Rajiv Gandhi University of Health Sciences, Karnataka
4th T Block Jayanagar, Bengaluru

Curriculum delivery design of B. Pharm. course of Semester VII System
w.e.f Academic year 2020-21

SEMESTER-VII

BP701T: INSTRUMENTAL METHODS OF ANALYSIS (Theory)

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing..

2. Departmental objectives (what the learners will be able to perform after completing the subject):
   A. Learning Objectives:

Upon completion of this course the student should be able to

i. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
ii. Understand the chromatographic separation and analysis of drugs.
iii. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

3. Annual objectives (for each year, if the subject is spread over different years):**NA**

4. Content distribution as per the list of topics, time allotted for each topic, distribution for 'Must know', 'Desirable to know' and 'Nice to know' and the probable weightage.
   The following table can also be a reference frame for continuous and formative assessment of learning. If the curriculum management is scheduled as per the tabulation, there can be clarity for both learners and teachers to take stock of the mastery achieved in each objective. This will also help for professional excellence that goes beyond the examination process.

UNIT-I	**Hours: 10**	**Weightage: 24 Marks**
Learning content distribution	**Topics**	
	UV Visible spectroscopy and Fluorimetry	

Must to know	**UV Visible spectroscopy:** Introduction, Nature of EMR, Energies associated with the organic molecules, Electronic transitions, Chromophores, Auxochromes, Beer and Lambert's law, Derivation and Deviations. Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Barrier layer cell, Photomultiplier tube, Photo voltaic cell, Spectrophotometric titrations. **Fluorimetry:** Introduction, Theory, Jablonski process, concepts of singlet, doublet and triplet electronic states, internal and inter system crossing, inner filter effect, factors affecting fluorescence, quenching, instrumentation and applications.
Desirable to know	Energy of EMR, wavelength, frequency, wave number, absorbance, Transmittance, absorptivity, molar extinction co-efficient, Color wheel, Solvent effect on absorption spectra, spectral shifts, Photo tube, Silicon Photodiode, Single component and multi component analysis. Equilibrium constant and rate constant.
Nice to know	K bands and R bands, E band and B band, forbidden and allowed transitions, Woodward Fieser rule.

UNIT-II	**Hours: 10**	**Weightage: 21 Marks**
Learning content distribution	**Topics**	
	IR spectroscopy, Flame Photometry, Atomic absorption spectroscopy, Nephloturbidometry	
Must to know	**IR Spectroscopy:** Introduction, criteria of a molecule to absorb IR, modes of vibrations in molecules, sample handling, Instrumentation- Sources of radiation, wavelength selectors, detectors –Bolometer, Golay cell, Thermocouple Thermistor, Pyroelectric detector and applications of IR. **Atomic Spectroscopy:** **Flame Photometry:** Introduction, Principle, Events occurring in the flame, structure of flame, instrumentation and applications of flame photometry. **Atomic Absorption spectroscopy:** Principle, thermal atomizers and applications.Interferences in Atomic spectroscopy. **Nepheloturbidometry** Principle, instrumentation and applications	
Desirable to know	Vibrational frequency of alcholol, aldehyde, ketone, carboxyl, amine, amide.	
Nice to know	Hooke's law in IR spectroscopy, FTIR, NIR, fuel and oxidants used in flame emission spectroscopy, differentiates fluorimeter and Nephelometer, Colorimeter and turbidimeter.	

UNIT-III	Hours: 10	Weightage: 19 Marks
Learning content distribution	**Topics**	
	Introduction to chromatography, Column chromatography, TLC, PC and Electrophoresis	
Must to know	Chromatographic principle and its classifications. Column chromatography: Introduction, Methodology, advantages, disadvantages and applications. Thin layer chromatography: Introduction, preparation, activation and visualization, advantages, disadvantages and applications, Paper chromatography: Introduction, development techniques, visualization, advantages, disadvantages and applications. Electrophoresis– Introduction, factors affecting electrophoresis mobility, Techniques of paper, gel and applications.	
Desirable to know	Isocratic and gradient, Normal Phase and Reverse Phase Chromatography, analytical and preparative, Frontal, displacement and elution analysis, Rf, Rx and Rm values, Classification and ideal properties of adsorbents, detecting reagents, Silica Gel GF254, edge effect, two-dimensional chromatography, capillary electrophoresis.	
Nice to know	Eluotropic series of solvents, Difference between TLC and HPTLC, Stahl's triangle in TLC, Moving boundary electrophoresis, isoelectric focusing electrophoresis.	

