Industrial Training (Skill Development) Module For

Undergraduates / Post graduates of Life sciences, Pharmacy Students

In Association with

Ribosome Research Centre Pvt Ltd
And
Shree Dhanvantary Pharmacy College KIM

Ribosome Research Centre
Quest to Discovery

Shree Dhanvantary Pharmacy College
KIM-SURAT

Under the Mentorship

Dr.Shelat
Assistant Commissioner FDCA Gujarat

Industrial Training Module

Shree Sahkar Education Trust
SHREE DHANVANTARY PHARMACY COLLEGE,
KIM-SURAT (GUJARAT)
In Collaboration with
RIBOSOME RESEARCH CENTRE (RRC)

Eligibility: Any Undergraduates / Post graduates of Life science, Pharmacy can apply for the this skill development module programs according to area of their interest

After Successful Completion of the program students will get certificate as "FDA APPROVED CHEMIST"

Benefits: This is a unique program modules which shall add value to your professional endeavours and shall prove to be a right choice for growth and progress in your career. This exhaustive modules provides detailed inputs on current aspects of pharmaceutical needs

- **PROGRAM 1 :** Production of API & Formulations, GMP
- **PROGRAM 2 :** Quality Control, Quality Assurance, GLP
- **PROGRAM 3 :** Research and Development API and Formulations
- **PROGRAM 4 :** Regulatory Affairs (RA) and Intellectual Property Rights (IPR)
- **PROGRAM 5 : In silico drug designing**

PROGRAM 1: Production of API & Formulations, GOOD MANUFACTURING PRACTICE (GMP))

Program duration: 1 year (30 weeks), 90 hrs, 6 hrs / week

Course Credits: 6

Throughout the program, we will emphasize positioning GMP as a tool for successfully coordinating, controlling, and improving quality, and developing regulatory control strategies. GMP will be presented as an opportunity to integrate product quality and regulatory compliance with performance. The program will provide all participants with the confidence to apply GMP to their specific job responsibilities and the comfort level to interact with fellow employees concerning GMP issues, as well as build a foundation for making GMP a lifestyle at their companies. This program will put emphasis on the

requirements of the FDA.

LEARNING OBJECTIVES:

- Explain regulatory requirements and the origin, status, and legal basis of the FDA and describe how DCGI and FDA directives fit into the regulatory picture
- Discuss the hierarchy of laws, directives, regulations, guidelines, and guidance documents
- Apply a fundamental knowledge of GMPs related to pharmaceutical industry operations
- Demonstrate a better understanding of how regulatory authorities review the production of pharmaceutical products
- Recognize GMP problem areas before they create issues
- Identify the key control areas associated with pharmaceutical operations that are required for compliance: technical (buildings, equipment, and materials); operational (policies, procedures, and records); and relational (employees, suppliers, and customers)
- Find current information regarding regulatory authority activities
- Prepare for a regulatory inspection and learn best practices on how to handle an inspection

Module-1: Facilities & Equipment System overview (15 Hrs – 10 hrs theory + 15 hrs hands on training)

- Facilities Design/Layout
- HVAC Design
- Monitoring of clean room & filter validation
- Water
- Qualification of equipment
- Preventive maintenance of equipment
- Calibration

Module-2 Part I: Quality Management System overview (QMS) & GMP (25 Hrs – 10 hrs theory + 15 hrs hands on training)

- Management responsibility: Quality overview Documentation practices, Quality evaluation & batch release
- Schedule-M, WHO GMP, EU guidelines and USFDA giidelines.
- Quality assurance - Role and responsibilities
- Batch reconciliation and Finished goods release
- Sanitization and hygiene
- Complaints and recall
- Contract production and analysis
- Self inspection and quality audits Personnel Training
- Personal hygiene, Premises, equipment and materials

Part II: Elements of Quality Management System (20 Hrs – 05 hrs theory + 15hrs hands on training)

