

Scheme and Syllabus

M. Pharmacy Regulatory Affairs

Batch 2017 onwards



**By
Board of Studies Pharmacy
Department of Academics**

First Semester

Course Code	Course Name	L	P	Marks			Credits
				Internal	External	Total	
MRA101T	Good Regulatory Practices	4	-	25	75	100	4
MRA102T	Documentation & Regulatory Writing	4	-	25	75	100	4
MRA103T	Clinical Research Regulations	4	-	25	75	100	4
MRA104T	Regulations & Legislation for Drugs & Cosmetics, Medical Device, Biologicals & Herbals, and Food & Nutraceuticals In India and Intellectual Property Rights	4		25	75	100	4
MRA105P	Regulatory Affairs Practical -I	-	12	50	100	150	6
-	Seminar/Assignment [#]	-	7	-	-	100	4
Total		16	19	150	400	650	26

- # Minimum five seminar/assignment each of 20 marks per semester

Second Semester

Course Code	Course Name	L	P	Marks			Credits
				Internal	External	Total	
MRA201T	Regulatory Aspects of Drugs & Cosmetics	4	-	25	75	100	4
MRA202T	Regulatory Aspects of Herbal & Biologicals	4	-	25	75	100	4
MRA203T	Regulatory Aspectsof Medical Devices	4	-	25	75	100	4
MRA204T	Regulatory Aspects of Food & Nutraceuticals	4		25	75	100	4
MRA205P	Regulatory Affairs Practical-II	-	12	50	100	150	6
-	Seminar/Assignment [#]	-	7	-	-	100	4
Total		16	19	150	400	650	26

- # Minimum five seminar/assignment each of 20 marks per semester

Third Semester

Course Code	Course Name	L	P	Marks			Credits
				Internal	External	Total	
MRM301T	Research Methodology & Biostatistics*	4	-	25	75	100	4
-	Journal Club	1	-	25	-	25	1
-	Discussion / Presentation (Proposal Presentation)	2	-	50	-	50	2
-	Research Work*	-	28	-	350	350	14
Total		7	28	100	425	525	21

- *Non -University Exam

Fourth Semester

Course Code	Course Name	L	P	Marks			Credits
				Internal	External	Total	
-	Journal Club	1	-	25	-	25	1
-	Research Work	-	31	-	400	400	16
-	Discussion/Final Presentation	3	-	75	-	75	3
-	Co-curricular Activities	-	-	Satisfactory/Unsatisfactory			2*
Total		4	31	100	400	500	22

**Note: Required credit points 02 for satisfactory; Less than 02 credit points unsatisfactory*

***Credits not included towards calculation of CGPA**

Semester Wise Credits Distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations & Other Scholarly Activities)	02*
Total Credit Points	93 + 2* = 95

- *Credit Points for Co-curricular Activities
- *Credits not included towards calculation of CGPA
- *The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University

Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit Points
Participation in National Level Seminar/ Conference/ Workshop/ Symposium/ Training Programs (related to the specialization of the student) OR Academic Award/Research Award from State Level/National Agencies	02
Participation in International Level Seminar/ Conference/ Workshop/ Symposium / Training Programs (related to the specialization of the student) #	02
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)*	01
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science)*\$	02

- #International Conference held even in India will be considered for award of Credit Points.
- *Only those research / review publications will be considered which have been published during the tenure of M. Pharm. Course.
- \$ International Journal: The Editorial Board outside India.

Academic Work

The department / teaching staff of respective courses shall maintain a regular record of attendance in Theory, Practical, Seminar, Assignment, Journal Club, and Discussion with the supervisor, Research work presentation and Dissertation.

Program Committee

1. M. Pharm. Programme shall have a Programme Committee constituted by the Head of the Institution in consultation with all the Heads of the departments.
2. The composition of the Programme Committee shall be as follows:
 - a. A teacher at the cadre of Professor shall be the Chairperson
 - b. One Teacher from each M. Pharm. Specialization
 - c. Four student representatives (two from each academic year), nominated by the Head of the Institution
3. Duties of the Programme Committee:
 - a. Periodically review the progress of the classes.
 - b. Discuss the problems concerning curriculum, syllabus and the conduct of classes.
 - c. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

Sessional Exams

- ❖ Two sessional exams shall be conducted for each theory/practical course
- ❖ The average marks of two sessional exams shall be computed for internal assessment
- ❖ Sessional exam shall be **conducted for 30 marks** for theory and shall be **computed for 15 marks**.
- ❖ Sessional exam for practical shall be **conducted for 40 marks** and shall be **computed for 30 marks**.

Question Paper Pattern for Theory Sessional Examinations

Multiple Choice Questions (MCQs) OR Objective Type Questions (5 x 2) (Answer all the questions)	10 x 1 = 10 OR 05 x 2 = 10
Short Answers (Answer 2 out of 3)	2 x 5 = 10
Long Answers (Answer 1 out of 2)	1 x 10 = 10
Total	30 Marks

Question Paper Pattern for Practical Sessional Examinations

Synopsis	10
Experiments	25
Viva voce	05
Total	40 Marks

Internal Assessment

- ❖ The internal assessment will have two components i.e. **Continuous Mode** and **Sessional Exams**

1. Theory Courses having Internal of 25 Marks the scheme of internal award is:

- Sessional Exams: 15 Marks
- Continuous Mode: 10 Marks

Continuous Mode Scheme

Criteria	Maximum Marks
*Attendance (as per table given below)	08
Student – Teacher interaction	02
Total	10