UNIT-IV	Hours: 08	Weightage: 17 Marks
Learning content distribution	**Topics**	
	Gas Chromatography and High-Performance Liquid Chromatography	
Must to know	Theories of Chromatography: Plate theory and Rate theory **Gas Chromatography:** Introduction, types, instrumentation, advantages, disadvantages and applications. **High-Performance Liquid Chromatography:** Introduction, types, instrumentation, advantages and applications. Stationary phases of GC & HPLC.	
Desirable to know	Temperature programming in GC, derivatization in GC, Guard column, system suitability factors.	
Nice to know	LC-MS and GC-MS.	
UNIT-V	**Hours: 07**	**Weightage: 14 Marks**
Learning content distribution	**Topics**	
	Ion exchange chromatography, Gel chromatography and Affinity chromatography	
Must to know	**Ion exchange chromatography:** Introduction, mechanism, classification	

	of ion exchange resins, factors affecting ion exchange and applications. **Gel chromatography:** Introduction, principle, various gels used, instrumentation and applications. **Affinity chromatography:** Introduction, principle, various ligands used and applications.
Desirable to know	Properties of ion exchange resins, regeneration of cation and anion exchange resin, theory of gel chromatography, theory of affinity chromatography.
Nice to know	Ion exchange capacity, Size exclusion chromatography, Chiral chromatography, Ion Chromatography.

5. Blueprint of question paper, for each QP. This shows the weightage given to each chapter in the summative assessment. This improves the content validity by distributing the assessment of learners in the competencies that are represented by learning objectives under each chapter.
   State the number of QPs for the subject.
   The following template demonstrates how each QP Blueprint would look like:

BLUE PRINT OF MODEL QUESTION PAPER

BP701T: Instrumental Methods of Analysis (Theory)

TIME: 3 HOURS MAX. MARKS: 75

Unit No	**Hours**	**Must know**			**Desirable to know**			**Weightage of marks**
		LE (10X3)	**SE (5X8)**	**SA (2X5)**	**LE (10X0)**	**SE (5X1)**	**SA (2X5)**	
Unit-I	10	1	1	1	-	1	1	24
Unit-II	10	1	1	2	-	-	1	21
Unit-III	10	-	3	-	-	-	2	19
Unit-IV	08	1	1	-	-	-	1	17
Unit-V	07	-	2	2	-	-	-	14
Total	**45**	**30**	**40**	**10**	**-**	**5**	**10**	**95**
		80			**15**			**95**

* 80 % of the questions shall be from the Must Know area and 20 % shall be from the Desirable to Know area of the Curriculum.

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SEMESTER-VII

BP702T: INDUSTRIAL PHARMACY (Theory)

7th semester B. Pharm

Scope: This course is designed to impart fundamental knowledge on pharmaceutical product commercialization from laboratory to market Objectives: Upon completion of the course, the student shall be able to: 1. Know the process of pilot plant and scale up of pharmaceutical dosage forms 2. Understand the process of technology transfer from lab scale to commercial batch 3. Know different laws and acts that regulate pharmaceutical industry in India and US 4. Understand the approval process and regulatory requirements for drug products

45 Hours

Sl. No.	Topic	Hours	Learning content distribution			Weightage (Marks)
			Must know	Desirable to know	Nice to know	
Unit I	Pilot plant scale up techniques:	10	General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation,	Introduction to Platform technology	SUPAC guidelines	19
Unit-II	Technology development and transfer:		WHO guidelines for Technology Transfer: Terminologies, Technology transfer protocol, Quality risk management, Transfer	Approved regulatory bodies and agencies, Commercialization - practical aspects and	confidentiality agreements, licensing, MoUs, legal issues	

