MASTER OF PHARMACY (M. PHARM.): PHARMACEUTICS

(Two year post graduate degree course)

CREDIT BASED SEMESTER SYSTEM

SCHEME OF TEACHING, EXAMINATION AND SYLLABUS

M. Pharm. I Semester

w.e.f. ACADEMIC SESSION 2013-2014

RKDF University

Bhopal (MP) 462033, INDIA

RKDF University

M. Pharm : Pharmaceutics

Scheme of Teaching and Examination

M. Pharm I Semester Scheme									
Subject Code	**Name of Subject**	**Teaching scheme (hrs/week)**		**Credits**		**Examination Scheme**			
						T		**P**	
		T	**P**	**T**	**P**	**Ext**	**Int**	**Ext**	**Int**
MPMI101[T]	Modern Instrumental Methods	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
MPMI101[P]	Modern Instrumental Methods	**-**	**6**	**-**	**3**	**-**	**-**	**60**	**40**
MPCS102[T]	Physical Pharmaceutics	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
MPCS102[P]	Physical Pharmaceutics	**-**	**6**	**-**	**3**	**-**	**-**	**60**	**40**
MPPD103[T]	Product Development and Quality Assurance	**4**	-	**4**	**-**	**70**	**30**	**-**	**-**
MPPD103[P]	Product Development and Quality Assurance	**-**	**6**	**-**	**3**	**-**	**-**	**60**	**40**
MPCS104[T]	Nanocarriers and Polymers Science	**4**	**-**	**4**	**-**	**70**	**30**	**-**	**-**
		16	**18**	**16**	**09**	**400**		**300**	
Total		**34 hrs/week**		**25**		**700**			

T- Theory, P- Practical, Ext- External, Int- Internal
Theory: 1 Theory hour = 1 Credit
Practical: 2 Practical hour = 1 Credit
Internal assessment (Theory): Best one out of two sessional per semester.
Internal assessment (Practical) Based on day to day performance including attendance, *viva-voce* and laboratory record.

Course	M. Pharm	Semester	First
Branch	Pharmaceutics	Duration	60 Hrs [Theory]
Subject Code	MPMI101[T]	Subject Name	Modern Instrumental Methods

Syllabus

Ultraviolet – Visible spectrometry: Introduction, the nature of electronic excitation, the origin of UV band structure, principle of absorption spectroscopy, chromophore- σ→σ*, η→σ*, π→π* transitions, basics of instrumentation techniques, pharmaceutical applications. Woodward - Fisher rule for calculation of λmax. Introduction to optical rotatory dispersion and circular dichroism. Derivative spectroscopy.

Fourier Transform Infrared Spectroscopy: Introduction, the infrared absorption process, the modes of vibrations, stretching and bending, bond properties and absorption trends, basics of instrumentation techniques, pharmaceutical applications. Interpretation of Infrared spectra.

Nuclear Magnetic Resonance Spectroscopy: High resolution ^{1}H and ^{13}C NMR spectroscopy, theoretical calculation of chemical shift of various carbon atoms, techniques used for finding out types of carbon attached proton test (APT) distortion less energy polarization transfer (DEPT), homonuclear and heteronuclear correlation spectroscopy. Different 1D and 2D NMR correlation spectrophotometric techniques used as COSy, NOESY, HETCOR, INADEQUATE, HSBC, HMQC, etc. Use of this technique in determination of absolute configuration.

Spectrometry of other important nuclei: Introduction to 15N, 19F, 31P, basic concepts.

.**Mass spectrometry:** Basic principle and theory involved, basics of instrumentation techniques, tandem mass spectrometry and its applications.

HPLC: Instrumentation covering detailed discussion of pumps, injector system, columns and detectors. Analytical method development, validation as per ICH guidelines and troubleshooting. Quantification methods used in HPLC. Ultra pressure liquid chromatography.

HPTLC: Basic instrumentation and its calibration. Analytical method development and its validation as per ICH guidelines. Quantification using HPTLC.

Thermoanalytical techniques: Differential Scanning Calorimetry (DSC), Thermogravimetry (TG), Thermo mechanical analysis (TMA): Principles instrumentation and applications (including interpretation of data) in pharmacy.

