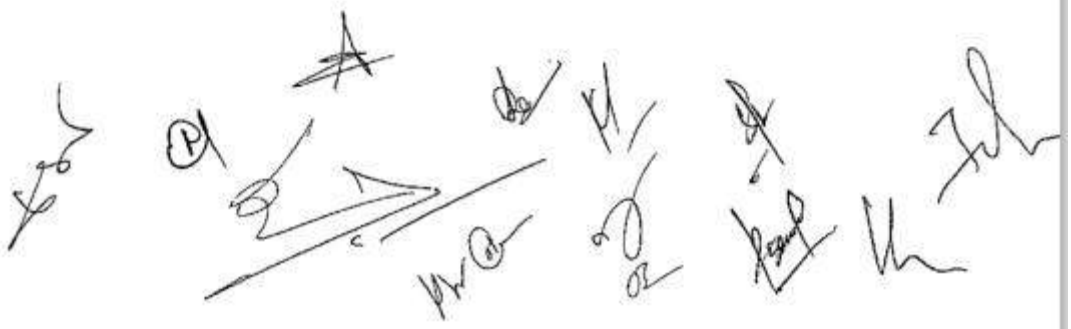
Practical No.	Content	Credit
1.	To prepare and evaluate hydrodynamically balanced system (HBS) of the given drug.	2
2.	To prepare and evaluate microemulsions using emulsification technique for the provided drug.	2
3.	To prepare and evaluate colon delivery tablet of the provided drug.	2
4.	To prepare and evaluate matrix based microcapsules of the given drug sample.	2
5.	To perform bioequivalence testing of marketed tablets.	2
6.	To compare dissolution rate of marketed tablets using different dissolution apparatus.	2
7.	To determine protein binding of drug by equilibrium dialysis method.	2
8.	To determine salivary excretion of paracetamol.	2
9.	To prepare and evaluate microcapsules of given drugs.	2
10.	To prepare and evaluate microspheres of given drug by emulsification method.	2
11.	To prepare and evaluate liposomes of given drug sodium.	2
12.	To prepare and evaluate osmotic pump tablets.	2

Books Recommended

1. L. Lachmann, H.A. Liberman, J.I. Kanig, Pharmaceutical dosage forms: Tablets, Volume I, II and III.
2. L. Lachmann, H.A. Liberman, J.I. Kanig, Pharmaceutical dosage forms: Parenteral medication, Volume I and II.
3. S. Turco, R.E. King, Sterile dosage forms, Lea and Febiger, Philadelphia.
4. Remington's pharmaceutical sciences.
5. A.N. Martin, J. Swarbrick, A. Cammarata, Physical pharmacy, Lea and Febiger, Philadelphia.
6. J.T. Carstensen, Theory of pharmaceutical systems, Academic Press, New York and London.
7. M. Gibaldi, D. Perrier, Pharmacokinetics, Marcel Dekker Inc., New York.



8. H.N. Abdou, Dissolution, bioavailability and bioequivalence, Mack Publishing Co., Easton, PA.
9. Remington's: The science and practice of pharmacy, 20th edition, Lipincott Williams and Wilkins.
10. L. Shargel, A. Yu, Applied biopharmaceutics and pharmacokinetics, Appleton and Large, Norwalk, CT.
11. J.C. Wagner, Fundamentals of clinical pharmacokinetics, Drug Intelligence Pub, Hamilton III.
12. R.V. Smith, J.T. Stewart, Text book of biopharmaceutical analysis, Lea and Febiger, Philadelphia.
13. P.G. Welling, F.S. Tse, S.V. Dighe, Pharmaceutical bioequivalence, Marcel Dekker Inc., New York.
14. M. Rowland, T.N. Tozer, Clinical pharmacokinetics – Concept and application, Lea and Febiger, USA.
15. R.E. Hotari, Biopharmaceutics and clinical pharmacokinetics, Marcel Dekker Inc., New York and Basel.
16. J.R. Robinson, V.H.I. Lee, Controlled and novel drug delivery, Marcel Dekker, New York and Basel.
17. N.K. Jain, Controlled and novel drug delivery, CBS Publishers, New Delhi.
18. N.K. Jain, Advances in novel and controlled drug delivery, CBS Publishers, New Delhi.
19. Y.W. Chien, Novel drug delivery systems, Marcel Dekker, New York and Basel.
20. T.J. Roseman, Controlled release drug delivery systems, Marcel Dekker, New York.
21. Goldberg, Targeted drugs.
22. S.D. Bruck, Controlled drug delivery, Volume I and II.



Scheme and Syllabus

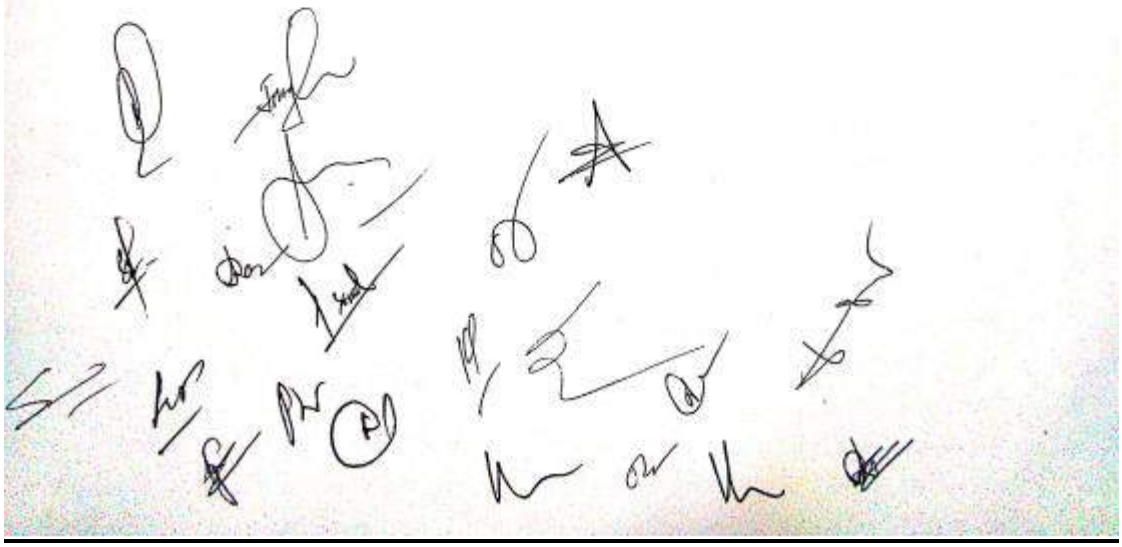
M. Pharm. (Pharmaceutical Chemistry)

Course Code	Course	Credit Hours	Credit Points	Hrs./w k	Marks
		Semester I			
101	Modern Research Methods	4	4	4	100
101P	Modern Research Methods	4	2	4	100
102	Pharmaceutical Biotechnology	4	4	4	100
102P	Pharmaceutical Biotechnology	4	2	4	100
103	Drug Regulatory Affairs & Quality Assurance	4	4	4	100
104	Stereochemistry & Reaction Mechanisms	4	4	4	100
104P	Stereochemistry & Reaction Mechanisms	4	2	4	100
	Total	28	22	28	700
		Semester II			
201	Advanced Pharmaceutical Chemistry-I	5	5	5	100
202	Advanced Pharmaceutical Chemistry-II	5	5	5	100
203	Advanced Medicinal Chemistry	5	5	5	100
204	Drug Design	5	5	5	100
205	Practical	18	9	18	200
206	Synopsis and Viva Voce		4		100
	Total	38	33	38	700
		Semester III			
301	Seminar on Research Progress				100
	Total		4	32	100
		Semester IV			
401	Thesis Report		8		200
402	Seminar & Viva-voce		8		200
	Total		16	32	400

S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmaceutical Chemistry) COURSE
Choice Based Credit System