2. Practical Courses having Internal of 50 Marks the scheme of internal award is:

- Sessional Exams: 30 Marks
- Continuous Mode: 20 Marks

Continuous Mode Scheme

Criteria	Maximum Marks
*Attendance (as per table given below)	10
Based on Practical Records, Regular viva voce, etc.	10
Total	20

***Guidelines for the Allotment of Marks for Attendance**

Percentage of Attendance	Theory (Maximum Marks 08)	Practical (Maximum Marks 10)
95 – 100	08	10
90 – 94	06	7.5
85 – 89	04	5
80 – 84	02	2.5
Less than 80	0	0

1st SEMESTER

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA101T	Good Regulatory Practices	4	-	25	75	1	3	4

Scope: This course is designed to impart fundamental knowledge on various Good Regulatory Practices viz., cGMP, GLP, GALP and GDP for Pharmaceuticals, Cosmetics, Food & Nutraceuticals, Medical devices, *In-vitro* Diagnostic Medical Devices (IVDs) and biological products and understand the rationale behind these requirements and will propose ways and means of complying with them.

Objectives: At completion of this course, it is expected that students will be able to understand

1. The key regulatory and compliance elements with respect to Good Manufacturing Practices, Good Laboratory Practices, Good Automated Laboratory Practices and Good Documentation Practices.
2. Prepare and implement the checklists and SOPs for various Good Regulatory Practices.
3. Implement Good Regulatory Practices in the Healthcare and related Industries.
4. Prepare for the readiness and conduct of audits and inspections.

Module 01

12 Hour

Current Good Manufacturing Practices

- Introduction, US cGMP Part 210 and Part 211
- EC Principles of GMP (Directive 91/356/EEC) Article 6 to Article 14
- WHO cGMP guidelines GAMP-5
- Medical device and IVDs Global Harmonization Task Force(GHTF) Guidance docs

Module 02

12 Hours

Good Laboratory Practices

- Introduction, USFDA GLP Regulations (Subpart A to Subpart K), Controlling the GLP inspection process, Documentation, Audit, goals of Laboratory Quality Audit, Audit tools
- Future of GLP regulations, relevant ISO and Quality Council of India(QCI) Standards

Module 03

12 Hours

Good Automated Laboratory Practices

- Introduction to GALP
- Principles of GALP
- GALP Requirements
- SOPs of GALP
- Training Documentation, 21 CFR Part 11, General check list of 21CFR Part 11, Software Evaluation checklist, relevant ISO and QCI Standards

Module 04

12Hours

Good Distribution Practices

- Introduction to GDP, Legal GDP requirements put worldwide, Principles, Personnel, Documentation, Premises and Equipment, Deliveries to Customers, Returns, Self-Inspection, Provision of information, Stability testing principles, WHO GDP, USP GDP (Supply chain integrity), relevant CDSCO guidance and ISO standards

Module 05

12Hours

Quality Management Systems

- Concept of Quality
- Total Quality Management
- Quality by design, Six Sigma concept, Out of Specifications (OOS), Change control

Validation

- Types of Validation
- Types of Qualification
- Validation master plan (VMP)
- Analytical Method Validation
- Validation of utilities, [Compressed air, steam, water systems, Heat Ventilation and Air conditioning (HVAC)]and Cleaning Validation
- The International Conference on Harmonization (ICH) process, ICH guidelines to establish quality, safety and efficacy of drug substances and products, ISO 13485, Sch MIII and other relevant CDSCO regulatory guidance documents

Recommended Books (Latest editions)

1. Good Laboratory Practice Regulations, by Sandy Weinberg, Drugs and the Pharmaceutical Sciences.
2. Good Pharmaceutical Manufacturing practice, Rational and compliance by John Sharp, CRC Press
3. Establishing a cGMP Laboratory Audit System, A practical Guide by David M. Bleisner, Wiley Publication.
4. How to practice GLP by PP Sharma, Vandana Publications.
5. Laboratory Auditing for Quality and Regulatory compliance by Donald C. Singer, Drugs and the Pharmaceutical Sciences.
6. Drugs & Cosmetics Act, Rules & Amendments.

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA102T	Documentation & Regulatory Writing	4	-	25	75	1	3	4

Scope: This course is designed to impart fundamental knowledge on documentation and general principles involved in regulatory writing and submission to agencies.

Objectives: Upon completion of the course, the student shall be able to,

1. Know the various documents pertaining to drugs in pharmaceutical industry.
2. Understand the basics of regulatory compilation.
3. Create and assemble the regulation submission as per the requirements of agencies.
4. Follow up the submissions and post approval document requirements.

Module 01

12Hours

Documentation in Pharmaceutical Industry

- Exploratory Product Development Brief (EPDB) for Drug substance and Drug product
- Product Development Plan (PDP)
- Product Development Report (PDR)
- Master Formula Record
- Batch Manufacturing Record and its calculations
- Batch Reconciliation
- Batch Packaging Records
- Print pack specifications
- Distribution records
- Certificate of Analysis (CoA)
- Site Master File and Drug Master Files (DMF)

Module 02

12Hours

Dossier Preparation and Submission

- Introduction and overview of dossiers
- Contents and organization of dossier, binders and sections, compilation and review of dossier
- Paper submissions, overview and modules of CTD, electronic CTD submissions
- Electronic submission: Planning electronic submission, requirements for submission, regulatory bindings and requirements, Tool and Technologies, electronic dossier submission process and validating the submission, Electronic Submission Gateway (ESG)
- Non eCTD electronic submissions (NeeS), Asian CTD formats (ACTD) submission
- Organizing, process and validation of submission
- Submission in Sugam system of CDSCO

