VOCATIONAL CURRICULUM – 2023-24

PHARMA TECHNOLOGY (616)

State Institute of Vocational Education
O/o the Commissioner of Intermediate Education,
Telangana State, Hyderabad
&
Board of Intermediate Education
Telangana State, Hyderabad

Navin Mittal, IAS
Commissioner

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Department of Intermediate Education

Foreword

In the Era of Liberalization and Globalization, there is a paradigm shift in the teaching-learning methodology which aims at achieving a holistic approach towards development of students' knowledge and skill-sets. Education when combined with vocational training encourages skill enhancement and competency that can facilitate self-sustenance through self-employability or making students job-ready and the Vocational Training Courses offered by the Telangana State Board of Intermediate Education, ensures these outcomes.

In this regard, I am pleased to note that the State Institute of Vocational Education, under the aegis of Commissionerate of Intermediate Education, Telangana, Hyderabad, has redesigned the curriculum by up-scaling the content, based on the need-based analysis to bridge the gap between the Academia and the Industry. The 'learning while doing' approach is emphasized upon, in vocational programmes. These courses typically include internships. Hence, students are braced with the knowledge and skill to become productive and are able to deliver the expected outcomes of the Course.

The Vocational Courses' curriculum has been revised for the Academic Year 2023-24 onwards, by the State Institute of Vocational Education (SIVE) and the Telangana Board of Intermediate Education (TSBIE). I believe, the revised curricula will benefit vocational students by providing opportunities to acquire skills in demand-driven, economically-beneficial fields of study.

With best wishes,

Navin Mittal

Commissioner of Intermediate Education
Govt. of Telangana

SCHEME OF INSTRUCTION AND EXAMINATION
ANNUAL SCHEME OF INSTRUCTION AND EXAMINATION FOR FIRST YEAR

Part-A		Theory		Practical		Total	
		Periods	Marks	Periods	Marks	Periods	Marks
	English	150	50	0	0	150	50
2.	General Foundation course	150	50	0	0	150	50
	Part-B						
3.	**Paper-I** Human anatomy and Physiology	120	50	120	50	240	100
4.	**Paper-II** Pharmaceutical Technology I	120	50	120	50	240	100
5.	**Paper-III** Pharmaceutical Chemistry and Quality Management systems	120	50	120	50	240	100
Part-C							
6.	**OJT**	0	0	365	100	365	100
	Total	540	**250**	**725**	**250**	**1385**	**500**

SECOND YEAR

Part-A		Theory		Practical		Total	
		Periods	Marks	Periods	Marks	Periods	Marks
1.	English	150	50	0	0	150	50
2.	General Foundation course	150	50	0	0	150	50
	Part-B						
3.	**Paper-I** Pharmacology and Pharmaceutical Regulations	120	50	120	50	240	100
4.	**Paper-II** Pharmaceutical Technology- II	120	50	120	50	240	100
5.	**Paper-III** Pharmaceutical Engineering	120	50	120	50	240	100
Part-C							
6.	**OJT**	-	-	450	100	450	100
	Total	**660**	**250**	**810**	**250**	**1470**	**500**
TOTAL FIRST YEAR AND SECOND YEAR MARKS 1000							

EVALUATION OF ON-THE-JOB TRAINING:

The "On the Job Training" shall carry 100 marks for each year and pass marks is 50. During on the job training the candidate shall put in a minimum of 90 % of attendance.
The evaluation shall be done in the last week of January.

Marks allotted for evaluation:

S.No	Name of the activity	Max. Marks allotted for each activity
1	Attendance and punctuality	30
2	Familiarity with technical terms	05
3	Familiarity with tools and material	05
4	Manual skills	05
5	Application of knowledge	10
6	Problem solving skills	10
7	Comprehension and observation	10
8	Human relations	05
9	Ability to communicate	10
10	Maintenance of dairy	10
	Total	100

NOTE: The On the Job Training mentioned is tentative. The spirit of On-the-Job training is to be maintained. The colleges are at liberty to conduct on the job training according to their local feasibility of institutions & industries. They may conduct the entire on the job training periods of (365) First year and (450) Second year **either by conducting classes in the morning session and send the students for OJT in the afternoon session or two days in week or weekly or monthly or by any mode which is feasible for both the college and the institution**. However, the total assigned periods for on-the-job training should be completed. The institutions are at liberty to conduct On the Job training during summer also, however there will not be any financial commitment to the department.