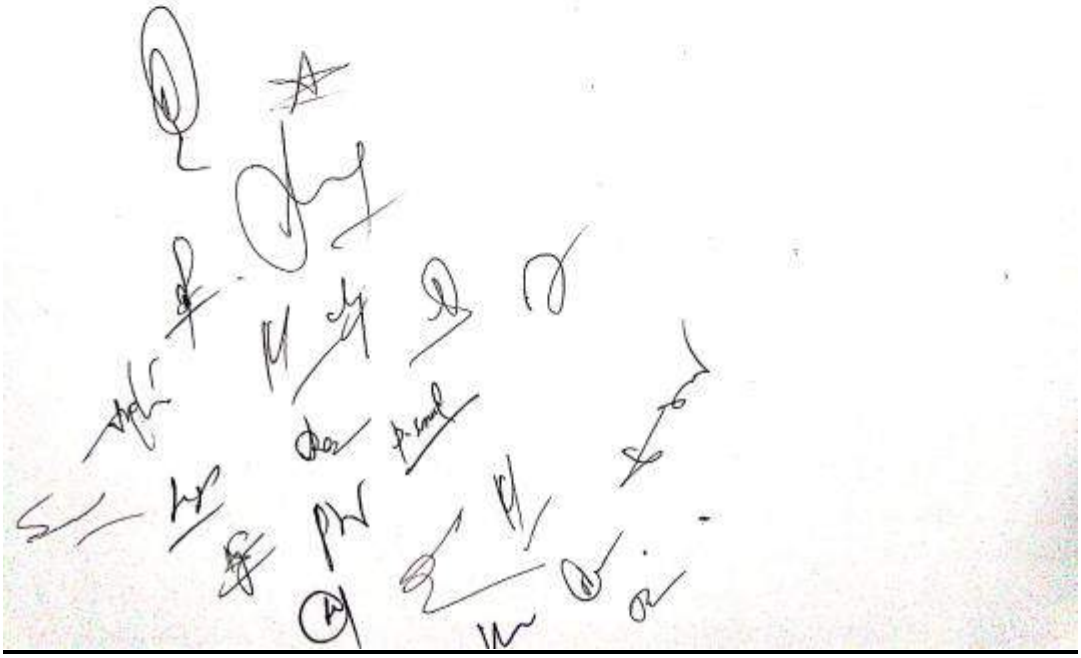
Semester	Course Type		Course Code	Name of Subject	Credits TH	Credits PR
M. Pharm. Semester-I	Core Course	Compulsory		Modern Research Methods	4	2
				Pharmaceutical Biotechnology	4	2
				Drug Regulatory Affairs & Quality Assurance	4	-
				Stereochemistry & Reaction Mechanisms	4	2
	Elective Course	Generic elective (discipline centric)		–		
		Open elective (unrelated discipline)		–		
	Foundation course	Compulsory foundation (for knowledge enhancement)		-		
		Elective Foundation (for value based and aimed at man working education)		-		
Credits					16	6
Total Credits					22	



S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmaceutical Chemistry) COURSE
Choice Based Credit System

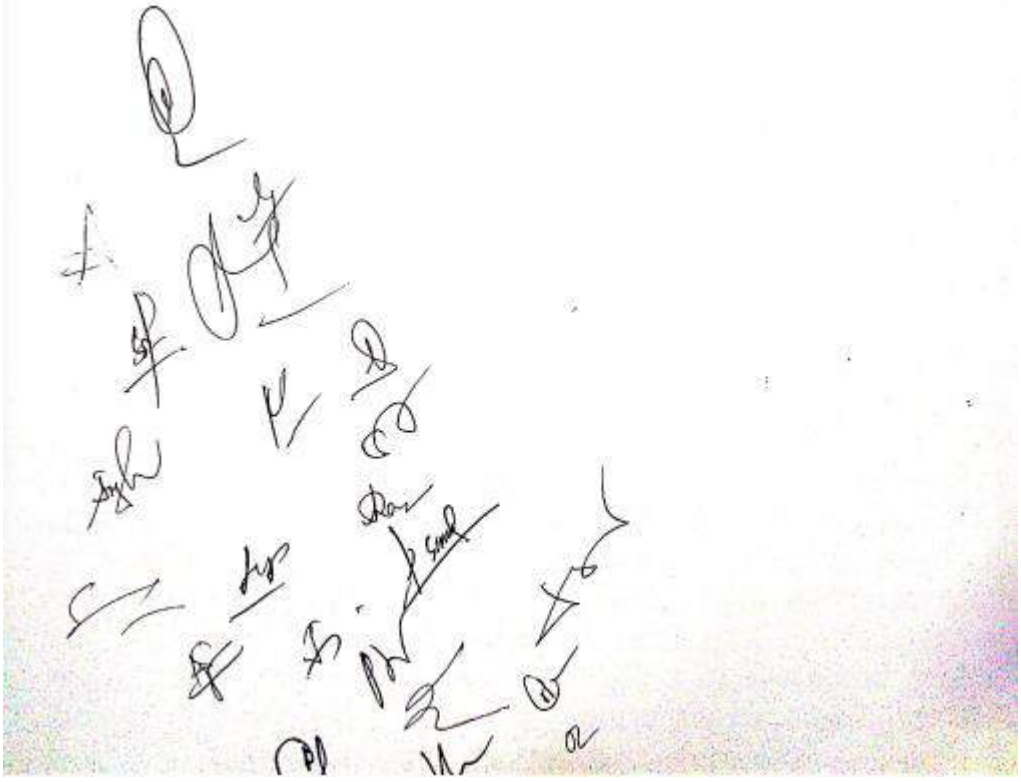
Semester	Course Type		Course Code	Name of Subject	Credits TH	Credits PR
M. Pharm. Semester-II	Core Course	Compulsory		Advanced Pharmaceutical Chemistry-I	4+1	9
				Advanced Pharmaceutical Chemistry-II	4+1	
				Advanced Medicinal Chemistry	4+1	
				Drug Design	4+1	-
				Synopsis and Viva Voce (Evaluated by Guide)	-	4
	Elective Course	Generic elective (discipline centric)		-		
		Open elective (unrelated discipline)		-		
	Foundation course	Compulsory foundation		-		
		Elective foundation		-		-
Credits					20	13
Total Credits					33	



S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmaceutical Chemistry) COURSE
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits	
					TH	PR
M. Pharm. Semester-III	Core Course	Compulsory		Seminar on Research Progress		4
	Elective Course	Generic elective (discipline centric)		–		
		Open elective (unrelated discipline)		–		
	Foundation course	Compulsory foundation		–		
		Elective foundation		–		
Credits						4
Total Credits					4	



S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmaceutical Chemistry) COURSE
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits TH	Credits PR
M. Pharm. Semester-IV	Core Course	Compulsory		Thesis Report		8
				Seminar & Viva-voce		8
	Elective Course	Generic elective (discipline centric)		–		
		Open elective (unrelated discipline)		–		
	Foundation course	Compulsory foundation		–		
		Elective foundation		–		
Credits						16
Total Credits					16	

Total Credits of the M. Pharm. (Pharmaceutical Chemistry) COURSE

S.N.	Semester	Total Credits
1.	I	22
2.	II	33
3.	III	04
4.	IV	16
Grand total (credits)		75

PHARMACEUTICAL CHEMISTRY (MPC)
FIRST SEMESTER

MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER I: MODERN RESEARCH METHODS (THEORY)

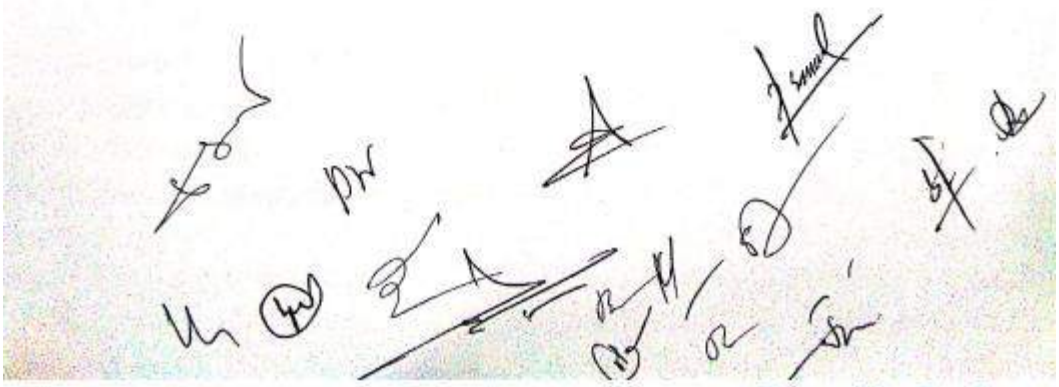
(4 hrs/week)

All topics will include instrumentation methodologies, techniques and applications to structural and quantitative analysis of drug and their methodologies.

Unit	Content	Credit
1.	Gas chromatography, high pressure liquid chromatography, gel filtration, electrophoresis, ion-pair chromatography and HPTLC.	12
2.	Ultra violet, infra-Red (including FTIR), nuclear magnetic resonance (including ^{13}C-NMR) and mass spectroscopy, atomic spectroscopy and plasma emission spectroscopy, electron microscopy.	20
3.	Radio assaying, radioimmuno assaying and autoradiography.	6
4.	Computer aids in pharmaceutical analysis	4
5.	Statistical treatment of data, test for significance, analysis of variance, multivarient statistics.	6

Books Recommended:

1. J.R. Dyer, Application of absorption spectroscopy.
2. Nakanishi, Infrared absorption spectroscopy.
3. William Kemp, Organic spectroscopy.
4. P.S. Kalsi, Spectroscopy of organic compounds.
5. Silverstein and Bassler, Spectroscopy of organic compounds.
6. Dudley William, Ian Flemming, Spectroscopic methods in organic chemistry, Tata McGraw Hill.
7. Williard, Merrit, Dean, Instrumental methods of analysis.