Radio analytical techniques used in pharmaceuticals: Isotopic dilution methods, Radioimmunoassay, ELISA etc.

Microscopy: Transmission electron microscopy (TEM), Scanning electron microscopy (SEM), cryomicroscopy, Atomic force microscopy (AFM), confocal microscopy.

Statistics : Collection and classification of experimental data and its statistical treatment, Probability- definition and laws of probability, regression and correlation, method of least squares, correlation coefficient and multiple regression, Test of significance and t-test, statistical quality control, process control, control chart, acceptance sampling plans.

Suggested Readings/Books:

1. Instrumental methods of chemical analysis by chatwal. K, Anand, 5th edition.
2. Organnic spectroscopy by Y.R.Sharma.
3. Text book of pharmaceutical analysis by S.Ravishankar.
4. Spectrometric identification of Organic Compounds, Robert. M. Silverstein et al, 7th Edition, 1981.
5. Principles of Instrumental Analysis by Donglas A. Skoog, James, J. Leary, 4th Edition.
6. Pharmaceutical Analysis – Modern Methods – Part A, Part B, James W. Munson –2001.
7. Practical Pharmaceutical Chemistry, Part two, A. H. Beckett & J. B. Stenlake – 4th Edition.
8. Instrumental Methods of Chemical Analysis – B. K. Sharma - 9th Edition.
9. Chromatography – P. D. Sethi, Dilip Charegaonkar, 2nd Edition.
10. Spectroscopy of Organic Compounds by P. S. Kalsi.
11.Organic Spectroscopy by William Kemp
12.Pharmaceutical drug analysis by Ashouthosh Kar
13.Quantitative analysis of Drugs and Formulations by Sethi

Course	M. Pharm	**Semester**	First
Branch	Pharmaceutics	**Duration**	120 Hrs [Practical]
Subject Code	MPMI101[P]	**Subject Name**	Modern Instrumental Methods

Practicals:

Practical exercises based on the topic mentioned in theory syllabus.

Course	M. Pharm	Semester	First
Branch	Pharmaceutics	Duration	60 Hrs [Theory]
Subject Code	MPCS102[T]	Subject Name	Physical Pharmaceutics

Particle dimensions: Particle size and powder surface area, Particle shape and surface morphology.

Characterization of solid state structure: Spectroscopy in pharmaceutical analysis, X-ray diffraction, Solid-state nuclear magnetic resonance, Vibrational spectroscopy, Calorimetry in pharmaceutical analysis, Thermal analysis techniques, Isothermal microcalorimetry, Water vapor sorption, Microscopy, Density measurements.

Characterization of specific surface area and inter/intra particulate pores: Permeametry, Gas adsorption, Mercury porosimetry, Solid-state NMR.

Physics of tablet compression: Compression and consolidation, strength of granules, compression and consolidation under high loads, effect of friction, distribution of forces in compaction, force volume relationships, Heckel plots, compaction profiles, energy involved in compaction, strength of tablet, crushing strength, friability, lamination, instrumentation of tablet machines.

Diffusion and dissolution: Steady state diffusion-procedure and applications, drug dissolution, drug release, diffusion principles in biologic systems, thermodynamics of diffusion, Fick's second law. Devices for dissolution rate testing viz., forced convection, non-sink devices, and continuous flow through methods; effect of environmental factors in dissolution testing; test apparatus for topical, trans-dermal products, suppositories, and controlled release products; in vitro-in vivo correlation.

Theories on stability of disperse systems: Adsorption, wetting, crystal growth mechanisms, physical stability of suspensions and emulsions, stability testing of emulsions and suspensions and release of drugs from suspension and emulsion formulations. Biopharmaceutical aspects of disperse systems.

Rheology: Theoretical consideration, instrumentation, rheological properties of disperse systems and semisolids.

Kinetics and drug stability: Stability calculations, rate equation, complex order kinetics, kinetics of some decompositions, strategy of stability testing, method of stabilization, method of accelerated stability testing in dosage forms, Freeze Thaw methods, centrifugal methods, temperature and humidity control, physical stability testing of pharmaceutical products.

Polymer science: Properties of polymers, phase separation, polymers in solid state and application of polymers in pharmaceutical formulations.