		10	from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packing materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer	problems (case studies), TOT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; Technology of Transfer (TOT) related documentation		24
Unit III	Regulatory affairs: Regulatory requirements for drug approval:	04 06	Introduction, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator‘s Brochure (IB) and New Drug Application (NDA), Clinical research / BE	Historical overview of Regulatory Affairs, Biostatistics in Pharmaceutical Product Development,	Data Presentation for FDA Submissions	24

			studies, Clinical Research Protocols, Management of Clinical Studies			
Unit-IV	Quality management systems:	08	Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by design, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, GLP	Six Sigma concept	NABL	14
Unit-V	Indian Regulatory Requirements:	07	Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Common Technical Document (CTD), Certificate of Pharmaceutical Product (COPP),	Regulatory requirements and approval procedures for New Drugs.	---	14

1. Blueprint of question paper, for each QP. This shows the weightage given to each chapter in the summative assessment. This improves the content validity by distributing the assessment of learners in the competencies that are represented by learning objectives under each chapter.

   State the number of QPs for the subject.

   The following template demonstrates how each QP Blueprint would look like:
2. Question paper layout to show which question number will represent which chapter (s)

Long Essay: **2 × 10 = 20**

1	Pilot plant scale up techniques:
2	Technology development and transfer:
3	Regulatory affairs: Regulatory requirements for drug approval:

Short Essays: **5 ×9 = 45**

4	Pilot plant scale up techniques:
5	Technology development and transfer:

BLUE PRINT OF MODEL QUESTION PAPER

BP 702 T: Industrial Pharmacy-II

TIME: 3 HOURS MAX. MARKS: 75

Unit No	Hours	Must know			Desirable to know			Weightage of marks
		LE (10X3)	SE (5X7)	SA (2X5)	LE (10X0)	SE (5X2)	SA (2X5)	
Unit-I	10	1	1	1	_		1	19
Unit-II	10	1	2	1	_	-	1	24
Unit-III	10	1	2	1	_		1	24
Unit-IV	08	-	1	1	_	1	1	14
Unit-V	07	-	1	1	_	1	1	14
Total	**45**	**30**	**35**	**10**	**-**	**10**	**10**	**95**
		75			**20**			**95**

6	Regulatory affairs: Regulatory requirements for drug approval:
7	Quality management systems:
8	Indian Regulatory Requirements:

Short Answers: **2 × 10 = 20**

9	Pilot plant scale up techniques:
10	Technology development and transfer:
11	Regulatory affairs: Regulatory requirements for drug approval:
12	Quality management systems:
13	Indian Regulatory Requirements:

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SEMESTER-VII

BP703T: PHARMACY PRACTICE (Theory)

3. Departmental objectives (what the learners will be able to perform after completing the subject):

A. Learning Objectives:

Upon completion of this course the student should be able to

1. Know various drug distribution methods in a hospital
2. Appreciate the pharmacy stores management and inventory control

3. Monitor drug therapy of patient through medication chart review and clinical review
4. Obtain medication history interview and counsel the patients
5. Identify drug related problems
6. Detect and assess adverse drug reactions
7. Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. Know pharmaceutical care services
9. Do patient counseling in communitypharmacy
10. Appreciate the concept of Rational drug therapy

4. Content distribution as per the list of topics, time allotted for each topic, distribution for 'Must know', 'Desirable to know' and 'Nice to know' and the probable weightage.

   The following table can also be a reference frame for continuous and formative assessment of learning. If the curriculum management is scheduled as per the tabulation, there can be clarity for both learners and teachers to take stock of the mastery achieved in each objective. This will also help for professional excellence that goes beyond the examination process.