PAPER I: MODERN RESEARCH METHODS (PRACTICAL)

Practical No.	Content	Credit
1.	To estimate the given sample of aspirin using UV spectroscopic method.	2
2.	To find out the effect of substituent in the absorption spectra of benzoic acid.	2
3.	To estimate the concentration of given sample of aspirin by colorimetric method.	2
4.	To estimate the given sample of ascorbic acid using visible spectroscopic method.	2
5.	To determine the percentage of acetyl salicylic acid in the given sample using back titration method.	2
6.	To determine the content of metronidazole in the given sample using UV spectroscopic method.	2
7.	To determine the total hardness of water of the given sample.	2
8.	To separate and identify the given amino acids using ascending paper chromatography.	2
9.	To study the kinetics of aspirin hydrolysis using visible spectrophotometric method.	2
10.	To separate and identify the given samples using thin layer chromatography.	2
11.	To perform the estimation of paracetamol using visible spectroscopic method.	2
12.	To determine the content of paracetamol in the given sample using UV spectroscopic method.	2

Books Recommended:

1. J.R. Dyer, Application of absorption spectroscopy.
2. Nakanishi, Infrared absorption spectroscopy.
3. William Kemp, Organic spectroscopy.
4. P.S. Kalsi, Spectroscopy of organic compounds.
5. Silverstein and Bassler, Spectroscopy of organic compounds.
6. Dudley William, Ian Flemming, Spectroscopic methods in organic chemistry, Tata McGraw Hill.
7. Williard, Merrit, Dean, Instrumental methods of analysis.

MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER II: PHARMACEUTICAL BIOTECHNOLOGY (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	**Introduction:** Biotechnology as an interdisciplinary area, traditional and modern biotechnology, technologies used in biotechnology, global impact of biotechnology on healthcare.	04
2.	**Recombinant DNA technology:** Physical and chemical nature of DNA, DNA replication in prokaryotes and eukaryotes, tools and techniques of genetic engineering, site directed mutagenesis, polymerase chain reaction and analysis of DNA sequences, gene library, advantages of producing biotechnological products by recombinant means, plants and transgenic animals as potential sources of recombinant biotechnological products, typical upstream and downstream process, product recovery, concentration and chromatographic purification, product stabilization and formulation, characterization and analysis, establishing purity and safety.	12
3.	**Biotechnology drugs:** Study of biotechnology derived products, their production, formulations, characterization, clinical use such as human insulin, interferons, human growth hormone, hepatitis B vaccines, erythropoietin, tissue plasminogen activators, interleukins etc.	05
4.	**Gene therapy:** Brief concept, gene delivery by viral and non viral vectors, applications in treatment of single gene disorders such as cystic fibrosis, ADA etc.	05
5.	**Immunology and immunological preparation:** Introduction to immunology, antigen antibodies, cells and organs of immune system, active and passive immunity, antigen antibody reactions and their applications, hypersensitivity, immunological tolerance, classification of immunologicals, typical manufacture techniques for vaccines and antisera, preparations, standardization and storage, adjuvants and their application in vaccine design, new generation vaccines such as sub-unit vaccines, DNA vaccines etc.	12
6.	**Hybridoma technology:** Formation and selection of hybrid cells, principles and productions of monoclonal antibodies, commercial, production, characterization, quality control and storage of monoclonal antibodies, advantages and applications of monoclonal antibodies.	05
7.	**Enzyme technology:** Different techniques of immobilization of enzymes and whole cells, advantages and disadvantages of immobilization, kinetics of immobilized enzymes, applications and future of immobilized enzyme technology.	05

Books Recommended:

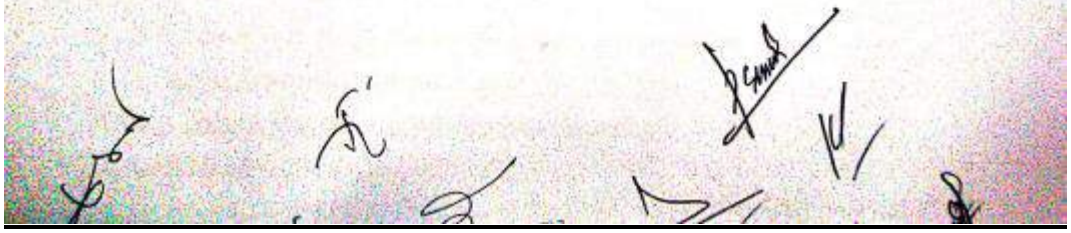
1. D.J.A. Crommelin, R.D. Sindelar, Pharmaceutical biotechnology, Taylor and Francis.
2. M.G. Grooves, Pharmaceutical biotechnology, Taylor and Francis.
3. G. Walsh, Pharmaceutical biotechnology – Concepts and applications, Willey Interscience Ltd.
4. S.P. Vyas and V.K. Dxit, Pharmaceutical biotechnology, CBS Publications.

PAPER II: PHARMACEUTICAL BIOTECHNOLOGY (PRACTICAL)

Practical No.	Content	Credit
1.	Colorimetric estimation of proteins (Biuret/Lowry/Bradford method).	2
2.	Changes in conformation of proteins by viscosity measurement.	2
3.	DNA isolation from onion/spleen/coconut endosperm and its characterization.	2
4.	DNA estimation by Diphenyl amine method.	2
5.	Electrophotetic (paper) separation of plasma proteins.	2
6.	Quantitative precipitation (Antigen-antibody) test.	2
7.	Agglutination (ABO blood group typing) test.	2
8.	Enzyme immobilization in alginate beads and its characterization.	2
9.	Enzyme immobilization by cross linking and its characterization.	2
10.	Solvent/salt precipitation of proteins.	2
11.	Dialysis and concentration of protein solutions.	2
12.	Freeze drying of given protein sample.	2

Books Recommended:

1. D.J.A. Crommelin, R.D. Sindelar, Pharmaceutical biotechnology, Taylor and Francis.
2. M.G. Grooves, Pharmaceutical biotechnology, Taylor and Francis.
3. G. Walsh, Pharmaceutical biotechnology – Concepts and applications, Willey Interscience Ltd.
4. S.P. Vyas and V.K. Dxit, Pharmaceutical biotechnology, CBS Publications.



MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER III: DRUG REGULATORY AFFAIRS AND QUALITY ASSURANCE (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Requirements of GMP, CGMP, GLP, USFDA, WHO guidelines and ISO 9000 series.	7
2.	Drugs and cosmetics acts and rules, drug regulatory affairs.	5
3.	Documentation: Protocols, forms and maintenance of records in pharmaceutical industry.	3
4.	Preparation of documents for new drug approval and export registration.	3
5.	Processing and its application intellectual property rights (patent, copyright and trade marks).	7
6.	Sewage disposal and pollution control.	3
7.	Concepts in validation, validation of manufacturing, analytical and process validation and its application.	4
8.	Basic concept of quality control and quality assurance systems, source and control of quality variation of raw materials, containers, closures, personnel, environment, etc.	5
9.	In process quality control tests, IPQC problems in pharmaceutical industries.	4
10.	Sampling plans, sampling and characteristic curves.	3
11.	Master formula generation and maintenance, standard operating procedure (SOP) for different dosage forms.	4

Books Recommended:

1. Willing, Tuckerman, Hitching, Good Manufacturing practices for pharmaceuticals.
2. Drugs and cosmetics acts and rules.
3. Bharathi, Drugs and pharmacy laws in India.
4. Patel, Industrial microbiology.
5. B.T. Loftus, R.A. Nash, Pharmaceutical process validation.
6. S. Bolton, Pharmaceutical statistics.
7. G.S. Banker, C.T. Rhodes, Modern pharmaceutics.
8. OPPI, Quality assurance.
9. Carletiori, Validation of aseptic pharmaceutical process.
10. Garfield, Quality assurance principles for analytical laboratories.
11. Indian pharmacopoeia.
12. British pharmacopoeia.
13. United State pharmacopoeia.

MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER IV: ELECTIVE FOR PHARMACEUTICAL CHEMISTRY BRANCH

STEREO CHEMISTRY AND REACITON MECHANISM (THEORY)

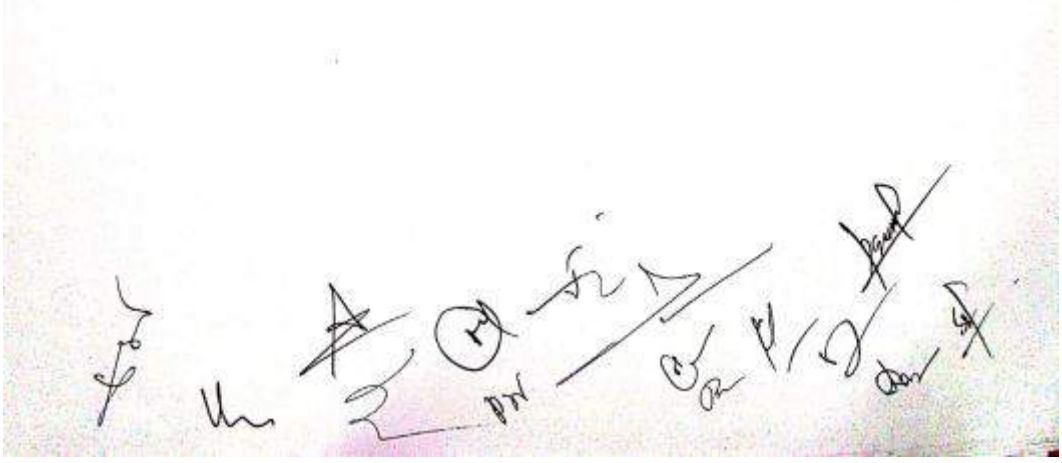
(4 hrs/week)