Suggested Readings/Books:

1. Physical Pharmacy by Alfred Martin.
2. Pharmaceutical Dosage forms by Howard. C. Ansel.
3. Practical Physical Pharmacy (Vol-I and Vol-II) by Gaud and Gupta.
4. Cooper and Gunn`s Tutorial Pharmacy by S.J Carter.
5. Cooper and Gunn`s Dispensing for Pharmaceutical Students by S.J. Carter.
6. Drug stability, Marcel Dekker Inc., New York.
7. Banker Gilbert S and Rhodes Christopher T, ed., Modern Pharmaceutics, Marcel Dekker Inc., New York.

Course	M. Pharm	Semester	First
Branch	Pharmaceutics	Duration	120 Hrs [Practical]
Subject Code	MPCS102[P]	Subject Name	Physical Pharmaceutics

Practicals:

Practical exercises based on the topic mentioned in theory syllabus.

Course	M. Pharm	Semester	First
Branch	Pharmaceutics	Duration	60 Hrs [Theory]
Subject Code	MPPD103[T]	Subject Name	Product development and quality assurance

Syllabus

Preformulation Studies: Introduction, goals of preformulation, physicochemical properties, criteria for selection of drug and excipients, compatibility tests. Partition coefficient, Solid state pharmaceutics.

Optimization: Definition, need, advantages, Meaning of general terms involved in optimization process. Classification of optimization methods.

Brief description and importance of experimental design with special reference to designs adequate for large number of variables. Introduction of correlation & regression analysis & mathematical model, contour plots. Basic understanding with at least one example of following optimization techniques:-Simplex method, langarengian method, EVOP, Grid search method.

Solubility and Solubilization: Development of theoretical relationships of prognostic relevance, theory and techniques of solubilization of drugs including surfactant systems, co-solvents, solid state manipulations, complexation and chemical modifications, methods of solubility enhancement, factors influencing solubility.

Designing of Pharmaceuticals: Tablet formulation, Special tablets, preparation of components for compression, characterization of granulation, coating of tablets, evaluation of tablets, Equipments and processing problems in tablet.

Liquids: Formulation considerations of oral liquids, suspensions, emulsions, development of various products. Formulation consideration of parenteral, ophthalmic, depot products, large volume and small volume parenterals, environmental control and quality assurance in parenterals.

Disperse systems: Molecular dispersion, coarse dispersions- Physical stability of suspensions and emulsion, 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.

Topical and rectal formulations and evaluation.

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.

Pilot-plant and scale-up techniques.

In vitro and In-Vivo evaluation techniques, product formulation and cGMP

Validation: Concepts in validation, prospective, concurrent, retrospective validation & revalidation, validation of manufacturing, analytical and process validation and its application.

Basic concepts of quality control and quality assurance systems, source and control of quality variation of raw materials: containers, closures, personnel, environmental etc.

In-process quality tests, IPQC problems in Pharmaceutical industries. ICH guidelines.

Sampling Plans, Sampling and Characteristic Curves.

Master formula generation and maintenance, standard operating procedure (SOP) for different dosage forms.

Suggested Readings/Books:

1. Lachmann, L., Lieberman, H.A. & Kanig, J.I.: The Theory and Practice of Industrial pharmacy. Lea and Fibiger, Philadelphia.
2. Banker, G.S. & Rhodes, C.T. : Modern Pharmaceutics, Marcel Dekker Inc. New York and Basel.
3. Turco, S. & King R.E. : Sterile Dosage Forms, Lea and Febiger, Philadelphia.
4. Bean, H.S., Backett, A.H. & Carless, J.E: Advances in Pharmaceutical Sciences, Academic Press, London and Newyork.
5. Jain, N.K.: Controlled and Novel Drug Delivery, CBS, Delhi.
6. Robinson, J.R. & Lee, V.H.L.: Controlled Drug Delivery, Marcel Dekker, New York and Basel.
7. Chien,Y.W.: Novel Drug Delivery Systems, Marcel Dekker, New York and Basel.
8. Jain N. K. Pharmaceutical Product Development, CBS Publisher, Delhi

Course	M. Pharm	Semester	First
Branch	Pharmaceutics	Duration	120 Hrs [Practical]
Subject Code	MPPD103[P]	Subject Name	Product development and quality assurance

Practicals:

Practical exercises based on the topic mentioned in theory syllabus.