Module 03

12Hours

Audits

- Introduction, Definition, Summary
- Types of audits
- GMP compliance audit
- Audit policy
- Internal and External Audits
- Second Party Audits
- External third party audits
- Auditing strategies
- Preparation and conducting audit
- Auditing strategies, audit analysis, audit report, audit follow up
- Auditing/inspection of manufacturing facilities by regulatory agencies
- Timelines for audits/inspection
- GHTF study group 4 guidance document
- ISO 13485

Module 04

12 Hours

Inspection

- Pre-approval inspections
- Inspection of pharmaceutical manufacturers
- Inspection of drug distribution channels
- Quality systems requirements for national good manufacturing practice inspectorates, inspection report, model certificate of good manufacturing practices
- Root cause analysis
- Corrective and Preventive action (CAPA)

Module 05

12 Hours

Product Life Cycle Management

- Prior Approval Supplement (PAS)
- Post Approval Changes [SUPAC]
- Changes Being Effectuated in 30 Days (CBE-30)
- Annual Report
- Post marketing Reporting Requirements
- Post approval Labeling Changes
- Lifecycle Management
- FDA Inspection and Enforcement
- Establishment Inspection Report (EIR)
- Warning Letters, Recalls
- Seizure and Injunctions

- ISO Risk Management Standard

Recommended Books (Latest editions)

1. Compliance auditing for Pharmaceutical Manufacturers. Karen Ginsbury and Gil Bismuth, Interpharm/CRC, Boca Raton, London New York, Washington D.C.
2. Pharmaceutical Manufacturing Handbook, Regulations and Quality by Shayne Cox Gad. Wiley-Interscience, A John Wiley and sons, Inc., Publications.
3. Handbook of microbiological Quality control. Rosamund M. Baird, Norman A. Hodges, Stephen P. Denyar. CRC Press.
4. Laboratory auditing for quality and regulatory compliance. Donald C. Singer, Raluca-loana Stefan, Jacobus F. Van Staden. Taylor and Francis.
5. Implementing Juran's Road Map for Quality Leadership: Benchmarks and Results, By Al Endres, Wiley.
6. Understanding, Managing and Implementing Quality: Frameworks, Techniques and Cases, By Jiju Antony; David Preece, Routledge.
7. Organizing for High Performance: Employee Involvement, TQM, Reengineering, and Knowledge Management in the Fortune 1000: The CEO Report By Edward E. Lawler, Susan Albers Mohrman; George Benson, Jossey-Bass.
8. Corporate Culture and the Quality Organization By James W. Fairfield- Sonn, Quorum Books.
9. The Quality Management Sourcebook: An International Guide to Materials and Resources By Christine Avery; Diane Zabel, Routledge.
10. The Quality Toolbox, Second Edition, Nancy R. Tague, ASQ Publications.
11. Juran's Quality Handbook, Sixth Edition, Joseph M. Juran and Joseph A. De Feo, ASQ Publications.
12. Root Cause Analysis, The Core of Problem Solving and Corrective Action, Duke Okes, 2009, ASQ Publications.
13. International Medical Device Regulators Forum (IMDRF) Medical Device Single Audit Program (MDSAP).

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA103T	Clinical Research Regulations	4	-	25	75	1	3	4

Scope: This course is designed to impart the fundamental knowledge on the clinical development process of drugs, pharmaceuticals and Medical Devices, phases and conduct of clinical trials and research, regulations and guidance governing the conduct of clinical research in India, USA and EU. It prepares the students to learn in detail on various laws, legislations and guidance related to safety, efficacy, ethical conduct and regulatory approval of clinical research.

Objectives: Upon completion of the course, the student shall be able to (know, do and appreciate)

1. History, origin and ethics of clinical and biomedical research and evaluation.
2. Clinical drug, medical device development process and different types and phases of clinical trials.
3. Regulatory requirements and guidance for conduct of clinical trials and research.

Module 01

12 Hours

Clinical Drug Development Process

- Different types of Clinical Studies
- Phases of clinical trials, Clinical Trial protocol
- Phase 0 studies
- Phase I and subtype studies (single ascending, multiple ascending, dose escalation, methods, food effect studies, drug – drug interaction, PK end points)
- Phase II studies (proof of concept or principle studies to establish efficacy)
- Phase III studies (Multi ethnicity, global clinical trial, registration studies)
- Phase IV studies (Post Marketing Studies; PSUR)

Clinical Investigation and Evaluation of Medical Devices & IVDs

- Different Types of Studies
- Key Concepts of Medical Device Clinical Evaluation
- Key concepts of Clinical Investigation

Module 02

12 Hours

Ethics in Clinical Research

- Historical Perspectives: Nuremberg Code, Thalidomide study, Nazis Trials, Tuskegee Syphilis Study, The Belmont Report, The declaration of Helsinki
- Origin of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines
- The ethics of randomized clinical trials
- The role of placebo in clinical trials
- Ethics of clinical research in special population

- Institutional Review Board/Independent Ethics Committee/Ethics Committee– composition, roles, responsibilities, review and approval process and ongoing monitoring of safety data
- Data safety monitoring boards
- Responsibilities of sponsor, CRO, and investigator in ethical conduct of clinical research
- Ethical principles governing informed consent process
- Patient Information Sheet and Informed Consent Form
- The informed consent process and documentation