Unit	Content	Credit
I. Stereo chemistry		
1.	Stereo isomerism, geometrical isomers and optical isomers, basic concepts of optical activity and chirality, structural features necessary for optical activity.	3
2.	Configuration and its specifications, correlation of configuration, absolute configuration, methods of determining configurations, racemic modification, resolution and optical purity.	3
3.	Stereo chemistry of olefins-cis-trans, stereo chemistry of ring systems including fused ring and bridged rings.	2
4.	Conformation and reactivity in acyclic compounds, conformational analysis.	2
5.	Conformation in open chain, six membered rings and other ring having hetero atoms.	3
6.	Steric strain in small rings, medium rings, unsaturated rings and unavoidable crowdings.	2
7.	Stereo selective and stereo regulated polymerization, asymmetric synthesis, chiral induction, chiral reagents, catalysis and solvents (industrially used), asymmetric synthesis of amino acids, β-lactams.	3
II. Reaction mechanisms		
1.	Methods for determining reaction mechanism.	2
2.	Aliphatic nucleophillic substitutions with special emphasis on mechanism and reactivity.	2
3.	Aliphatic electrophillic substitutions with special emphasis on mechanism and reactivity.	2
4.	Aromatic electrophillic substitutions with special emphasis on mechanism, orientation and reactivity.	2
5.	Aromatic nucleophillic substitutions with special emphasis on mechanism and reactivity.	2
6.	Free radical substitution with special reference to mechanism and reactivity.	2
7.	Addition to carbon-carbon multiple bonds with special reference to mechanism and reactivity.	2

8.	Addition to carbon-heteroation multiple bonds with special reference to mechanism and reactivity.	2
9.	Eliminations with special reference to mechanism, orientation and reactivity.	3
10.	Rearrangements with special emphasis on mechanism and reactivity.	2
11.	Generation of nitronium and ions nitrone their reactivity	2
12.	Oxidation and reduction reaction with special emphasis on mechanism and reactivity.	3
13.	Mechanistic consideration in detail for the following organic reactions. Beckmann, Hofmann, Curtius, Schmidt, Frie's rearrangements, Benzilic acid, Claisen's condensation, Wittig's reaction, Oppenaurr oxidation, Birch's reduction, Clemensen's reduction, Reimer-Tiemann's reaction, Meerwin Pondorff's Valery reaction, Wolf-Kishner's reduction, Michaels condensation, Diels Alder reaction, Cannizzarro's reaction.	4

Books Recommended

1. E.J. Ariens, Drug design, Academic Press, New York.
2. E.L. Eliel, Stereo chemistry of carbon compounds, Mc Graw Hill Book Company Inc., New York.
3. S.H. Salkovisky, A.A. Sinkula, S.C. Valvani, Physical chemical properties of drug, Marcel Dekker Inc., New York.
4. J. March, Advanced organic chemistry – reaction mechanism and structure, John Willey and Sons, New York.
5. E.S. Gould, Mechanism and structure in organic chemistry, Holt, Rinewart and Winston, New York.
6. Monographs and relevant review articles appearing in various periodicals and journals.
7. D. Nasipuri, Stereo chemistry of organic compounds: Principles and applications, New Age International.

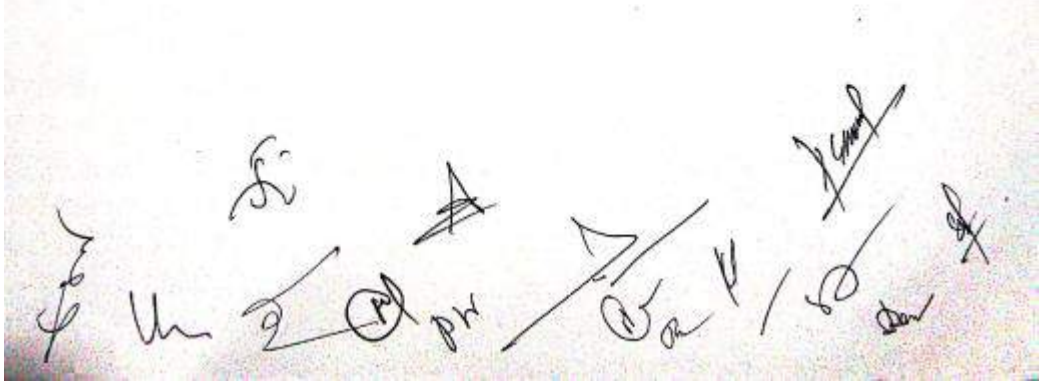


PAPER IV: ELECTIVE FOR PHARMACEUTICAL CHEMISTRY BRANCH
STEREO CHEMISTRY AND REACITON MECHANISM (PRACTICAL)

Practical No.	Content	Credit
1.	To prepare and analyze N-benzoyl-β-alanine.	2
2.	To prepare and analyze ethyl acetoacetate.	2
3.	To prepare and analyze benzene β-azonaphthol.	2
4.	To prepare and analyze isatoic anhydride from phthalic anhydride.	2
5.	To prepare and analyze isatoic anhydride from phthalamic acid.	2
6.	To prepare and analyze benzyl alcohol and benzoic acid by Cannizzaro reachtion.	2
7.	To draw, construct and demonstrate different molecular models with the help of balls and sticks.	2
8.	To prepare organic compounds by stereo selective synthesis.	2
9.	To prepare, submit and analyze phenytoin from benzil.	2
10.	To prepare, submit and analyze dibenzalacetone from benzaldehyde.	2
11.	To prepare, submit and characterize p-nitro aniline from p-nitroacetanilide.	2
12.	To prepare, submit and analyze methyl organge from sulphanilic acid.	2

Books Recommended

1. Kar Ashutosh, Advanced practical medicinal chemistry.
2. V.I. Arthur, Elementary practical organic chemistry, Part I: Small scale preparation, CBS Publishers, New Delhi.



PHARMACEUTICAL CHEMISTRY (MPC)
SECOND SEMESTER

MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

PAPER I: ADVANCED PHARMACEUTICAL CHEMISTRY-I (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Molecular dissymmetry, compounds with one or two dissymmetric carbon atoms (like and unlike).	04
2.	Racemic modification: Nature, formulation, properties and resolution.	04
3.	Configuration: Absolute and relative.	04
4.	Conformation: five, six, seven and eight membered ring systems, conformation of six membered heterocyclic rings (an introductory approach), atropisomerism.	06
5.	Stereoisomerism of allenes, alylidene, spiranes, axo-dissymmetry and centre of dissymmetry.	05
6.	S_N^1, S_N^1', S_N^1, S_N^1', S_N^2 and SNAr reactions with their mechanism.	05
7.	Hydrolysis of ester, E1 and E2 mechanism, Hoffman and Sayetzef elimination.	04
8.	Rearrangement: Pinocol and related rearrangements, benzillic acid rearrangement, Beckmann rearrangement, Hofmann, Curtius, Lossen and Schmidt rearrangements, Claisen rearrangements, Birch reduction, Mannich reaction, Meerwein-Ponndorf-Verley reduction and Oppeneur oxidation, Ozonolysis and Hydrogenation.	16

Books Recommended

1. E.J. Ariens, Drug design, Academic Press, New York.
2. E.L. Eliel, Stereo chemistry of carbon compounds, Mc Graw Hill Book Company Inc., New York.
3. S.H. Salkovisky, A.A. Sinkula, S.C. Valvani, Physical chemical properties of drug, Marcel Dekker Inc., New York.
4. J. March, Advanced organic chemistry – reaction mechanism and structure, John Willey and Sons, New York.
5. E.S. Gould, Mechanism and structure in organic chemistry, Holt, Rinewart and Winston, New York.
6. Monographs and relevant review articles appearing in various periodicals and journals.

MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

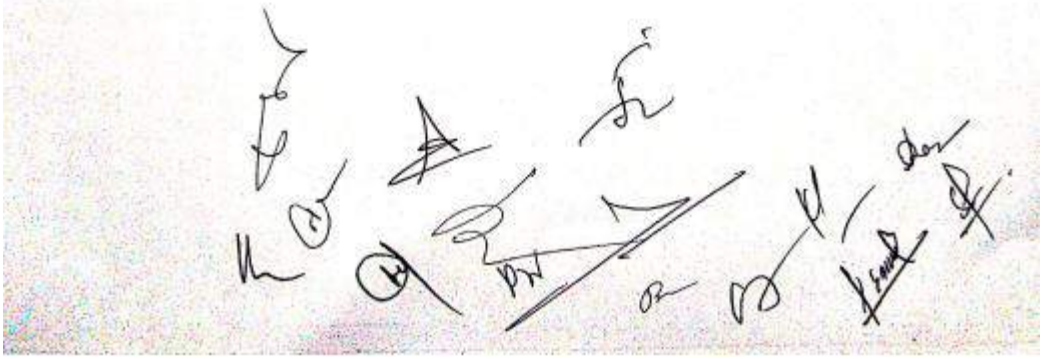
PAPER II: ADVANCED PHARMACEUTICAL CHEMISTRY-II (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Stereochemistry and chemistry of the side chain of cholesterol, conformation of steroid nucleus, chemistry of oestrone and corticosterone, structure activity relationship of sex hormones.	12
2.	A study of phenothiazine, tranquillizeres and antidepressants, structural requirements for the anti-thyroid activity, antihyperlipidimic agents, polypeptides like oxytocin, insulin and haemoglobin (excluding elucidation of structure).	12
	The following topics would be dealt with incorporating the latest advances	
3.	Antifertility agents, methods of fertility control, steroidal and non-steroidal antiferility agents, abortifacients.	12
4.	Endorphins: discovery of enkephalins and endorphins, dynorphins.	06
5.	Radioprotective drugs.	06