Course	M. Pharm	Semester	First
Branch	Pharmaceutics	Duration	60 Hrs [Theory]
Subject Code	MPCS104[T]	Subject Name	Nanocarriers and Polymers Science

Syllabus

Nanocarriers: Design and development of various nanosized drug delivery systems: nanocrystals, nanoparticles, nanocapsules, nanofibers, dendrimers, solid lipid nanoparticles, liposomes, fullerenes, i.e., carbon nanotubes, nanorods, and self-assembling nanostructures. Nanocarriers and targeted drug delivery.

Long-circulating nanocarriers: Rational of long circulation and mechanism of clearance of nanoparticles from body. Chemistry involved in PEGylation of nanocarriers. Stealth nanoparticles. Bioconjugation, antibodies based mechanism.

Nanocarriers in diagnosis: Nanosized materials used in diagnosis of cancer and other critical diseases, MRI contrast enhancement, and in diagnostic kits.

Biomaterials: Introduction, classification, mechanical, surface, electrochemical, & physiochemical properties of biomaterials, metallic, ceramic, polymeric, composite, biodegradable hydrogels, and biologic biomaterials. Testing of biomaterials, biocompatibility, blood compatibility and tissue compatibility of biomaterials. *In vitro* and *In vivo* testing of toxicity, sensitization, carcinogenicity, mutagenicity.

Regulatory aspects of biomaterials: Regulatory aspects of biomaterials and their approval status in various countries.

Packaging of Pharmaceuticals: Types of containers and closures, packaging and stability assessment. Advances in pharmaceutical packaging. Advances in Polymer sciences and its applications in pharmacy.

Suggested Readings/Books:

1. Sujata V. Bhatt, *Biomaterials***,** Springer, 2002.

2. Buddy D. Ratner, Fredrick J. Schoen, Allan S. Hoffman, and Jack E. Lemons "*Biomaterials Science: An introduction to Materials in medicine*, Academic Press, 2004.

3. Jonathan Black, *Biological Performance of materials*, Taylor & Francis,2006

4. C.P.Sharma & M.Szycher, *Blood compatible materials and devices*, Technomic Publishing Co. Ltd., 1991.

5. Piskin & A.S Hoffmann, *Polymeric Biomaterials* (Eds), Martinus Nijhoff Publishers, 1986

6. J. B. Park, *Biomaterials - Science and Engineering*, Plenum Press, 1984.

RKDF University

MASTER OF PHARMACY (M. PHARM.): PHARMACEUTICS

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CREDIT BASED SEMESTER SYSTEM

SCHEME OF TEACHING, EXAMINATION AND SYLLABUS

M. Pharm. II Semester

w.e.f. ACADEMIC SESSION 2013-2014

RKDF University

Bhopal (MP) 462033, INDIA

Scheme of Teaching and Examination

M. Pharm II Semester Scheme									
Subject Code	Name of Subject	Teaching scheme (hrs/week)		Credits		Examination Scheme			
						T		P	
		T	P	T	P	Ext	Int	Ext	Int
MPCS201[T]	Novel Drug Delivery System - I	4	-	4	-	70	30	-	-
MPCS202[T]	Biopharmaceutics and Pharmacokinetics	4	-	4	-	70	30	-	-
MPCS203[T]	Novel Drug Delivery Systems - II	4	-	4	-	70	30	-	-
MPCS204[T]	Advanced Pharmaceutics	4	-	4	-	70	30	-	-
MPCS205[P]	Pharmaceutics Practical-II	-	18	-	09	-	-	60	40
		16	18	16	09	400		100	
Total		34 hrs/week		25		500			

T- Theory, P- Practical, Ext- External, Int- Internal
Theory: 1 Theory hour = 1 Credit
Practical: 2 Practical hour = 1 Credit
Internal assessment (Theory): Best one out of two sessional per semester.
Internal assessment (Practical) Based on day to day performance including attendance, *viva-voce* and laboratory record.