Module 03

12 Hours

Regulations Governing Clinical Trials

India

- Clinical Research regulations in India – Schedule Y & Medical Device Guidance

USA

- Regulations to conduct drug studies in USA (FDA)
- NDA 505(b)(1) of the FD&C Act (Application for approval of a new drug)
- NDA 505(b)(2) of the FD&C Act (Application for approval of a new drug that relies, at least in part, on data not developed by the applicant)
- ANDA 505(j) of the FD&C Act (Application for approval of a generic drug product)
- FDA Guidance for Industry - Acceptance of Foreign Clinical Studies
- FDA Clinical Trials Guidance Document: Good Clinical Practice

EU

- Clinical Research regulations in European Union (EMA)

Module 04

12 Hours

Clinical Research Related Guidelines

- Good Clinical Practice Guidelines (ICH GCP E6)
- Indian GCP Guidelines
- ICMR Ethical Guidelines for Biomedical Research
- CDSCO guidelines
- GHTF study group 5 guidance documents

Regulatory Guidance on Efficacy and Safety ICH Guidance's

- E4 – Dose Response Information to support Drug Registration
- E7 – Studies in support of General Population: Geriatrics
- E8 – General Considerations of Clinical Trials
- E10 – Choice of Control Groups and Related Issues in Clinical Trials,
- E 11 – Clinical Investigation of Medicinal Products in the Pediatric Population
- General biostatistics principle applied in clinical research

Module 05

12 Hours

USA & EU Guidance

USA: FDA Guidance

- CFR 21Part 50: Protection of Human Subjects
- CFR 21Part 54: Financial Disclosure by Clinical Investigators
- CFR 21Part 312: IND Application
- CFR 21Part 314: Application for FDA Approval to Market a New Drug
- CFR 21Part 320: Bioavailability and bioequivalence requirements
- CFR 21Part 812: Investigational Device Exemptions
- CFR 21Part 822: Post-market surveillance
- FDA Safety Reporting Requirements for INDs and BA/BE Studies
- FDA Med Watch
- Guidance for Industry: Good Pharmacovigilance Practices and Pharmacoepidemiologic Assessment

European Union: EMA Guidance

- EU Directives 2001
- EudraLex (EMA) Volume 3 – Scientific guidelines for medicinal products for human use
- EU Annual Safety Report (ASR)
- Volume 9A – Pharmacovigilance for Medicinal Products for Human Use
- EU MDD with respect to clinical research
- ISO 14155

Recommended Books (Latest editions)

1. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams.
2. HIPAA and Human Subjects Research: A Question and Answer Reference Guide by Mark Barnes, JD, LL.M and Jennifer Kulynych, JD, PhD.
3. Principles and Practices of Clinical Research, Edited by John I. Gallin and Frederick P. Ognibene.
4. Reviewing Clinical Trials: A Guide for the Ethics Committee; Johan PE Karlberg and Marjorie A Speers; Karlberg, Johan Petter Einar, Hong Kong.
5. International Pharmaceutical Product Registration: Aspects of Quality, Safety and Efficacy; Anthony C. Cartwright; Taylor & Francis Inc., USA.
6. New Drug Approval Process: The Global Challenge; Guarino, Richard A; Marcel Dekker Inc., NY.
7. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics; Douglas J. Pisano, David Mantus; CRC Press, USA.
8. Country Specific Guidelines from official websites.
9. Drugs & Cosmetics Act & Rules and Amendments

Recommended Websites

1. EU Clinical Research Directive 2001:
<http://www.eortc.be/services/doc/clinical-eudirective-04-april-01.pdf>
2. Code of Federal Regulations, FDA:
<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm>
3. Guidelines of International Conference on Harmonization:
<http://www.ich.org/products/guidelines.html>
4. Eudralex Guidelines: <http://www.gmpcompliance.info/euguide.htm>
5. FDA New Drug Application:
<http://www.fda.gov/regulatoryinformation/legislation/FederalFoodDrugandCosmeticActFDCAct/FDCActChapterVDrugsandDevices/ucm108125.htm>
6. Medicines and Healthcare products Regulatory Agency: <http://www.mhra.gov.uk>
7. Central Drugs Standard Control Organization Guidance for Industry:
<http://cdsco.nic.in/CDSCO-GuidanceForIndustry.pdf>
8. ICMR Ethical Guidelines for Biomedical Research: http://icmr.nic.in/ethical_guidelines.pdf

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA104T	Regulations & Legislation For Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals In India and Intellectual Property Rights	4	-	25	75	1	3	4

Scope: This course is designed to impart fundamental knowledge on regulations and legislation in India w.r.t. Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals. It prepares the students for basic regulatory requirements in India of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals for manufacture, import & registration, export, sale, marketing authorization, clinical trials and intellectual property rights.

Objectives: Upon the completion of the course, the student shall be able to

1. Know different Acts and guidelines that regulate Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals industry in India.
2. Understand the approval process and regulatory requirements for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals.