UNIT-I	**Hours: 10**	**Weightage: 22 Marks**
Learning content distribution	**Topics**	
	Hospital and it's organization, Hospital pharmacy and its organization, Adverse drug reaction, Community Pharmacy	
Must to know	Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization structure of a hospital Definition, functions of hospital pharmacy, Adverse drug reactions- Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug	

	interaction- beneficial interactions, Adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management. Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.
Desirable to know	Organization structure, location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists, Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store,
Nice to know	Medical staffs involved in the hospital and their functions,

UNIT-II	**Hours: 10**	**Weightage: 22 Marks**
Learning content distribution	**Topics**	
	Drug distribution systemin a hospital, Hospital formulary, Therapeutic drug monitoring, Medication adherence, Patient medication history interview, Community pharmacymanagement	
Must to know	Dispensing of drugs to inpatients, Dispensing of controlled drugs. Definition, contents of hospital formulary, preparation and revision, and addition and deletion of drug from hospital formulary. Causes of medication non-adherence, monitoringofpatientmedicationadherence,	
Desirable to know	Types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, Financial, materials, staff, and infrastructure requirements.	
Nice to know	Differentiation of hospital formulary and Drug list, Indian scenario for Therapeutic Drug Monitoring. pharmacist role in the medication adherence, Need for the patient medication history interview, medication interview forms.	

UNIT-III	**Hours: 10**	**Weightage: 21 Marks**
Learning content distribution	**Topics**	
	Pharmacy and therapeutic committee, information services, counselling, Education and training programin the hospital, Prescribed medication order and communication skills	

Must to know	Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation, steps involved in patient counselling, Prescribed medication order- interpretation and legal requirements
Desirable to know	Organization, functions of P and T committee, Sources of drug information, Definition of patient counseling; Special cases that require thepharmacist, Role of pharmacist in the interdepartmental communication and community healtheducation.
Nice to know	Drug and Poison information centre, Computerised services, and storage and retrieval of information. Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, Communication skills- communication with prescribers and patients

UNIT-IV	**Hours: 8**	**Weightage: 19 Marks**
Learning content distribution	**Topics**	
	Preparation and implementation, Clinical Pharmacy, Over the counter (OTC) sales	
Must to know	Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern	
Desirable to know	Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist Rational use of common over the countermedications.	
Nice to know	Budget preparation and implementation, Introduction and sale of over the counter,	

UNIT-V	**Hours: 7**	**Weightage: 11 Marks**

Learning content distribution	**Topics**
	Drug store management and inventory control, Investigational use of drugs, Interpretation of Clinical Laboratory Tests
Must to know	Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, Blood chemistry, hematology, and urinalysis
Desirable to know	Organisation of drug store, types of materials stocked and storage conditions, Methods used for the analysis of the drugexpenditure
Nice to know	Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee

Blueprint of question paper, for each QP.
This shows the weightage given to each chapter in the summative assessment.
This improves the content validity by distributing the assessment of learners in the competencies that are represented by learning objectives under each chapter.

BLUE PRINT OF MODEL QUESTION PAPER

BP 703T PHARMACY PRACTICE(Theory)

TIME: 3 HOURS MAX. MARKS: 75

Unit No	Hours	Must know			Desirable to know			Weightage of marks
		LE (10X3)	SE (5X8)	SA (2X7)	LE (10X0)	SE (5X1)	SA (2X3)	
Unit-I	10	1	2	1	_	-	-	22
Unit-II	10	1	2	1	_	-	-	22
Unit-III	10	1	1	2	_	-	1	21
Unit-IV	08		2	1	_	1	1	19
Unit-V	07		1	2	_	-	1	11
Total	**45**	**30**	**40**	**14**	**-**	**5**	**6**	**95**
		84			**11**			**95**

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SEMESTER-VII

BP 704T: NOVEL DRUG DELIVERY SYSTEMS

5. Departmental objectives (what the learners will be able to perform after completing the subject):

A. Learning Objectives:Upon completion of this course the student should be able to

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development ofNovel drug delivery systems, their formulation and evaluation.

6. Content distribution as per the list of topics, time allotted for each topic, distribution for 'Must know', 'Desirable to know' and 'Nice to know' and the probable weightage.

   The following table can also be a reference frame for continuous and formative assessment of learning. If the curriculum management is scheduled as per the tabulation, there can be clarity for both learners and teachers to take stock of the mastery achieved in each objective. This will also help for professional excellence that goes beyond the examination process.