Books Recommended

1. M.E. Wold, Brugers medicinal chemistry, John Wiley and Sons, New York, Volume I, II and III.
2. R.F. Doerge, Wilson and Gisvold's text book of organic medicinal and pharmaceutical chemistry, Lippincott.
3. W.O. Foye, Principles of medicinal chemistry, Lea and Febiger, Philadelphia.
4. Finar, Chemistry of natural products, Volume I and II.
5. Monographs and relevant review articles



MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

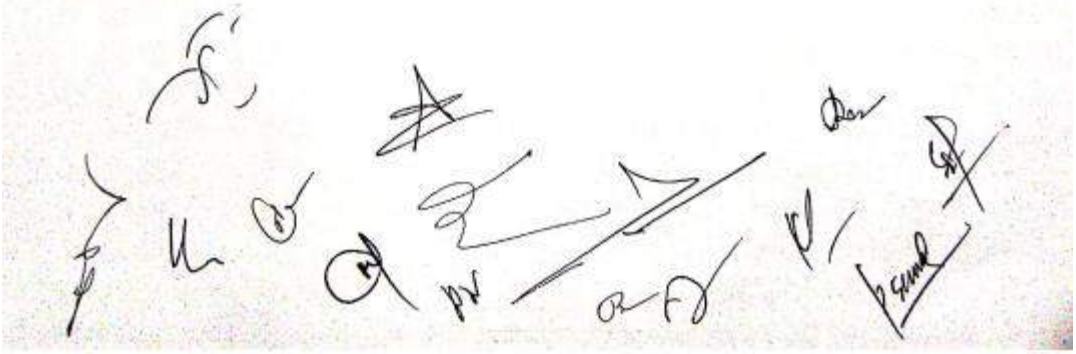
PAPER III: ADVANCED MEDICINAL CHEMISTRY (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Chemistry of cell membrane: Receptors, drug-receptor interaction, G-protein coupled receptors, ion-channel linked receptors, ligand gated ion channel, ligand receptor theories, Clarks occupancy theory, induced fit theory, macromolecular perturbation theory and activation aggregation theory.	08
2.	Stereochemistry and drug action: A study of correlation of physic-chemical and biochemical properties to drug activity, isosterism and bio-isosterism, molecular orbital approach to drug activity.	10
3.	Theory, SAR and biochemical basis of the following categories of drugs. (i) Psychotomimetics (ii) Antineoplastics (iii) Eicosanoids (iv) Immunomodulators (v) Antiviral agents (vi) NSAID's (vii) Antianginal agents	30

Books Recommended

1. M.E. Wolf, Brugers medicinal chemistry, John Wiley and Sons, New York, Volume I, II and III.
2. R.F. Doerge, Wilson and Gisvold's text book of organic medicinal and pharmaceutical chemistry, Lippincott.
3. W.O. Foye, Principles of medicinal chemistry, Lea and Febiger, Philadelphia.
4. Lednicer and Mitschler, Drug synthesis, Vol. I, II and III.
5. Martindale, The Extra Pharmacopoeia, Pharmaceutical Press, London.
6. Monographs and relevant review articles appearing in various periodicals and journals.



MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

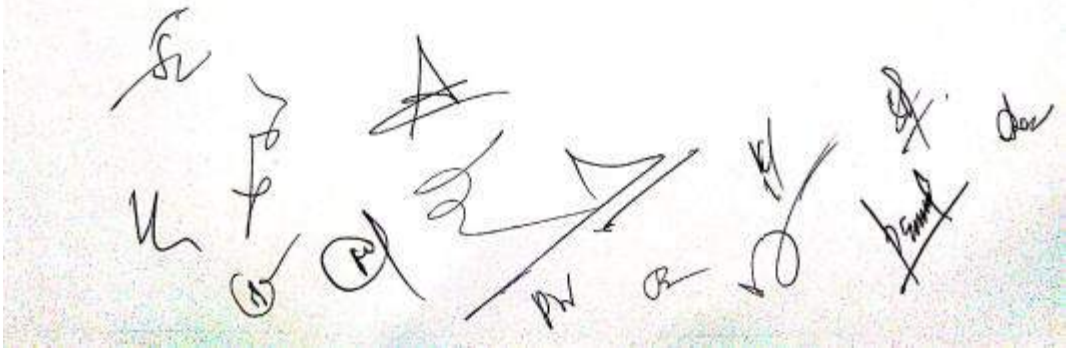
PAPER IV: DRUG DESIGN (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Three dimensional structure aided drug design: The structure-aided drug design process, methods to derive three dimensional structures, The design process, software aided drug design, examples of structure aided drug design process.	12
2.	Quantitative structure activity relationships (QSAR): parameters, quantitative models, statistical methods, design of test and training series in QSAR, application of Hansch analysis and Free Wilson analysis, 3D QSAR approaches for drug design.	12
3.	Molecular modeling in drug design: Molecular mechanics and Quantum mechanics, known and unknown receptor.	8
4.	Analog design.	4
5.	Rational design of enzyme inhibitors.	4
6.	Role of natural products in drug design.	4
7.	Recombinant DNA technology in drug design.	4

Books Recommended

1. K. Hugo, QSAR, Hansch analysis and related approaches.
2. K.L. Poul, A text book of drug design and development.
3. J.P. Thomas, C.L. Propst, Computer aided drug design.
4. P. Veerapandian, Structure based drug design.
5. S.C. Paul, Practical applications of computer aided drug design.
6. L. Paul, Receptor based drug design.
7. C. Hansch, Comprehensive medicinal chemistry, Volume IV.
8. Bruger's medicinal chemistry, Volume I, 6th edition.
9. J.D. Watson and Tooze, "Recombinant DNA techniques" A short course.

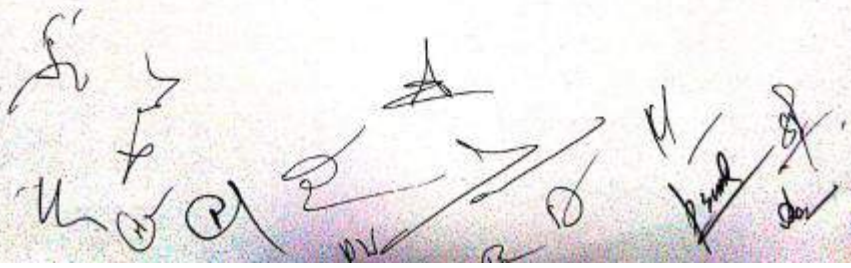


PHARMACEUTICAL CHEMISTRY PRACTICALS

Practical No.	Content	Credit
1.	To prepare, analyze and submit benzillic acid from benzil (Benzil-Benzilic acid rearrangement.	2
2.	To prepare, analyze and submit Dihydropyrimidinone from ethyl acetoacetate using green chemistry approach.	2
3.	To prepare, analyze and submit 2-amino-5-phenyl-1,2,3-thiadiazole.	2
4.	To prepare, analyze and submit benzocaine from benzoyl chloride or To prepare, analyze and submit benzoyl glycine from glycine.	2
5.	To prepare, analyze and submit o-amino benzoic acid (anthranilic acid) or o-chlorobenzoic acid.	2
6.	To carry out the synthesis of phenytoin from benzaldehyde.	2
7.	To carry out the synthesis of 7-hydrody 4-methyl coumarin from resorcinol.	2
8.	To carry out the synthesis of benzimidazole from phenylene diamine.	2
9.	To prepare and analyze methyl orange from aniline.	2
10.	To prepare and analyze dibromofluorescin or sodium eosin from phthalic anhydride.	2
11.	To prepare, analyze and submit p-bromobenzanilide from benzophenone or To prepare, analyze and submit acetyl salicylic acid from salicylic acid using green chemistry approach.	2
12.	To carry out the synthesis of 2,5-piperazine dione from glycine.	2

Books Recommended

1. Kar Ashutosh, Advanced practical medicinal chemistry.
2. V.I. Arthur, Elementary practical organic chemistry, Part I, II and III: Small scale preparation, CBS publishers, New Delhi.
3. M.E. Wold, Burgers medicinal chemistry, John Wiley and Sons, New York, Volume I, II and III.