Module 01

12 Hours

Biologicals & Herbals, and Food & Nutraceuticals Acts and Rules (with latest amendments)

- Drugs and Cosmetics Act 1940 and Rules 1945: DPCO and NPPA
- Other relevant provisions (rules schedules and guidelines for approval of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals in India
- Other relevant Acts: Narcotics Drugs and Psychotropic Substances Act; Medicinal and Toilet Preparations (Excise Duties) Act, 1955; Pharmacy Act, 1948; Drugs and Magic Remedies (Objectionable Advertisements) Act, 1955; Prevention of Cruelty to Animals Act

Module 02

12 Hours

Regulatory requirements and approval procedures for Drugs & Cosmetics Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals

- CDSCO (Central Drug Standard Control Organization) and State Licensing Authority: Organization, Responsibilities
- Rules, regulations, guidelines and standards for regulatory filing of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals
- Format and contents of Regulatory dossier filing
- Clinical trial/ investigations

Module 03

12 Hours

- Indian Pharmacopoeial Standards, BIS standards, ISO, and other relevant standards

Module 04

12 Hours

Testing of Natural Products and Drugs

- Bioavailability and Bioequivalence data (BA &BE), BCS Classification of Drugs, Regulatory Requirements for Bioequivalence study
- Stability requirements: ICH and WHO
- Guidelines for Drug testing in animals/Preclinical Studies
- Animal testing: Rationale for conducting studies, CPCSEA Guidelines
- Ethical guidelines for human participants
- ICMR-DBT Guidelines for Stem Cell Research

Module 05

12 Hours

Patents

- Intellectual Property Rights: Patent, Trademark, Copyright, Industrial Designs and Geographical Indications, Indian Patent Scenario
- IPR vs Regulatory Affairs

Recommended Books (Latest editions)

1. Manual of Patent Practice & Procedure, by The Patent Office of India.
2. Patent Failure How Judges, Bureaucrats, and Lawyers put innovators at risk by James Bessen and Michael J. Meurer.
3. Principles and Practice of Clinical Trial Medicine by Richard Chin and Bruce Y. Lee.
4. Ethical Guidelines for Biomedical Research on Human Participants by Indian Council of Medical Research New Delhi.
5. CPCSEA Guidelines for Laboratory Animal Facility by Committee for the purpose of control and supervision on experiments on animals (CPCSEA).
6. ICH E6 Guideline — Good Clinical Practice by ICH Harmonised Tripartite.
7. Guidance for Industry on Submission of Clinical Trial Application for Evaluating Safety and Efficacy by CDSCO (Central Drug Standard Control Organisation).
8. Guidance for Industry on Requirement of Chemical & Pharmaceutical Information including Stability Study Data before approval of clinical trials /BE studies by CDSCO.
9. Guidelines for Import and Manufacture of Medical Devices by CDSCO.
10. Guidelines from official website of CDSCO.

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA105P	Regulatory Affairs Practical - I	-	12	50	100	6	6	6

1. Case studies (4 Nos.) of each of Good Pharmaceutical Practices.
2. Documentation for in process and finished products Quality control tests for Solid, liquid, Semisolid and Sterile preparations.
3. Preparation of SOPs, Analytical reports (Stability and validation).
4. Protocol preparation for documentation of various types of records (BMR, MFR, DR).
5. Labeling comparison between brand & generics.
6. Preparation of clinical trial protocol for registering trial in India.
7. Registration for conducting BA/ BE studies in India.
8. Import of drugs for research and developmental activities.
9. Preparation of regulatory dossier as per Indian CTD format and submission in SUGAM.
10. Registering for different Intellectual Property Rights in India.
11. GMP Audit Requirements as per CDSCO.
12. Preparation and documentation for Indian Patent application.
13. Preparation of checklist for registration of IND as per ICH CTD format.
14. Preparation of checklist for registration of NDA as per ICH CTD format.
15. Preparation of checklist for registration of ANDA as per ICH CTD format.
16. Case studies on response with scientific rationale to USFDA Warning Letter.
17. Preparation of submission checklist of IMPD for EU submission.
18. Comparison study of marketing authorization procedures in EU.
19. Comparative study of DMF system in US, EU and Japan.
20. Preparation of regulatory submission using eCTD software.
21. Preparation of Clinical Trial Application (CTA) for US submission.
22. Preparation of Clinical Trial Application (CTA) for EU submission.
23. Comparison of Clinical Trial Application requirements of US, EU and Japan of a dosage form.
24. Regulatory requirements checklist for conducting clinical trials in India.
25. Regulatory requirements checklist for conducting clinical trials in Europe.
26. Regulatory requirements checklist for conducting clinical trials in USA.

2nd SEMESTER

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA201T	Regulatory Aspects of Drugs & Cosmetics	4	-	25	75	1	3	4

Scope: This course is designed to impart the fundamental knowledge on the drug development process, regulatory requirements for approval of new drugs, drug products and cosmetics in regulated and semi-regulated countries. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products and cosmetics in regulated and semi-regulated countries.

Objectives: Upon completion of the course, the student shall be able to know

1. Process of drug discovery, development, and generic product development.
2. Regulatory approval process and registration procedures for API and drug products in US, EU.
3. Cosmetics regulations in regulated and semi-regulated countries.
4. A comparative study of India with other global regulated markets.