UNIT-I	**Hours: 10**	**Weightage: 22 Marks**
Learning content distribution	**Topics**	
	Controlled drug delivery systems	
Must to know	**Controlled drug delivery systems:**Terminology/definitions and rationale, advantages, disadvantages and selection of drug candidates. Approaches to design controlled release formulations, Physicochemical and biological properties of drugs relevant to controlled release formulations.	
Desirable to know	**Polymers:**Classification, properties and advantages. Polymers: Application of polymers in formulation of controlled release drug delivery systems.	
Nice to know	Advanced technologies using modern polymers in controlled release drug delivery systems.	

UNIT-II	**Hours: 10**	**Weightage: 22 Marks**
Learning content distribution	**Topics**	
	Microencapsulation, Mucosal Drug Delivery system &Implantable Drug Delivery Systems	
Must to know	**Microencapsulation:**Microspheres/ microcapsules, microparticles. Methods of Microencapsulation and its applications. **Mucosal Drug Delivery system:** Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems.	

	Implantable Drug Delivery Systems: Concept of implants and osmotic pump.
Desirable to kn	Implantable Drug Delivery Systems: Advantages and disadvantages
Nice to know	Implantable Injection

UNIT-III	**Hours: 10**	**Weightage: 22 Marks**
Learning content distribution	**Topics**	
	Transdermal Drug Delivery Systems, Gastroretentive drug delivery systems and Nasopulmonary drug delivery system	
Must to know	**Transdermal Drug Delivery Systems:**Factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches. **Gastroretentive drug delivery systems**: Approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems. **Nasopulmonary drug delivery system:**Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers.	
Desirable to know	**Transdermal Drug Delivery Systems:**Permeation through skin. **Gastroretentive drug delivery systems:**Advantages, disadvantages and their applications.	
Nice to know	Evaluation methods of transdermal, Nasal drug delivery systems and GRDDS. Introduction to Nasal and Pulmonary routes of drug delivery	

UNIT-IV	**Hours: 10**	**Weightage: 22 Marks**
Learning content distribution	**Topics**	
	Targeted drug Delivery	
Must to know	**Targeted drug Delivery:** Concepts and approaches.	
Desirable to	**Targeted drug Delivery:** liposomes, niosomes,	

know	nanoparticles, monoclonal antibodies and their applications. Advantages and disadvantages.
Nice to know	Targeted drug Delivery system formulation available in market.

UNIT- V	**Hours: 10**	**Weightage: 22 Marks**
Learning content distribution	**Topics**	
	Ocular Drug Delivery Systems and Intrauterine Drug Delivery Systems	
Must to know	**Ocular Drug Delivery Systems:**Ocular formulations and ocuserts **Intrauterine Drug Delivery Systems:**Development of intra uterine devices (IUDs) and applications	
Desirable to know	**Ocular Drug Delivery Systems:**Intra ocular barriers and methods to overcome –Preliminary study. **Intrauterine Drug Delivery Systems:**Advantages and disadvantages,	
Nice to know	Preliminary studies of ocular drug delivery system and brief study in glaucoma.	

Blueprint of question paper.
This shows the weightage given to each chapter in the summative assessment.
This improves the content validity by distributing the assessment of learners in the competencies that are represented by learning objectives under each chapter.

BLUE PRINT OF MODEL QUESTION PAPER

BP 704T: NOVEL DRUG DELIVERY SYSTEMS

TIME: 3 HOURS MAX. MARKS: 75

Unit No	Hours	Must know			Desirable to know			Weightage of marks
		LE (10X3)	SE (5X8)	SA (2X5)	LE (10X0)	SE (5X1)	SA (2X5)	
Unit-I	10	1	1	-	-	1	1	22
Unit-II	10	1	1	-	-	1	1	22
Unit-III	10	1	2	-	-	-	1	22
Unit-IV	08	-	1	1	-	1	-	17
Unit-V	07	-	2		-	-	1	12
Total	**45**	**30**	**40**	**2**	**-**	**15**	**8**	**95**
		72			**23**			**95**

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SEMESTER-VII

BP706 PS: PRACTICE SCHOOL

Introduction

- Practice school (PS) is an educational innovation included in the university curriculum with certain objectives.
- The objectives are achieved by inculcating the process of education into the real time situation of the work of pharma industry.
- To carry out the work of PS, the required facilities are provided for experimental and cooperative learning with an opportunity to work on appropriate assignments.
- The work is done under the guidance and supervision of faculty.