Scheme and Syllabus

M. Pharm. (Pharmacology)

Course Code	Course	Credit Hours	Credit Points	Hrs./w k	Marks
		Semester I			
101	Modern Research Methods	4	4	4	100
101P	Modern Research Methods	4	2	4	100
102	Pharmaceutical Biotechnology	4	4	4	100
102P	Pharmaceutical Biotechnology	4	2	4	100
103	Drug Regulatory Affairs & Quality Assurance	4	4	4	100
104	Basic And Molecular Pharmacology	4	4	4	100
104P	Basic And Molecular Pharmacology	4	2	4	100
	Total	28	22	28	700
		Semester II			
201	Advanced Pharmaceutics	5	5	5	100
202	Biopharmaceutics & Pharmacokinetics	5	5	5	100
203	Controlled & Novel Drug Delivery System	5	5	5	100
204	Pharmaceutical Packaging	5	5	5	100
205	Practical	18	9	18	200
206	Synopsis and Viva Voce		4		100
	Total	38	33	38	700
		Semester III			
301	Seminar on Research Progress				100
	Total		4	32	100
		Semester IV			
401	Thesis Report		8		200
402	Seminar & Viva-voce		8		200
	Total		16	32	400

S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmacology) COURSE
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits TH	Credits PR
M. Pharm. Semester-I	Core Course	Compulsory		Modern Research Methods	4	2
				Pharmaceutical Biotechnology	4	2
				Drug Regulatory Affairs & Quality Assurance	4	-
				Basic And Molecular Pharmacology	4	2
	Elective Course	Generic elective (discipline centric)		-		
		Open elective (unrelated discipline)		-		
	Foundation course	Compulsory foundation (for knowledge enhancement)		-		
		Elective Foundation (for value based and aimed at man working education)		-		
Credits					16	6
Total Credits					22	

S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

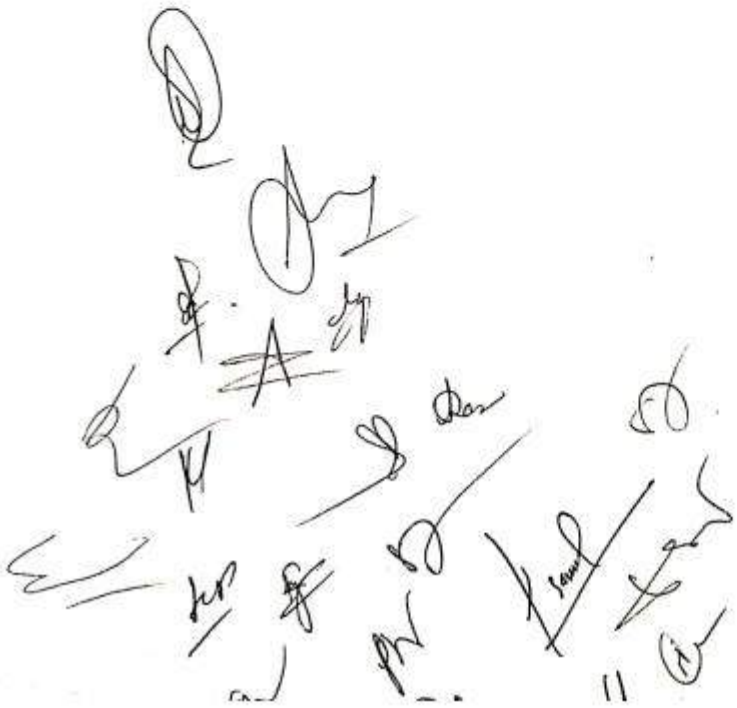
M. Pharm. (Pharmacology) COURSE
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits TH	Credits PR
M. Pharm. Semester-II	Core Course	Compulsory		General Pharmacology and Toxicology	4+1	9
				Pharmacological Screening Methods	4+1	
				Clinical Pharamacology	4+1	
				Recent Advances & Emerging Trends in Pharmacological Sciences	4+1	-
				Synopsis and Viva Voce (Evaluated by Guide)	-	4
	Elective Course	Generic elective (discipline centric)		–		
		Open elective (unrelated discipline)		–		
	Foundation course	Compulsory foundation		-		
		Elective foundation		-		
Credits					20	13
Total Credits					33	

S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmacology) COURSE
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits	
					TH	PR
M. Pharm. Semester-III	Core Course	Compulsory		Seminar on Research Progress		4
	Elective Course	Generic elective (discipline centric)		-		
		Open elective (unrelated discipline)		-		
	Foundation course	Compulsory foundation		-		
		Elective foundation		-		
						4
Credits						
Total Credits					4	



S.L.T. Institute of Pharmaceutical Sciences
Guru Ghasidas Vishwavidyalaya, Bilaspur

M. Pharm. (Pharmacology) COURSE
Choice Based Credit System

Semester	Course Type		Course Code	Name of Subject	Credits	
					TH	PR
M. Pharm. Semester-IV	Core Course	Compulsory		Thesis Report		8
				Seminar & Viva-voce		8
	Elective Course	Generic elective (discipline centric)		–		
		Open elective (unrelated discipline)		–		
	Foundation course	Compulsory foundation		–		
		Elective foundation		–		
						16
Credits						
Total Credits					16	

Total Credits of the M. Pharm. (Pharmacology) COURSE

S.N.	Semester	Total Credits
1.	I	22
2.	II	33
3.	III	04
4.	IV	16
Grand total (credits)		75

PHARMACOLOGY (MPL)
FIRST SEMESTER

MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER I: MODERN RESEARCH METHODS (THEORY)

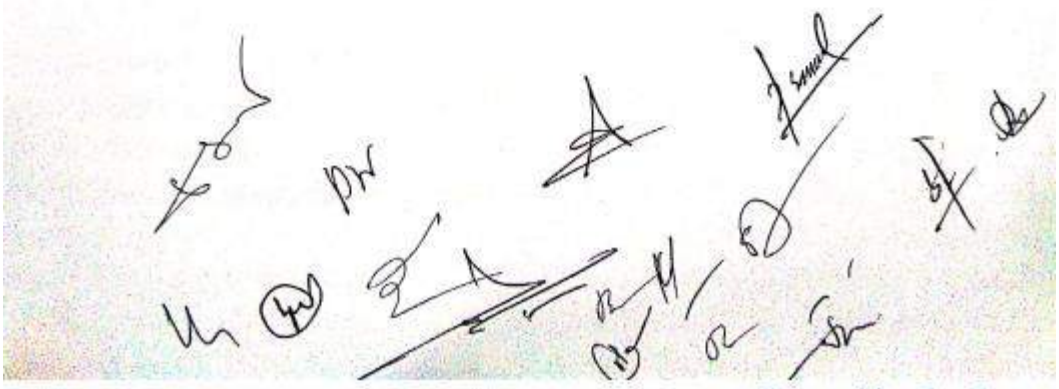
(4 hrs/week)

All topics will include instrumentation methodologies, techniques and applications to structural and quantitative analysis of drug and their methodologies.

Unit	Content	Credit
1.	Gas chromatography, high pressure liquid chromatography, gel filtration, electrophoresis, ion-pair chromatography and HPTLC.	12
2.	Ultra violet, infra-Red (including FTIR), nuclear magnetic resonance (including ^{13}C-NMR) and mass spectroscopy, atomic spectroscopy and plasma emission spectroscopy, electron microscopy.	20
3.	Radio assaying, radioimmuno assaying and autoradiography.	6
4.	Computer aids in pharmaceutical analysis	4
5.	Statistical treatment of data, test for significance, analysis of variance, multivarient statistics.	6

Books Recommended:

1. J.R. Dyer, Application of absorption spectroscopy.
2. Nakanishi, Infrared absorption spectroscopy.
3. William Kemp, Organic spectroscopy.
4. P.S. Kalsi, Spectroscopy of organic compounds.
5. Silverstein and Bassler, Spectroscopy of organic compounds.
6. Dudley William, Ian Flemming, Spectroscopic methods in organic chemistry, Tata McGraw Hill.
7. Williard, Merrit, Dean, Instrumental methods of analysis.



PAPER I: MODERN RESEARCH METHODS (PRACTICAL)

Practical No.	Content	Credit
1.	To estimate the given sample of aspirin using UV spectroscopic method.	2
2.	To find out the effect of substituent in the absorption spectra of benzoic acid.	2
3.	To estimate the concentration of given sample of aspirin by colorimetric method.	2
4.	To estimate the given sample of ascorbic acid using visible spectroscopic method.	2
5.	To determine the percentage of acetyl salicylic acid in the given sample using back titration method.	2
6.	To determine the content of metronidazole in the given sample using UV spectroscopic method.	2
7.	To determine the total hardness of water of the given sample.	2
8.	To separate and identify the given amino acids using ascending paper chromatography.	2
9.	To study the kinetics of aspirin hydrolysis using visible spectrophotometric method.	2
10.	To separate and identify the given samples using thin layer chromatography.	2
11.	To perform the estimation of paracetamol using visible spectroscopic method.	2
12.	To determine the content of paracetamol in the given sample using UV spectroscopic method.	2

Books Recommended:

1. J.R. Dyer, Application of absorption spectroscopy.
2. Nakanishi, Infrared absorption spectroscopy.
3. William Kemp, Organic spectroscopy.
4. P.S. Kalsi, Spectroscopy of organic compounds.
5. Silverstein and Bassler, Spectroscopy of organic compounds.
6. Dudley William, Ian Flemming, Spectroscopic methods in organic chemistry, Tata McGraw Hill.
7. Williard, Merrit, Dean, Instrumental methods of analysis.

MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER II: PHARMACEUTICAL BIOTECHNOLOGY (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	**Introduction:** Biotechnology as an interdisciplinary area, traditional and modern biotechnology, technologies used in biotechnology, global impact of biotechnology on healthcare.	04
2.	**Recombinant DNA technology:** Physical and chemical nature of DNA, DNA replication in prokaryotes and eukaryotes, tools and techniques of genetic engineering, site directed mutagenesis, polymerase chain reaction and analysis of DNA sequences, gene library, advantages of producing biotechnological products by recombinant means, plants and transgenic animals as potential sources of recombinant biotechnological products, typical upstream and downstream process, product recovery, concentration and chromatographic purification, product stabilization and formulation, characterization and analysis, establishing purity and safety.	12
3.	**Biotechnology drugs:** Study of biotechnology derived products, their production, formulations, characterization, clinical use such as human insulin, interferons, human growth hormone, hepatitis B vaccines, erythropoietin, tissue plasminogen activators, interleukins etc.	05
4.	**Gene therapy:** Brief concept, gene delivery by viral and non viral vectors, applications in treatment of single gene disorders such as cystic fibrosis, ADA etc.	05
5.	**Immunology and immunological preparation:** Introduction to immunology, antigen antibodies, cells and organs of immune system, active and passive immunity, antigen antibody reactions and their applications, hypersensitivity, immunological tolerance, classification of immunologicals, typical manufacture techniques for vaccines and antisera, preparations, standardization and storage, adjuvants and their application in vaccine design, new generation vaccines such as sub-unit vaccines, DNA vaccines etc.	12
6.	**Hybridoma technology:** Formation and selection of hybrid cells, principles and productions of monoclonal antibodies, commercial, production, characterization, quality control and storage of monoclonal antibodies, advantages and applications of monoclonal antibodies.	05
7.	**Enzyme technology:** Different techniques of immobilization of enzymes and whole cells, advantages and disadvantages of immobilization, kinetics of immobilized enzymes, applications and future of immobilized enzyme technology.	05

Books Recommended:

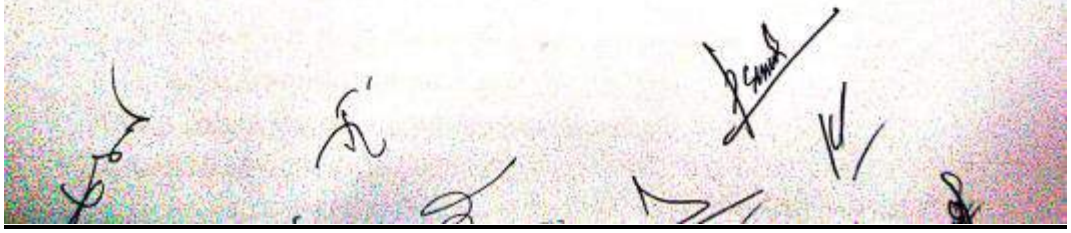
1. D.J.A. Crommelin, R.D. Sindelar, Pharmaceutical biotechnology, Taylor and Francis.
2. M.G. Grooves, Pharmaceutical biotechnology, Taylor and Francis.
3. G. Walsh, Pharmaceutical biotechnology – Concepts and applications, Willey Interscience Ltd.
4. S.P. Vyas and V.K. Dxit, Pharmaceutical biotechnology, CBS Publications.

PAPER II: PHARMACEUTICAL BIOTECHNOLOGY (PRACTICAL)

Practical No.	Content	Credit
1.	Colorimetric estimation of proteins (Biuret/Lowry/Bradford method).	2
2.	Changes in conformation of proteins by viscosity measurement.	2
3.	DNA isolation from onion/spleen/coconut endosperm and its characterization.	2
4.	DNA estimation by Diphenyl amine method.	2
5.	Electrophotetic (paper) separation of plasma proteins.	2
6.	Quantitative precipitation (Antigen-antibody) test.	2
7.	Agglutination (ABO blood group typing) test.	2
8.	Enzyme immobilization in alginate beads and its characterization.	2
9.	Enzyme immobilization by cross linking and its characterization.	2
10.	Solvent/salt precipitation of proteins.	2
11.	Dialysis and concentration of protein solutions.	2
12.	Freeze drying of given protein sample.	2

Books Recommended:

1. D.J.A. Crommelin, R.D. Sindelar, Pharmaceutical biotechnology, Taylor and Francis.
2. M.G. Grooves, Pharmaceutical biotechnology, Taylor and Francis.
3. G. Walsh, Pharmaceutical biotechnology – Concepts and applications, Willey Interscience Ltd.
4. S.P. Vyas and V.K. Dxit, Pharmaceutical biotechnology, CBS Publications.



MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER

PAPER III: DRUG REGULATORY AFFAIRS AND QUALITY ASSURANCE (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Requirements of GMP, CGMP, GLP, USFDA, WHO guidelines and ISO 9000 series.	7
2.	Drugs and cosmetics acts and rules, drug regulatory affairs.	5
3.	Documentation: Protocols, forms and maintenance of records in pharmaceutical industry.	3
4.	Preparation of documents for new drug approval and export registration.	3
5.	Processing and its application intellectual property rights (patent, copyright and trade marks).	7
6.	Sewage disposal and pollution control.	3
7.	Concepts in validation, validation of manufacturing, analytical and process validation and its application.	4
8.	Basic concept of quality control and quality assurance systems, source and control of quality variation of raw materials, containers, closures, personnel, environment, etc.	5
9.	In process quality control tests, IPQC problems in pharmaceutical industries.	4
10.	Sampling plans, sampling and characteristic curves.	3
11.	Master formula generation and maintenance, standard operating procedure (SOP) for different dosage forms.	4

Books Recommended:

1. Willing, Tuckerman, Hitching, Good Manufacturing practices for pharmaceuticals.
2. Drugs and cosmetics acts and rules.
3. Bharathi, Drugs and pharmacy laws in India.
4. Patel, Industrial microbiology.
5. B.T. Loftus, R.A. Nash, Pharmaceutical process validation.
6. S. Bolton, Pharmaceutical statistics.
7. G.S. Banker, C.T. Rhodes, Modern pharmaceutics.
8. OPPI, Quality assurance.
9. Carletiori, Validation of aseptic pharmaceutical process.
10. Garfield, Quality assurance principles for analytical laboratories.
11. Indian pharmacopoeia.
12. British pharmacopoeia.
13. United State pharmacopoeia.

8MASTER OF PHARMACY

M.PHARM. FIRST SEMESTER
PAPER IV: ELECTIVE FOR PHARMACOLOGY BRANCH
BASIC AND MOLECULAR PHARMACOLOGY (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Molecular structure of the biological membrane and transport mechanisms across the cell membrane, factors influencing drug absorption, drug distribution, protein binding, tissue binding, blood brain barrier, placental barrier, volume of distribution.	14
2.	Biotransformation of drugs: Microsomal, non-microsomal metabolism, factors influencing, enzyme induction and inhibition pharmacogenetics.	03
3.	Drug excretion: Renal and non renal, factors influencing renal clearance, biological half life.	03
4.	Pharmacokinetics: Single and multiple dose therapy, single and multiple compartmental models, bioavailability.	03
5.	Pharmacology of drugs acting on ANS.	12
6.	Pharmacology of general and local anaesthetics.	03
7.	Receptors: Theories of drug receptors and drug receptor interactions, ion channels, drug antagonism, cellular and molecular basis of drug action, G-protein coupled receptors,	10

Books Recommended

1. M. Gibaldi, D. Perrier, Pharmacokinetics.
2. Norary, Biopharmaceutics and Pharmacokinetics, an introduction.
3. B. Testa, P. Jenne, Drug Metabolism.
4. Goldstein, Aranow, Kalman, Principles of Drug action.
5. D. R. Lawrence and P. N. Bennette, Clinical Pharmacology.
6. R. S. Satoskar and S. D. Bhandaarkar, Pharmacology and Pharmacotherapeutica,
7. L.S. Goodman, A. Gillman, The Pharmacological basis of Therapeutics.
8. H.P. Rang and M.M. Dale, Pharmacology.
9. K.D. Tripathi, Essentials of medical pharmacology.
10. International and National Journals.

PAPER IV: ELECTIVE FOR PHARMACOLOGY BRANCH
BASIC AND MOLECULAR PHARMACOLOGY (PRACTICAL)

Practical No.	Content	Credit
1.	Introduction to experimental pharmacology, CPCSEA & IAEC.	2
2.	To study the effects of different drug on isolated frog heart preparation, guinea pig ileum, rabbit eye, ciliary motility, dogs blood pressure using pharmacology software.	2
3.	To record the concentration response curve of acetylcholine using cock ileum/rat ileum.	2
4.	To determine the concentration of given sample of acetylcholine by matching bioassay method using cock ileum/ rat ileum..	2
5.	To determine the unknown concentration of acetylcholine sample using cock ileum preparation by bracketing method.	2
6.	To determine the unknown concentration of acetylcholine sample by interpolation bioassay method using cock ileum.	2
7.	To record a cumulative response curve of acetylcholine by using cock ileum.	2
8.	To study the potentiating effect acetylcholine by neostigmine.	2
9.	To study the different routes of drug administration in rats/mice/ To study the techniques of animal handling.	2
10.	To study oestrous cycle in rats using vaginal smear.	2
11.	To demonstrate Introcerebroventricular (I.C.V.) cannulation implantation in mice	2
12.	To demonstrate cannulation of carotid artery in rat/ To demonstrate ovarectomy of female rat.	2

Books Recommended

1. S.K. Kulkarni. Handbook of experimental pharmacology. Vallabh Prakashan, Delhi.
2. M.N. Ghosh. Fundamentals of experimental pharmacology. Hilton & Company, Kolkota.
3. L.J. McLeod. Pharmacological experiments on intact preparations. E & S Livingstone, Edinburgh and London.
4. W.L.M. Perry. Pharmacological experiments on isolated preparations. Second edition. E & S .Livingston. Edinburge, London.
5. M.C. Prabhakar. Experimental pharmacology for undergraduates.Orient Longman..
6. R.K. Goyal. Pharmacology: Principles and methods of bioassay. BS Shah Prakashan Ahmedabad.
7. H.G. Vogels, Drug discovery and evaluation, Springer.