Module 01

12 Hours

USA & CANADA

- Historical perspectives, Organization structure and functions of FDA
- Federal register and Code of Federal Regulations (CFR), History and evolution of United States Federal, Food, Drug and Cosmetic Act (FFDCA)
- Hatch Waxman act and Orange book, Purple book, Drug Master Files (DMF) system in US
- Regulatory Approval Process for Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Supplemental New Drug Application (SNDA)
- Regulatory requirements for Orphan drugs and Combination Products, Changes to an approved NDA / ANDA
- Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in USA
- Legislation and regulations for import, manufacture, distribution and sale of cosmetics in USA and Canada

Module 02

12 Hours

European Union & Australia

- Organization and structure of EMA & EDQM, General guidelines, Active Substance Master Files (ASMF) system in EU, Content and approval process of IMPD
- Marketing Authorization procedures in EU (Centralized procedure, Decentralized procedure, Mutual recognition procedure and National Procedure)
- Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in EU, Eudralex directives for human medicines, Variations & extensions, Compliance of

European Pharmacopoeia (CEP)/ Certificate of Suitability (CoS), Marketing Authorization (MA) transfers, Qualified Person (QP) in EU

- Legislation and regulations for import, manufacture, distribution and sale of cosmetics in European Union & Australia

Module 03

12 Hours

Japan

- Organization of the PMDA
- Pharmaceutical Laws and regulations, types of registration applications, DMF system in Japan, drug regulatory approval process
- Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in Japan
- Post marketing surveillance in Japan

Module 04

12 Hours

Emerging Market

- Introduction, Countries covered, Study of the world map, study of various committees across the globe (ASEAN, APEC, EAC, GCC, PANDRH, SADC)
- Transgenic plants, methods used in gene identification, localization and sequencing of genes
- WHO, GMP, Regulatory Requirements for registration of drugs and post approval requirements in WHO through prequalification programme, Certificate of Pharmaceutical Product (CoPP) -General and Country Specific (South Africa, Egypt, Algeria and Morocco, Nigeria, Kenya and Botswana)

Module 05

12 Hours

Brazil, ASEAN, CIS and GCC Countries

- ASIAN Countries: Introduction to ACTD, Regulatory Requirements for registration of drugs and post approval requirements in China and South Korea & Association of Southeast Asian Nations (ASEAN) Region i.e. Vietnam, Malaysia, Philippines, Singapore and Thailand
- CIS (Commonwealth Independent States): Regulatory pre-requisites related to Marketing authorization requirements for drugs and post approval requirements in CIS countries i.e. Russia, Kazakhstan and Ukraine GCC (Gulf Cooperation Council) for Arab states: Regulatory pre-requisites related to Marketing authorization requirements for drugs and post approval requirements in Saudi Arabia and UAE
- Legislation and regulations for import, manufacture, distribution and sale of cosmetics in Brazil, ASEAN, CIS and GCC Countries

Recommended Books (Latest editions)

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143.
2. The Pharmaceutical Regulatory Process, Edited by Ira R. Berry Marcel Dekker Series, Vol.144.
3. The Pharmaceutical Regulatory Process, Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185 Informa Health care Publishers.
4. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, Drugs and the Pharmaceutical Sciences, Vol.190.
5. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
6. Drugs: From Discovery to Approval, By Rick NG.
7. New Drug Development: A Regulatory Overview, Eighth Edition By Mark Mathieu.
8. Pharmaceutical Risk Management By Jeffrey E. Fetterman, Wayne L. Pines and Gary H. Slatko.
9. Preparation and Maintenance of the IND Application in eCTD Format by William K. Sietsema.
10. Country Specific Guidelines from official websites.
11. http://www.who.int/medicines/areas/quality_safety/regulation_legislation/ListMRAWebsites.pdf
12. Roadmap to an ASEAN economic community Edited by Denis Hew. ISEAS Publications, Singapore, ISBN981-230-347-2.
13. ASEAN, Rodolfo C. Severino, ISEAS Publications, Singapore, ISBN 978-981-230-750-7.
14. Building a Future with Brics: The Next Decade for Offshoring, Mark Kobayashi-Hillary, Springer.
15. Outsourcing to India: The Offshore Advantage, Mark Kobayashi-Hillary, Springer Trade performance and Regional Integration of the CIS Countries, Lev Freinkman.
16. The World Bank, Washington, DC, ISBN: 0-8212-5896-0.
17. Global Pharmaceutical Policy: Ensuring Medicines for Tomorrow's World by Frederick M. Abbott, Graham Dukes, and Maurice Nelson Graham Dukes 139.
18. The Gulf Cooperation Council: A Rising Power and Lessons for ASEAN by Linda Low and Lorraine Carlos Salazar.
19. Doing Business in the Asean Countries, Balbir Bhasin, Business Expert Press ISBN: 13:978-1-60649-108-9.
20. Realizing the ASEAN Economic Community: A Comprehensive Assessment, Michael G Plummer (Editor), Chia Siow Yue (Editor), Institute of South East Asian studies, Singapore.

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA202T	Regulatory Aspects of Herbal & Biologicals	4	-	25	75	1	3	4

Scope: This course is designed to impart fundamental knowledge on Regulatory Requirements, Licensing and Registration, Regulation on Labelling of Biologics in India, USA and Europe. It prepares the students to learn in detail on Regulatory Requirements for biologics, Vaccines and Blood Product.

Objectives: Upon the completion of the course, the student shall be able to

1. Know the regulatory Requirements for Biologics and Vaccines.
2. Understand the regulation for newly developed biologics and biosimilars.
3. Know the pre-clinical and clinical development considerations of biologics.
4. Understand the Regulatory Requirements of Blood and/or its components including blood products and label requirements.