PHARMA TECHNOLOGY
FIRST YEAR
PAPER – I: HUMAN ANATOMY AND PHYSIOLOGY (THEORY)
TIME SCHEDULE, WEIGHTAGE & BLUE PRINT

S. No	Name of the Unit	No of Periods	Weightage in marks	Short Answer Questions	Essay/ Problem Questions
I	**Introduction to Pharma Technology** **A) Health Education** i) General hygiene ii) Sanitization and sanitizing agents iii) Water borne diseases **B) Basic Introduction** i) Scope of Anatomy & Physiology ii) Structure of human cell, function of its components iii) Elementary tissues the body	22	08	01	01
II	**Digestive System** i) Parts of Gastro-Intestinal Tract ii)Digestion of food & absorption iii)Structure and functions of Liver iv) Diseases affecting the GIT	08	08	01	01
III	**Respiratory System** i) Various parts of Respiratory System & their functions ii) Mechanism of Respiration iii) Disorders of Respiratory System.	07	08	01	01
IV	**Cardiovascular System** i) Structure and functions of various parts of the Heart & blood vessels	12	08	01	01

	ii) Disorders of Cardiovascular System				
V	**Blood and Blood Components** i) Composition of Blood, functions of Blood elements. Blood groups and coagulation of Blood ii) Disorders affecting affecting Blood & Blood cells	12	08	01	01
VI	**Central Nervous System** i) Introduction to Nervous system ii) Classification of Nervous system iii)Parts of Brain & Spinal cord iv) Diseases affecting CNS	15	08	01	01
VII	**A) Skeletal & Muscular System.** i) Structure & functions of Skeletal System & disorders ii) Structure & functions of Muscular System & disorders. **B) Endocrine System** i) Introduction to Endocrine System ii) Types of Endocrine glands iii) Functions of different Endocrine glands & their disorders in brief	22	10	01 01	01
VIII	**A) Reproductive System** i) Parts of male reproductive system & their functions	22	10	01 01	01

	ii) Parts of female Reproductive system & their functions **B) Urinary system** i) parts of Urinary system ii) Diseases affecting Urinary system				
	Total	**120**		**10**	**8**

Text Books:

- Principles of Anatomy and Physiology by Tortora G.J., and N.P. Anagnostakos,
- Principles of Anatomy and Physiology by Ross & Wilson.
- Goyal, R. K, Natvar M.P, and Shah S.A, Practical anatomy and physiology and biochemistry, latest edition, Publisher: B.S Shah Prakashan, Ahmedabad.

Reference Books:

- Human Physiology by C.C. Chatterjee, Medical Allied Agency, India.
- Text Book of Medicinal Physiology by A.C. Guyton, W.B. Prism Books Pvt. Ltd.,
- Ranade VG, Text book of practical physiology, Latest edition, Publisher: PVG, Pune
- Anderson Experimental Physiology, Latest edition, Publisher: NA

PHARMA TECHNOLOGY
PART B – VOCATIONAL SUBJECTS
FIRST YEAR
PAPER – I: HUMAN ANATOMY AND PHYSIOLOGY (PRACTICALS)
TIME SCHEDULE