Course	M. Pharm	Semester	Second
Branch	Pharmaceutics	Duration	60 Hrs [Theory]
Subject Code	MPCS201[T]	Subject Name	Novel Drug Delivery System – I

Syllabus

Controlled Drug Delivery Systems (CDDS): Concepts and rationale, classification of controlled release systems, carriers for CDDS, design and evaluation. Release kinetics.

Microencapsulation: General considerations, various techniques employed for micro-encapsulation, evaluation and application.

Transdermal Drug Delivery System (TDDS): General considerations, basic components, different approaches, methods of enhancements of percutaneous absorption, evaluations and applications of TDDS.

Implants and Inserts: General considerations, mechanism of drug release, various approaches, devices and its applications.

Osmotically Regulated Systems: General considerations, classifications and development of osmotic pumps, applications.

General considerations and Applications of following Drug Delivery System: Bioadhesive and mucoadhesive drug delivery, nasopulmonary drug delivery, occular drug delivery, pro-drug.

Colon – Specific drug delivery: General considerations, various approaches and applications

An overview of oral controlled drug delivery

Suggested Readings/Books:

1. Jain, N. K., "**Controlled & Novel drug delivery",** CBS Publishers & distributors, New Delhi.

2. Jain, N. K., "**Advances in Controlled & Novel drug delivery",** CBS Publishers & distributors, New Delhi

3. Vyas , S. P. and Khar, R. K. "**Controlled drug delivery – Concepts & Advances**", Vallabh Prakashn, Delhi

4. Vyas, S. P. and Khar, R. K, "**Targeted & Controlled drug delivery Novel Carrier Systems**", CBS Publishers, New Delhi.

5. Mathiowitz, E., "**Encyclopedia of Controlled drug delivery"** Vol -1 & II, John Wiley & Sons, Canada

6. Swarbick , J. and Boyln, J ., "**Encyclopedia of pharmaceutical technology"** Vol. 1- III, Marcel Dekker , Inc ., New York.

7. Jones, D. A., "**Transdeermal & related drug delivery system**", Marcel Dekker , Inc ., NY.

8. Robinson, J. R. and Lee,. H., "**Controlled drug delivery fundamentals & applications"** Marcel Dekker , Inc., New York.

9. Chein , Y. W. , "**Transdermal controlled systemic medications"** Marcel Dekker, Inc., New York .

10. Hillery , A . and Llyod, A. W., "**Drug delivery & Targetting",** Taylor & Francis, London

11. Deasy, P. B., "**Microencapsulations & related drug processes**" Marcel Dekker, Inc., New York.

Course	M. Pharm	Semester	Second
Branch	Pharmaceutics	Duration	60 Hrs [Theory]
Subject Code	MPCS202[T]	Subject Name	Biopharmaceutics And Pharmacokinetics

Syllabus

Transport of drugs through membranes and barriers other than GI tract. Buccal absorption, salivary excretion of drugs, excretion of drugs via sweat, excretion of drugs into milk, penetration of drugs into eye, transfer across placenta, passage of drugs into and out of cerebrospinal and brain.

Measurement and interpretation of *In vitro* rates of dissolution. Intrinsic rates of dissolution, dissolution of drugs from solid dosage forms, various modern methods and models for testing dissolution rate, factors and kinetics of dissolution.

Bioavailability and bioequivalence: Bioequivalence and its determination, study design for the assessment of bioavailability and bioequivalence, factors influencing bioavailability and bioequivalence. *In vitro - in vivo* correlation.

Statistical concepts in estimation of bioavailability and bioequivalence.

Pharmacokinetics: Consideration of one, two and multiple compartment models on intravenous administration, intravenous infusion and first order absorption of single dose

Kinetic of multiple dosing: dosage regimens, loading and maintenance doses, one and two compartment models on intravenous administration, and first order absorption of single dosing.

Kinetics of reversible pharmacological effects - direct and indirect effects.

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.

Physiologic pharmacokinetic models, concepts, physiologic pharmacokinetic models with binding blood flow - limited versus diffusion – limited model, applications and limitation of physiologic pharmacokinetic models, Mean Residence Time (MRT), Statistical Moments Theory, Mean Absorption Time (MAT), Mean Dissolution Time (MDT).

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.