- Thus, PS serves as an opportunity that could in future promote the link between pharmacy colleges and pharma industries for efficient exchange of the resources.

Objectives

- To fulfill the rapidly changing needs.
- To face challenges of a pharma industry.
- To facilitate the students for applying the knowledge and skills that they acquired in unfamiliar and open-ended real life situations.
- To facilitate the pharmacy students to get a link with potential employers for getting an opportunity to enter into the pharma industry.
- To enhance communication skills, interpersonal skills, leadership qualities, etc.
- To provide an opportunity for the students to apply some of the ideas/skills, which enhance their confidence levels.
- To enable the students to understand their strengths and limitations as professionals.
- To increase marketability of students after graduation.
- To make the students know time management.
- To provide an opportunity for the students know the report writing.

Evaluation

- Aims of the work
- Extent of completion of the targets
- Handling of equipments
- Application of theoretical knowledge in practice
- Quality of report preparation
- Quality of presentation
- Overcoming limitations
- Communication skills
- Attitude and discipline
- Efficiency in planning and execution

Execution Plan

- Duration : 3 practical classes per week (12 hours) for 15 weeks
- Period : August to December of year
- Semester : 7^{th} Semester (4^{th} year)
- Credits : 6

- Batches : 4 (maximum of 15 students)
- Mentors: One guide and two teachers from each department.
- Evaluation stages: Internal exam and final exam
- Evaluation share : 25 + 125 = 150
- Evaluation method : Report preparation for internals and Oral PPT presentation for final
- At the end of the practice school the student should submit the PS report consisting of not more than 25 pages to the guide who will submit to the college.
- Two subject experts at the college level shall conduct examinations.

Work Distribution

Batch A	**Batch B**	**Batch C**	**Batch D**
15 students (1-15)	15 students (16-30)	15 students (31-45)	15 students (46-60)
Ph-Ceutics dept	Ph-Cology dept	Ph-Chemistry dept	Ph-Cognosy dept
Guide: Mon (2-5 pm)	Guide: Monday (2-5 pm)	Guide: Monday (2-5 pm)	Guide: Monday (2-5 pm)
Teacher 1: Tue (2-5 pm)	Teacher 1: Tue (2-5 pm)	Teacher 1:Tue (2-5 pm)	Teacher 1: Tue (2-5 pm)
Teacher 2: Wed (2-5 pm)	Teacher 2: Wed (2-5 pm)	Teacher 2:Wed (2-5 pm)	Teacher 2: Wed (2-5 pm)