- Change Control
- Deviation-(planned and unplanned)
- Incident
- CAPA
- Handling of non-conformance

Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC)

• Developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials • In process quality control and finished products quality control for following dosage forms in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenterals, ophthalmic and surgical products (How to refer pharmacopoeias)

Module 02: Instrumental analysis (25 hrs – 10 hrs theory + 15 hrs hands on training)

UV-Visible Spectroscopy

• Introduction, Theory, Laws, and Instrumentation associated with UV-Visible spectroscopy •Calibration of instrument • Choice of solvents and solvent effect • Applications of UV- Visible spectroscopy, Difference/ Derivative spectroscopy

IR Spectroscopy

• Theory, Modes of Molecular vibrations, Sample handling • Instrumentation of Dispersive and Fourier - Transform IR Spectrometer• Calibration of instrument • Factors affecting vibrational frequencies • Applications of IR spectroscopy, Data Interpretation

Spectroflourimetry

• Theory of Fluorescence • Factors affecting fluorescence (characteristics of drugs that can be analyzed by flourimetry), Quenchers, Instrumentation and calibration• Applications of fluorescence spectrophotometer

Flame Emission Spectroscopy and Atomic Absorption Spectroscopy

• Principle, Instrumentation, Interferences and Applications

Module 03 - Hyphenated techniques (25 hrs - 10 hrs theory + 15 hrs hands on training)

NMR Spectroscopy

• Quantum numbers and their role in NMR • Principle, Instrumentation, Solvent requirement in NMR • Relaxation process, NMR signals in various compounds • Chemical shift, Coupling constant, Nuclear magnetic double resonance • Brief outline of principles of FT-NMR and 13C NMR • Applications of NMR spectroscopy and interpretation of results

Mass Spectroscopy

• Principle, Theory, Instrumentation and Calibration of Mass Spectroscopy • Mass fragmentation and its rules • Meta stable ions •Isotopic peaks • Applications of Mass spectroscopy and interpretation of spectra

- Learn easy-to-grasp basics of regulatory requirements, current issues, and trends in the pharmaceutical industry with an emphasis on applying GMP in day-to-day operations
- History of the GMP regulations, the regulatory process, and the concept of operating in a "state of control," with an emphasis on the regulation of pharmaceutical products.

PROGRAM 2: QUALITY CONTROL AND QUALITY ASSURANCE, GOOD LABORATORY PRACTICES (GLP))

Program duration: 1 year (30 weeks), 90 hrs, 6 hrs / week

Course Credits: 6

This training program focus will be on the aspects of the analytical chemistry that have particular importance in pharmaceutical field. After completing the course the undergraduate/ post graduate students should be able to know the theoretical foundations, the potential and analytical applications of the most useful instrumental techniques, commonly available in a research lab and / or quality control, especially in the pharmaceutical sector. Furthermore, students should acquire the conceptual basis for the identification of the most suitable methodologies and instrumental techniques to solve different analytical problems. Students will develop skill as per need of industry which will be beneficial for the finding job in reputed pharmaceutical company.

LEARNING OBJECTIVES:

- Chemical and physical analysis
- Instrumental analysis(UV, IR, NMR; MASS, Chromatography)
- Standards (RS and WRS) Good laboratory practices
- Application of microbiology in pharmaceutical testing
- Impurities (known and unknown) : ICH guideline
- Calibration of instruments
- Packing material analysis
- Deviations Planned and Unplanned
- Post release monitoring-complaints, recalls

Module 01: Introduction to Good Laboratory Practices (15 hrs)

Introduction

- Concept and evolution and scopes of Quality Control and Quality Assurance, Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q- series guidelines

Good Laboratory Practices

- Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non-clinical testing, control on animal house, report preparation and documentation

- Out of specification (OOS)
- Market recalls
- Market complaints
- Material systems
- Production system
- Laboratory control systems
- Facilities and equipment systems
- Packaging and labeling system - Design of artworks and legal requirements