Module 01

12 Hours

India

- Introduction, Applicable Regulations and Guidelines
- Principles for Development of Similar Biologics
- Data Requirements for Preclinical Studies
- Data Requirements for Clinical Trial Application
- Data Requirements for Market Authorization Application
- Post-Market Data for Similar Biologics
- Pharmacovigilance
- GMP and GDP

Module 02

12 Hours

USA

- Introduction to Biologics; biologics, biological and biosimilars, different biological products
- Difference between generic drug and biosimilars, laws, regulations and guidance on biologics/ biosimilars
- Development and approval of biologics and biosimilars (IND, PMA, BLA, NDA, 510(k))
- Pre-clinical and clinical development considerations, advertising, labelling and packing of biologics

Module 03

12 Hours

European Union

- Introduction to Biologics; directives, scientific guidelines and guidance related to biologics in EU, comparability/ biosimilarity assessment, Plasma master file, TSE/BSE evaluation, development and regulatory approval of biologics (Investigational medicinal products and biosimilars), pre-clinical and clinical development considerations; stability, safety, advertising, labelling and packing of biologics in EU

Module 04

12 Hours

Vaccine Regulations in India, European Union and US

- Clinical evaluation, Marketing authorisation, Registration or licensing, Quality assessment, Pharmacovigilance, Additional requirements
- Blood and Blood Products Regulations in India, US and European Union: Regulatory Requirements of Blood and/or Its Components Including Blood Products, Label Requirements, ISBT (International Society of Blood Transfusion) and IHN (International Haemovigilance Network)

Module 05

12 Hours

Herbal Products

- Quality, safety and legislation for herbal products in India, USA and European Union

Recommended Books (Latest editions)

1. FDA Regulatory Affairs: A Guide for Prescription Drugs, Medical Devices, and Biologics, Douglas J. Pisano, David S. Mantus; Informa.
2. Biological Drug Products: Development and Strategies; Wei Wang, Manmohan Singh; Wiley.
3. Development of Vaccines: From Discovery to Clinical Testing; Manmohan Singh, Indresh K. Srivastava; Wiley.
4. www.who.int/biologicals/en
5. www.fda.gov/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/
6. www.ihn-org.com
7. www.isbtweb.org
8. Guidelines on Similar Biologics: Regulatory Requirements for Marketing Authorization in India, www.cdsc.nic.in
9. www.ema.europa.eu › scientific guidelines › Biologics
10. [www.fda.gov/biologicsbloodVaccines/GuidanceComplianceRegulatoryInformation\(Biologics\)](http://www.fda.gov/biologicsbloodVaccines/GuidanceComplianceRegulatoryInformation(Biologics))

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA203T	Regulatory Aspects of Medical Devices	4	-	25	75	1	3	4

Scope: This course is designed to impart the fundamental knowledge on the medical devices and *in vitro* diagnostics, basis of classification and product life cycle of medical devices, regulatory requirements for approval of medical devices in regulated countries like US, EU and Asian countries along with WHO regulations. It prepares the students to learn in detail on the harmonization initiatives, quality and ethical considerations, regulatory and documentation requirements for marketing medical devices and IVDs in regulated countries.

Objectives: Upon completion of the course, the student shall be able to know

1. Basics of medical devices and IVDs, process of development, ethical and quality considerations.
2. Harmonization initiatives for approval and marketing of medical devices and IVDs.
3. Regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN.
4. Clinical evaluation and investigation of medical devices and IVDs.

Module 01

12 Hours

Medical Devices

- Introduction, Definition, Risk based classification and Essential Principles of Medical Devices and IVDs.
- Differentiating medical devices IVDs and Combination Products from that of pharmaceuticals
- History of Medical Device Regulation
- Product Lifecycle of Medical Devices and Classification of Medical Devices

IMDRF/GHTF

- Introduction, Organizational Structure
- Purpose and Functions
- Regulatory Guidelines
- Working Groups
- Summary Technical Document (STED)
- Global Medical Device Nomenclature (GMDN)

Module 02

12 Hours

Ethics

- Clinical Investigation of Medical Devices
- Clinical Investigation Plan for Medical Devices
- Good Clinical Practice for Clinical Investigation of medical devices (ISO 14155:2011)
- Quality: Quality System Regulations of Medical Devices: ISO 13485

- Quality Risk Management of Medical Devices: ISO 14971, Validation and Verification of Medical device
- Adverse Event Reporting of Medical device

Module 03

12 Hours

USA

- Introduction, Classification, Regulatory approval process for Medical Devices (510k) Premarket Notification
- Pre-Market Approval (PMA)
- Investigational Device Exemption (IDE) and *in vitro* Diagnostics
- Quality System Requirements 21 CFR Part 820
- Labeling requirements 21 CFR Part 801
- Post marketing surveillance of MD
- Unique Device Identification (UDI)
- Basics of *in vitro* diagnostics, classification and approval process

Module 04

12 Hours

European Union

- Introduction, Classification, Regulatory approval process for Medical Devices (Medical Device Directive, Active Implantable Medical Device Directive) and *in vitro* Diagnostics (*in vitro* Diagnostics Directive)
- CE certification process
- Basics of *in vitro* diagnostics, classification and approval process

Module 05

12 Hours

ASEAN, China & Japan

- Medical Devices and IVDs, Regulatory registration procedures, Quality System requirements and clinical evaluation and investigation
- IMDRF study groups and guidance documents

Recommended Books (Latest editions)

1. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics by Douglas J. Pisano, David Mantus.
2. Medical Device Development: A Regulatory Overview by Jonathan S. Kahan.
3. Medical Product Regulatory Affairs: Pharmaceuticals, Diagnostics, Medical Devices by John J. Tobin and Gary Walsh.
4. Compliance Handbook for Pharmaceuticals, Medical Devices and Biologics by Carmen Medina.
5. Country Specific Guidelines from official websites.