Guidelines for preparing modules

Pharma ceutics	Pharmacognosy	Pharma chemistry	Pharmacology	Quality control and Quality Assurance
• Handling of apparatus available in the college but not used anywhere in the curriculum • Preparation and evaluation of the following cosmetics • Giving exposure of advanced instruments available in the department • Pharma Industry and Pharmaceutics. • • General Aspects to be considered on formulation selection • • Steps in Pharmaceutical Research • SOP Handling • DCS • Tablet compression • Dissolution	Handling of apparatus available in the college but not used anywhere in the curriculum • Introduction • Methods of Identification of plants • Different Conventional Methods of Extraction • Advanced extraction techniques • General Isolation techniques • Chromatographic techniques • Column chromatography, HPTLC, HPLC and Flash Chromatography. • Identification of phytoconstituents present in the extracts by chemical tests • WHO guidelines for Quality control of crude drugs and Extracts • Tissue culture techniques • Immobilization Techniques • Introduction to molecular biology • Isolation of DNA	Handling of apparatus available in the college but not used anywhere in the curriculum • Introduction to hazardous chemicals and MSD • Handling of hazardous chemicals and safety requirements • Purification of organic Solvents • Crystallization techniques for purification of chemical compounds • Microwave assisted organic Synthesis • Development of thin layer chromatography using silica gel. • Column	Handling of apparatus available in the college but not used anywhere in the curriculum ➢ Introduction to laboratory animals ➢ Handling of laboratory animals ➢ Anaesthesia and analgesia ➢ Euthanasia ➢ Blood collection techniques ➢ Breeding techniques ➢ Surgical Techniques-Preoperative and Postoperative Care ➢ Necropsy techniques ➢ Design of preclinical Experiments ➢ Antibiotic sensitivity testing ➢ Antimicrobial assay ➢ Introduction to the art of writing paper. ➢ Introduction to UGC care listed journals, Scopus	• Introduction to analytical techniques • Importance and preparation of SOPs • UV spectrophotometer • HPLC • FTIR • LC-MS • AAS • Calibration of glass wares • Calibration of analytical instruments • Preparation of analytical reagents and working standards • Monograph analysis of Pharmaceuticals • Analytical method developments and validation techniques • Preparation of Reports

Apparatus • Orbitary shaker • High speed homogenizer • Extrusion &Spheronizer • Literature Search • Requirement Short listing • Vendor selection • Providing Control number and documentation. • Preformulation • Trail batch and optimization • Lab Validation. • Scale up validation • Tech Transfer • Regulatory clearance in detail • Solid Lipid Nano Particles • Liposomes • Nano emulsions • Muco-adhesive drug delivery system • Utilization of PK solver to solve various problems related to Biopharmaceutics.	• Isolation of RNA • Isolation of protein • Agarose gel electrophoresis • SDS-Page • Introduction to Microbiology • Isolation of microorganism from soil • Identification procedures for bacteria (Biochemical test) • Antibiotic sensitivity test • Construction of growth curve • Thermal death kinetics • Introduction to *in vitro* cell culture techniques • Basic handling techniques • Contamination • Hands of training on sub-culturing /passing • Cytotoxicity studies • Introduction to the art of writing paper. • Introduction to UGC care listed journals, Scopus index, ISSN, eISSN, ISBN, impact factor, h index, i index, ORCID, etc. • Introduction to plagiarism and software for evaluation	chromatographic techniques • Protein crystallographic data and protein data Bank • Protein modelling techniques • Docking study • QSAR • ADMET prediction and interpretation 1. Introduction to the art of writing paper. 2. Introduction to UGC care listed journals, Scopus index, ISSN, eISSN, ISBN, impact factor, h index, i index, ORCID, etc. • Introduction to plagiarism and software for evaluation	index, ISSN, eISSN, ISBN, impact factor, h index, i index, ORCID, etc. ➢ Introduction to plagiarism and software for evaluation ➢ Alternative method for animal experiments ➢ In vitro methods of biological screening	• Good documentation practice • Introduction to the art of writing paper. • Introduction to UGC care listed journals, Scopus index, ISSN, eISSN, ISBN, impact factor, h index, i index, ORCID, etc. • Introduction to plagiarism and software for evaluation

• Utilization of DD solver to explore the dissolution data of pharmaceuticals. • Introduction to the art of writing paper. • Introduction to UGC care listed journals, Scopus index, ISSN, eISSN, ISBN, impact factor, h index, i index, ORCID, etc. • Introduction to plagiarism and software for evaluation				

General guidelines

1. The students can be distributed to all the possible departments available in the college. Model table given above is for reference only.
2. The students should undergo practice school in one department.
3. List of experiments given in the above table are a few examples. However, college can design suitable experiments on the basis of the availability of infrastructure and other resources. Whatever the experiments are designed for practice school should be exclusive of all the practicals done in the course.
4. Wherever appropriate, the colleges can plan visits to pharmaceutical industries, research laboratories, or any such institutions.
5. Wherever possible, services of expert faculty can be invited for the practice school.