Module-3: Manufacturing & Packaging of Dosage forms And Manufacturing of API (30Hrs – 10 hrs theory + 20hrs hands on training)

- cGMP of Pharmaceutical manufacturing
- Manufacturing & Packing of Dosage Forms
- Evolution and Principles of cGMP, Schedule-M, WHO-GMP requirements, EU and USFDA guidelines
- Manufacturing of Dosage Forms
- cGMP complied manufacturing and documentation aspects including Environmental monitoring Cleaning (Equipment, Area, Environment), BMR, Process flow, in process checks and FP analysis
- Tablets, Capsules
- Liquid Orals
- Parenteral/ Injectables/ Semisolids/ Ointments

Packaging of Dosage Forms

- cGMP complied packaging and documentation aspects including BPR Process flow, in-process checks, and FP analysis. Labelling requirements for Tablets, Capsules, Liquid Orals, Parenterals / Injectables, and Semisolids / Ointments

Manufacturing of API

- GMP ICH Q7A
- Drug substance development, scale-up, cGMP complied manufacturing and documentation aspects of API production,
- Unit operations,
- Handling of solvent
- Waste management
- Safety of personnel

PROGRAM OUTCOMES:

- Establish the most cost-effective methods to produce product.
- Can Monitoring and control of production operations
- Can Coordination for Preparation of the master document required for production like SOP, EOP, ECC, BMR and PDR
- Able to explore GMP principles and approaches for active pharmaceutical ingredients (APIs), excipients, and finished pharmaceuticals

Chromatography

Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following:

- Thin Layer chromatography
- High Performance Thin Layer Chromatography
- Gas chromatography
- High Performance Liquid chromatography
- Ultra High Performance Liquid chromatography

Module 04 - Documentation in Pharmaceutical Industry (15 hrs)

- Three tier documentation, Policy, Procedures and Work instructions
- Records (Formats) Basic principles- How to maintain, retention etc
- Standard operating procedures (How to write), Master Batch Record, Batch Manufacturing Record, Quality audit plan and reports
- Specification and test procedures, Protocols and reports
- Distribution Records
- Electronic data handling
- Concepts of controlled and uncontrolled documents
- Submission documents for regulators DMFs, as Common Technical Document and Electronic Common Technical
- Documentation (CTD, eCTD)
- Concept of regulated and non regulated markets

Module 05 Manufacturing Operations and Controls(10 Hours)

- Sanitation of manufacturing premises, mix-ups and cross contamination
- Processing of intermediates and bulk products
- Packaging operations
- IPQC

• Release of finished product, process deviations, charge-in of components

• Time limitations on production, drug product inspection

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Module 05:Manufacturing Operations and Controls(10 Hours -04 hrs theory + 06 hrs hands on training)

• Sanitation of manufacturing premises, mix-ups and cross contamination • Processing of intermediates and bulk products • Packaging operations • IPQC • Release of finished product, process deviations, charge-in of components • Time limitations on production, drug product inspection

Program 3: Research andDevelopment

Program duration: 1 year (30 weeks), 90 hrs, 6 hrs / week

Course Credits: 6

MODULE : 1 R& D IN API
Drug discovery and development process (30 Hrs- 10 hrs theory + 20hrs hands on training)

- Drug discovery and development algorithm
- Clinical research process
- New drug delivery system
- Understanding on IND, NDA, ANDA/Dossiers

Generic Product Development and registration (30 Hrs - 10 hrs theory + 20 hrs hands on training)

- Requirements for registration and approval
- Pre-formulation and formulation development activities
- Analytical method development
- Process/method/cleaning validation
- Technology transfer methods
- BE studies for IR and MR products

MODULE 2: Formulation and Development (F&D)

Design and Development of per oral novel drug delivery systems(30 Hrs - 10 hrs theory + 20 hrs hands on training)

- Scientific principles involved in the design of novel drug delivery systems(NDDS)
- Concepts of life-cycle management with NDDS