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA204T	Regulatory Aspects of Food & Nutraceuticals	4	-	25	75	1	3	4

Scope: This course is designed to impart the fundamental knowledge on Regulatory Requirements, Registration and Labeling Regulations of Nutraceuticals in India, USA and Europe. It prepares the students to learn in detail on Regulatory Aspects for nutraceuticals and food supplements.

Objectives: Upon completion of the course, the student shall be able to

1. Know the regulatory Requirements for nutraceuticals.
2. Understand the regulation for registration and labeling of nutraceuticals and food supplements in India, USA and Europe.

Module 01

12 Hours

Nutraceuticals

- Introduction, History of Food and Nutraceutical Regulations, Meaning of Nutraceuticals, Dietary Supplements, Functional Foods, Medical Foods, Scope and Opportunities in Nutraceutical Market

Module 02

12 Hours

Global Aspects

- WHO guidelines on nutrition
- NSF International: It's Role in the Dietary Supplements and Nutraceuticals Industries, NSF Certification, NSF Standards for Food and Dietary Supplements
- Good Manufacturing Practices for Nutraceuticals

Module 03

12 Hours

India

- Food Safety and Standards Act
- Food Safety and Standards Authority of India: Organization and Functions, Regulations for import, manufacture and sale of nutraceutical products in India
- Recommended Dietary Allowances (RDA) in India

Module 04

12 Hours

USA

- US FDA Food Safety Modernization Act
- Dietary Supplement Health and Education Act
- U.S. regulations for manufacture and sale of nutraceuticals and dietary supplements

- Labelling Requirements and Label Claims for Dietary Supplements
- Recommended Dietary Allowances (RDA) in the U.S

Module 05

12 Hours

European Union

- European Food Safety Authority (EFSA): Organization and Functions
- EU Directives and regulations for manufacture and sale of nutraceuticals and dietary supplements
- Nutrition labelling
- European Regulation on Novel Foods and Novel Food Ingredients
- Recommended Dietary Allowances (RDA) in Europe

Recommended Books (Latest editions)

1. Regulation of Functional Foods and Nutraceuticals: A Global Perspective by Clare M. Hasler, Wiley Online Library.
2. Nutraceutical and Functional Food Regulations in the United States and Around the World by Debasis Bagchi, Academic Press, Elsevier.
3. <http://www.who.int/publications/guidelines/nutrition/en/>
4. [http://www.europarl.europa.eu/RegData/etudes/STUD/2015/536324/IPOL_STU\(2015\)536324_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2015/536324/IPOL_STU(2015)536324_EN.pdf)
5. Handbook of Nutraceuticals by Yashwant Pathak, CRC Press.
6. Food Regulation: Law, Science, Policy and Practice by Neal D. Fortin, Wiley.
7. Country Specific Guidelines from official websites.

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRA205P	Regulatory Affairs Practical - II	-	12	50	100	6	6	6

1. Case studies on
 - a. Change Management/ Change control
 - b. Deviations Corrective & Preventive Actions (CAPA)
2. Documentation of raw materials analysis as per official monographs
3. Preparation of audit checklist for various agencies
4. Preparation of submission to FDA using eCTD software
5. Preparation of submission to EMA using eCTD software
6. Preparation of submission to MHRA using eCTD software
7. Preparation of Biologics License Applications (BLA)
8. Preparation of documents required for Vaccine Product Approval
9. Comparison of clinical trial application requirements of US, EU and India of Biologics
10. Preparation of Checklist for Registration of Blood and Blood Products
11. Registration requirement comparison study in 5 emerging markets (WHO) and preparing check list for market authorization
12. Registration requirement comparison study in emerging markets (BRICS) and preparing check list for market authorization
13. Registration requirement comparison study in emerging markets (China and South Korea) and preparing checklist for market authorization
14. Registration requirement comparison study in emerging markets (ASEAN) and preparing check list for market authorization
15. Registration requirement comparison study in emerging markets (GCC) and preparing check list for market authorization
16. Checklists for 510k and PMA for US market
17. Checklist for CE marking for various classes of devices for EU
18. STED Application for Class III Devices
19. Audit Checklist for Medical Device Facility
20. Clinical Investigation Plan for Medical Devices

3rd SEMESTER

Course Code	Course Title	Teaching Load		Marks		Exam (hrs)		Credits
		L	P	Int.	Ext.	Int.	Ext.	
MRM301T	Research Methodology & Biostatistics	4	-	25	75	1	3	4

Module 01

12 Hours

General Research Methodology

- Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques

Module 02

12 Hours

Biostatistics

- Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students “t” test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxon rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values

Module 03

12 Hours

Medical Research

- History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality

Module 04

12 Hours

CPCSEA Guidelines for Laboratory Animal Facility

- Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals

Module 05

12 Hours

Declaration of Helsinki

- History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care

Recommended Books (Latest editions)

1. Basic & Clinical Biostatistics, Beth Dawson and Robert G. Trapp. Lange Medical Books/McGraw-Hill Medical Publishing Division.
2. Research Methodology, R. Panneerselvam, PHI Learning Pvt. Limited, Delhi.
3. Methods in Biostatistics, B.K. Mahajan. JAYPEE Brothers Medical Publishers (P) Ltd.
4. CPCSEA Guidelines.
A Handbook of Applied Statistics in Pharmacology, Katsumi Kobayashi and K. Sadasivan Pillai. CRC Press, Taylor & Francis Group.