Suggested Readings/Books:

1. Gibaldi M., Pharmacokinetics, Marcel Dekker Inc. New York.
2. Abdou, H.M. Dissolution, Bioavailbility and Bioequivalence, Mack Publishing Co. Easton, PA
3. Smith, R.V. & Stewart, J.T., Text book of Biopharmaceutical Analysis, Lea and Febiger, Philadelphia.
4. Wagner J.G.- Fundamentals of Clinical Pharmacokinetics, Drug Intelligence Pub. Hamilton.
5. Welling, P.G., Tse, F.I.S. & Dighe, S.V.(eds),Pharmaceutical Bioequivalance, Marcel Dekker Inc., New York
6. Gibalidi,M., Perrier, D.: Pharmacokinetics, Marcel Dekker Inc., New York
7. Rowland, M. & Tozer, T. N., Clinical Pharmacokinetics - Concept and Applications , Lea and Febiger USA.
8. Shargel,L. & Yu,ABC.:Applied Biopharmaceutics & Pharmacokinetics,Appleton and lange, Connecticut, USA.
9. Hotari, R.E., Biopharamaceutics and clinical pharmcokinetics, Marcel Dekker Inc., New York and Basel.

Course	M. Pharm	Semester	Second
Branch	Pharmaceutics	Duration	60 Hrs [Theory]
Subject Code	MPCS203[T]	Subject Name	Novel Drug Delivery System – II

Syllabus

Molecular basis of targeted drug delivery.

General considerations, methods of preparation, characterization and applications of following drug delivery systems: Liposomes, niosomes, nanoparticles, solid lipid nanoparticles, resealed erythrocytes, dendrimers, multiple emulsions, submicron emulsion.

An overview and applications of following drug delivery systems: Aquasomes, pharmacosomes, transfersomes, liquid crystals, magnetically modulated drug delivery, peptide and protein drug delivery.

Suggested Readings/Books:

1. Jain, N. K., "**Controlled & Novel drug delivery",** CBS Publishers & distributors, New Delhi.

2. Jain, N. K., "**Advances in Controlled & Novel drug delivery",** CBS Publishers & distributors, New Delhi

3. Vyas , S. P. and Khar, R. K. "**Controlled drug delivery – Concepts & Advances**", Vallabh Prakashn, Delhi

4. Vyas, S. P. and Khar, R. K, "**Targeted & Controlled drug delivery Novel Carrier Systems**", CBS Publishers, New Delhi.

5. Mathiowitz, E., "**Encyclopedia of Controlled drug delivery"** Vol - 1 & II, John Wiley & Sons, Canada

6. Swarbick , J. and Boyln, J ., "**Encyclopedia of pharmaceutical technology"** Vol. 1- III, Marcel Dekker , Inc ., New York.

7. Jones, D. A., "**Transdeermal & related drug delivery system**", Marcel Dekker , Inc ., NY.

8. Robinson, J. R. and Lee,. H., "**Controlled drug delivery fundamentals & applications"** Marcel Dekker , Inc., New York. 15

9. Chein , Y. W. , "**Transdermal controlled systemic medications"** Marcel Dekker, Inc., New York . 10. Hillery , A . and Llyod, A. W., "**Drug delivery & Targetting",**

Taylor & Francis, London

11. Deasy, P. B., "**Microencapsulations & related drug processes**" Marcel Dekker, Inc., New York.

Course	M. Pharm	Semester	Second
Branch	Pharmaceutics	Duration	60 Hrs [Theory]
Subject Code	MPCS204[T]	Subject Name	Advanced Pharmaceutics

Syllabus

Advances in pharmaceutical technology: Recent advances in tablet technology, parenteral technology and microencapsulation. Process automation in pharmaceutical manufacturing, role of GMP, quality assurance and validation. Formulation development of vitamin and antibiotics products. Stability indicating assays.

Site specific oral drug delivery systems: Designing of oral mucosal drug delivery systems, buccal patches /tablets, medicated chewing gum, and lozenges. Osmotic tablets, colonic drug targeting. pulsincaps, hydrophilic sandwich and enterion technology. Targeting through Peyer's patches lymphatic system.