Program 4: Regulatory Affairs and Intellectual Property Rights (IPR)

Program duration: 6 Months (15 weeks), 30 hrs, 2 hrs / week

Course Credits: 2

Module : 1 Global view on registration of generic products (30 Hrs)

- Requirements for registration and approval of generic products for USFDA (ANDA), EU/AU/SA (Dossier), and TPD (ANDS), etc
- ICH guidelines
- Registration of pharmaceuticals
- Domestic
- Regulated markets ANDAs, DMFs, eCTDs
- BA/BE studies and CRO
- Dossier preparation, submission, approval & maintenance
- Guidance dealing with impurity limits, residual solvents limits, bio-equivalence testing for IR and MR products, blend uniformity, stability requirements, dissolution testing, analytical method validation, etc
- Patent laws involved with generic products registration - TRIPS, GATT, and IPR
- Scale-up post approval changes (SUPAC) and variations

PROGRAM 5: Computer Aided Drug Design and Formulation Development

Program duration: 1 year (30 weeks), 90 hrs, 6 hrs / week

Course Credits: 6

Program outcomes:

1. Explain the various stages of drug discovery.
2. Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery.
3. Explain various targets for drug discovery.
4. Explain various lead seeking method and lead optimization.
5. Appreciate the importance of the role of computer aided drug design in drug discovery

Module 01 Introduction (10hrs)

- An overview of modern drug discovery process: Target identification, target validation, lead identification and lead Optimization. Economics of drug discovery
- Physicochemical parameters and methods to calculate physicochemical parameters
- Hammett equation and electronic parameters (sigma), lipophilicity effects and parameters (log P, pi-substituent constant), steric effects (Taft steric and MR parameters)
- Experimental and theoretical approaches for the determination of these physicochemical parameters
- Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics
- Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins
- Role of transgenic animals in target validation

Module 02 In Silico lead discovery (25 hrs – 10 hrs theory + 15 hrs hands on training)

- Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques
- Assay development for hit identification
- Protein structure, Levels of protein structure, Domains, motifs, and folds in protein structure
- Computational prediction of protein structure: Threading and homology modeling methods
- Molecular docking and drug receptor interactions: Rigid docking, flexible docking and extraprecision docking
- Application of NMR and X-ray crystallography in protein structure prediction

Module 03 Rational Drug Design (15 hrs – 05 hrs theory + 10hrs hands on training)

- Traditional vs rational drug design
- Methods followed in traditional drug design
- High throughput screening
- Concepts of Rational Drug Design
- Rational Drug Design Methods: Structure and Pharmacophore based approaches

Module 04 Computer-aided formulation development (25 hrs – 10 hrs theory + 15 hrs hands on training)

- Concept of optimization, Optimization parameters, Factorial design, Optimization technology & Screening design.
- Computers in Pharmaceutical Formulation: Development of pharmaceutical emulsions, micro emulsion drug carriers Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis
- Computer-aided biopharmaceutical characterization: Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in vitroin vivo correlation, Biowaiver considerations
- Computer Simulations in Pharmacokinetics and Pharmacodynamics: Introduction, Computer Simulation: Whole Organism, Isolated Tissues, Organs, Cell, Proteins and Genes. c. Computers in Clinical Development: Clinical Data Collection and Management, Regulation of Computer Systems

Module 05: Quality by design (QbD) and process analytical technology (PAT) (15 hrs – 05hrs theory + 10hrs hands on training)

- Current approach and its limitations. Why QbD is required, Advantages, Elements of QbD, and Terminology: QTPP.
- CMA, CQA, CPP, RLD, Design space, Design of Experiments, Risk Assessment and mitigation/minimization.
- Quality by Design, Formulations by Design, QbD for drug products, QbD for Drug Substances, QbD for Excipients, Analytical QbD.
- FDA initiative on process analytical technology. PAT as a driver for improving quality and reducing costs: quality by design (QbD),QA,QC and GAMP. PAT guidance, standards and regulatory requirements