PHARMACOLOGY (MPL)
FIRST SEMESTER

MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

PAPER I: PHARMACOLOGY I: GENERAL PHARMACOLOGY AND TOXICOLGY

(THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Pharmacology of drugs acting on central nervous system and drugs used in Alzheimer disease.	12
2.	Pharmacology of drugs acting on cardiovascular system.	13
3.	Pharmacology of diuretics.	02
4.	Gene based therapy.	02
5.	General principles of chemotherapy, sulphonamides, trimethoprim, nitrofurans, antibiotics, chemotherapy of tuberculosis, leprosy, malaria, amoebiasis, helminthiasis, viral diseases and neoplastic diseases.	12
6.	General principle of toxicology and various preclinical toxicity tests as per schedule Y and ICH guidelines. Heavy metal poisoning and chelating agents.	04
7.	Radioactive isotopes, handling of cytotoxic drugs and radiopharmaceuticals.	03

Books Recommended

1. M. Gibaldi, D. Perrier, Pharmacokinetics.
2. Norary, Biopharmaceutics and Pharmacokinetics, an introduction.
3. B. Testa, P. Jenne, Drug Metabolism.
4. Goldstein, Aranow, Kalman, Principles of Drug action.
5. D. R. Lawrence and P. N. Bennette, Clinical Pharmacology.
6. R. S. Satoskar and S. D. Bhandaarkar, Pharmacology and Pharmacotherapeutica,
7. L.S. Goodman, A. Gillman, The Pharmacological basis of Therapeutics.
8. H.P. Rang and M.M. Dale, Pharmacology.
9. K.D. Tripathi, Essentials of medical pharmacology.
10. R.J.M. Niesink, J.D. Ries, M.A. Hollinger, Toxicology: Principles and applications.
11. Gossel, Breker Principles of clinical toxicology.
12. International and National Journals.

MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

PAPER II: PHARMACOLOGICAL SCREENING METHODS (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Pharmaceutical screening techniques to evaluate drugs on different system.	3
2.	Animal models of diabetes, arrhythmia, asthma, hypertension, reproduction, ulcers and convulsions.	6
3.	Evaluation of drugs acting on ANS.	5
4.	Evaluation of drugs acting on CNS.	7
5.	Drugs acting on respiratory system.	5
6.	Evaluation of drugs acting on kidney.	4
7.	Animals ethics.	4
8.	Bioassays (quantitative determination) of PD, PA Quantal assays, determination of LD_{50} and ED_{50}.	6
9.	Drug toxicity and safety evaluation.	4
10.	Alternative to animals screening procedure.	4

Books Recommended

1. D.R. Lawrence, A.L. Bucharach, Evaluation of Drug Activities: Pharmacometrics, Academic press, London and New York.
2. Turner, Screening methods in Pharmacology.
3. D.J. Karm, K.A. Keller, Txicology Testing Handbook Principles, applications and data interpretations, Marcel Dekker.
4. P.L. Chambers, P Gehring, F. Sarkar, New concepts and developments in toxicology, Oxford, New York.
5. D. Anderson, D.M. Conning, Experimental Toxicology, The basic issues, The Royal Society of Chemistry.
6. R. Haecker, Evaluation methods in laboratory medicine, VCH.
7. H.G. Vogel, Drug Discovery and evaluation: Pharmacological assays.
8. M. Emuenl, Drug bio screening: Drug discovery and evaluation.

MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

PAPER III: PHARMACOLOGY III: CLINICAL PHARMACOLOGY (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	Definition, scope, organization and growth of clinical pharmacology	02
2.	Clinical pharmacokinetics	02
3.	Monitoring of drug therapy and adverse drug reaction	02
4.	Patient compliance	02
5.	Pharmacogenetics	02
6.	Drug therapy monitoring in special situations such as pediatric, geriatric, pregnancy etc.	04
7.	New drug development	02
8.	Drug therapy of cardiovascular diseases, hepatic and biliary diseases, UTI, respiratory disorders, renal diseases, rheumatic disease, endocrine disorders, neurological disorders: Parkinsons disease, epilepsy, migraine and psychiatric diseases, where ever possible case studies to be included.	21
9.	Essential drug list, national drug policy and pharmacoepidemiology.	03
10.	Ethics of clinical trials and clinical evaluation of drugs	03
11.	Drug and poison information, pharmacy administration.	02
12.	Social pharmacy, development of interpersonal skills, pharmacy practice and prescription analysis.	03

Books Recommended

1. R. Walker, Clinical Pharmacy and Therapeutics, Churchil Livingstone Publication.
2. H. Herfindal, Clinical Pharmacy and Therapeutics.
3. Bennet, Brown, Clinical Pharmacology, Churchil livingstore Publication
4. Dipiro, Clinical Pharmacy and Therapeutics.
5. G. Parthsarthi, A text book of clinical pharmacy practice, Orient Longman publication.
6. Roger walker, Workbook for clinical pharmacy and therapeutics, Churchil livingstone Publication.
7. Katzung, Basic and Clinical Pharmacology: McGraw Hill Company.

MASTER OF PHARMACY

M.PHARM. SECOND SEMESTER

PAPER IV: PHARMACOLOGY IV: RECENT ADVANCES AND EMERGING TRENDS IN PHARMACOLOGICAL SCIENCES (THEORY)

(4 hrs/week)

Unit	Content	Credit
1.	CVS: New treatment for hypertension, angina, arrhythmia and CHF	09
2.	CNS: New treatment for Psychosis, Depression, epilepsy and Parkinson's disease	10
3.	Recent trends in Immunopharmacology	04
4.	Recent drugs acting on Respiratory system: Asthma, expectorant	05
5.	Newer antibiotics and Chemotherapeutic agents	05
6.	Mechanism of multi drug resistance, gene therapy, gene therapy protocol, applications of gene therapy.	05
7.	Newer drugs acting on Gastrointestinal system: antiulcer, antidiarrhoeal and antiemetics drugs.	05
8.	Autocoids: Histamine, phospholipids mediators, 5-HT, Nitric oxide	06

Books Recommended

As discussed in current periodicals like:

1. Trends in Pharmacological Sciences.
2. Annual review PharmacologyPharmacological Reviews.
3. Trends in Neurosciences.
4. Trends in Biochemical Sciences.
5. Indian Journal of Pharmacology.
6. Indian Journal of Physiology and Pharmacology.
7. European Journal of Pharmacology.
8. British Journal of Pharmacology.
9. Lancet New England Journal Medicine.
10. Indian Journal of Experimental Biology.

PHARMACOLOGY PRACTICALS

Practical No.	Content	Credit
1.	To determine the unknown concentration of acetylcholine sample using cock/rat ileum preparation by three point bioassay method.	2
2.	To estimate the strength of an unknown sample of acetylcholine by four point bioassay method using cock/rat ileum.	2
3.	To determine the pA_2 value of atropine using acetylcholine induced concentration on cock/rat ileum.	2
4.	To study the effect of caffeine on locomotor activity using actophotometer in mice.	2
5.	To study the analgesic effect of given drug in mice using hot plate/ tail flick/writhing method.	2
6.	To study antianxiety effect of drugs in mice using elevated plus maze apparatus.	2
7.	To study the anticonvulsant effect of phenobarbitone against Maximal Electro Shock Induced convulsions in rats/mice./ To study screening of compounds for antiepileptic activity using pentylenetetrazole induced seizures.	2
8.	To study the antidepressant activity of drug using forced swim test (Porsolt).	2
9.	To study hypolipidemic activity of given drug in rat in high fat diet induce method.	2
10.	To estimate the SGOT, SGPT and ALP value in paracetamol/CCL_4 induce acute hepatotoxicity in rat.	2
11.	To study anti hypertensive activity of drug by using non-invasive blood pressure method (NIBP).	2
12.	To determine the LD_{50} value of given drug	2

Books Recommended

1. S.K. Kulkarni. Handbook of experimental pharmacology. Vallabh Prakashan, Delhi.
2. M.N. Ghosh. Fundamentals of experimental pharmacology. Hilton & Company, Kolkota.
3. L.J. McLeod. Pharmacological experiments on intact preparations. E & S Livingstone, Edinburgh and London.
4. W.L.M. Perry. Pharmacological experiments on isolated preparations. Second edition. E & S .Livingston. Edinburge, London.
5. M.C. Prabhakar. Experimental pharmacology for undergraduates.Orient Longman..
6. R.K. Goyal. Pharmacology: Principles and methods of bioassay. BS Shah Prakashan Ahmedabad.
7. H.G. Vogels, Drug discovery and evaluation, Springer.