Modified release liquid drug delivery systems: Dispersed and colloidal drug delivery systems. Sustained release suspensions, multiple emulsions, self emulsifying drug delivery systems (SEDDS), liquid crystals, *in situ* gels.

Radiopharmaceuticals: Production, control and its applications.

Novel drug delivery technologies: Study of TIMERx®, MASRx®, COSRx®, RingCap®, Smartrix®, TheriForm®, DissoCubes®, Orasolv® and Durasolv® and other novel patented technologies developed for various controlled and sustained /fast release oral drug delivery systems. Study of marketed and patented depot technologies: Atrigel®, Lupron® Depot, Trelstar® Depot, Consta®, Microsieve®. Study of dry powder inhalers (DPI), metered dose inhalers (MDI), delivery of peptides and vaccines through lungs.

Books Recommended:

1. Liberman , H.A. & Lachman, L., Pharmaceutical Dosages Forms: Tablets. Vol. I, II and III.

2. Avis, Lachman I. & Liberman H.A.: Pharmaceutical Dosages Forms: Parenternal Medication Vol. I and II.

3. Turco, S. and King, R.F., Sterile Dosages Forms., Lea and Febiger, Philadelphia.

4. Remington's Pharmaceutical Siences.

5. Martin, A.N., Swarbrick, J & Cammarata, A., Physical Pharmacy, Lea and Febiger, Philadelphia.

6. Carstensen, J.T. Theory of Pharmaceutical Systems, Academic Press, New York and London.

Course	M. Pharm	Semester	Second
Branch	Pharmaceutics	Duration	120 Hrs [Practical]
Subject Code	MPCS205[P]	Subject Name	Pharmaceutics Practical

Practicals:

Practical exercises based on the topic mentioned in theory syllabus of second semester.

MASTER OF PHARMACY (M. PHARM.): PHARMACEUTICS

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CREDIT BASED SEMESTER SYSTEM

SCHEME OF TEACHING, EXAMINATION AND SYLLABUS

M. Pharm. III Semester

w.e.f. ACADEMIC SESSION 2013-2014

RKDF University

Bhopal (MP) 462033, INDIA

M. Pharm : Pharmaceutics

Scheme of Teaching and Examination

M. Pharm III Semester								
Subject Code	Name of Subject	Teaching Scheme (hrs/week)		Credits		Examination Scheme		
				T	P	T	P	
		T	P				Ext	Int
MPCSDIS-I	Dissertation - I	-	36	-	18	-	180	120
Total		36 hrs/week		18		300		

T- Theory, P- Practical, Ext- External, Int- Internal
Practical: 2 Practical hour = 1 Credit
Internal assessment (Practical) Based on dissertation work and *viva-voce*.

Course	M. Pharm	Semester	Third
Branch	Pharmaceutics	Duration	36 Hrs/Week
Subject Code	MPCSDIS-I	Subject Name	Dissertation - I

Research work during third semester.

The examination shall be based on dissertation - I submitted at the end of third semester and presentation in open seminar.

MASTER OF PHARMACY (M. PHARM.): PHARMACEUTICS

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CREDIT BASED SEMESTER SYSTEM

SCHEME OF TEACHING, EXAMINATION AND SYLLABUS

M. Pharm. IV Semester

w.e.f. ACADEMIC SESSION 2013-2014

RKDF University

Bhopal (MP) 462033, INDIA

M. Pharm : Pharmaceutics

Scheme of Teaching and Examination

M. Pharm IV Semester								
Subject Code	Name of Subject	Teaching Scheme (hrs/week)		Credits		Examination Scheme		
				T	P	T	P	
		T	P				Ext	Int
MPCSDIS-II	Dissertation - II	-	36	-	18	-	180	120
Total		36 hrs/week		18		300		

T- Theory, P- Practical, Ext- External, Int- Internal
Practical: 2 Practical hour = 1 Credit
Internal assessment (Practical) Based on dissertation work and *viva-voce*.

Course	M. Pharm	**Semester**	Fourth
Branch	Pharmaceutics	**Duration**	36 Hrs/Week
Subject Code	MPCSDIS-II	**Subject Name**	Dissertation - II

Research work during third and fourth semester.

The examination shall be based on dissertation - II submitted at the end of Fourth semester and presentation in open seminar.