S.No	Name of the Unit	No of Periods	Weightage in Marks
1	Human Skeleton- Name of the Bones - Identification Points, Surfaces of [skull, scapula, clavicle, humerus radius, ulna, carpal bones, metal carpal bones, phalanges - Innominate bone, Femur, Patella, tibia, fibula, tarsal bones, meta tarsal bones, Phalanges, Ribs Classification, Vertebrae, Sternum.	18	
2	Human Organs [Pop models] - Brain, Stomach, Lungs, Intestines, Heart, Liver, kidney, Uterus, Spleen, Fallopian tubes	20	
3	First aid methods Emergency case (CPR and burns)	18	
4	Human Slides [Permanent Slides]- Epithelial Tissue, Connective tissue, Muscular Tissue, Nervous Tissue, Liver, Kidney, Spleen, Pancreas, Lymph nodes, Skin, Testes, Ovary, Uterus, Tonsil, Stomach layers, Small & Large Intestine	16	
5	Blood Pressure Measurement of Blood Pressure	06	
6	T.P.R [Temperature, pulse, respiration] chart	06	
7	TC, DLC [RBC & WBC Total Count], differential Leucocytes Count.	15	
8	Estimation of glucose in blood & urine	06	
9	Estimation of Haemoglobin	06	
10	Use of biochemical kits for quick testing (Pregnancy test, HIV test, Widal test)	09	
	Total periods	120	

Reference Books:

1. S.R. Kale and R.R. Kale, Practical Human Anatomy & Physiology, Nirali Prakashan, Pune 2003.
2. CL Ghai, Text book of Practical Physiology, Jay Pee, New Delhi, 2005.
3. Best and Taylor's Physiological Basis of Medical Practice, Williams & Wilkins, Baltimore

PHARMA TECHNOLOGY
PART B – VOCATIONAL SUBJECTS
FIRST YEAR
PAPER – II: PHARMACEUTICAL TECHNOLOGY – I (THEORY)
TIME SCHEDULE, WEIGHTAGE & BLUE PRINT

S.No	Name of the Unit	No of Periods	Weightage in marks	Short Answer Questions	Essay/ Problem Questions
I	**A) Introduction to Pharmaceutical Sciences** i) History of Pharmacy ii) Pharmacy in India iii) classification of Dosage forms iv) Metrology-systems of weight & measures, Percentage calculations **B) Pre-formulation Studies** Definition of i) Solubility ii) Partition Coefficient iii) Powder flow iv) Bulk density & tapped density	15	10	02	01
II	**Oral Solid Dosage Forms:** i) Definition of tablets & capsules & types of tablets & capsules. ii) Different methods of manufacture of tablets & capsules. iii) Excipients used in OSD. iv) Definition of In-Process Quality checks. v) Observed defects in tablet formulations & possible reasons for defects. vi) Quality control tests for finished OSD. vii)Definition of controlled release OSD & types.	15	08	01	01
III	**Liquid oral dosage forms:** i) Types of liquid oral dosage forms. ii) Process flow diagram of manufacturing of liquid oral dosage forms.	15	08	01	01

	iii) Excipients used in liquid oral dosage forms. iv) Define vehicle-preparation of different types of vehicles. v) Advantages & disadvantages of liquid oral dosage forms. vi) IPQC tests				
IV	**Semi-Solid Dosage Forms:** i)Definition & types of semi-solid dosage forms & preparations ii) Excipients used in semi-solid dosages. iii)Advantages & disadvantages 1. iv) IPQC tests	15	08	01	01
V	**Parenteral Dosage forms:** i)Definition & types of parenteral dosage forms. ii)Different processes involved in manufacturing of parenteral dosage forms iii) Excipients iv)Advantages & disadvantages v)Water for injection & types 1) vi) IPQC tests	15	08	01	01
VI	**Pharmaceutical packaging and labelling:** i)Types of packaging for different dosage forms ii) Regulatory guidelines regarding labelling iii) IPC in packaging & labelling 1) iv)Visual inspection of finished dosage forms.	15	08	01	01
VII	**Extraction Techniques:** Extraction of crude techniques i)Various solvents used ii) Properties of solvents iii) Handling & storage of solvents iv)Extraction Techniques a) Maceration 1) b) Percolation	15	08	01	01
VIII	**Safety Health & Environment concepts of safety.** i) Use of materials safety data sheet ii) Process safety analysis & Hazard iii) Fire safety iv) PPEs used in different production	15	10	02	01

	operations v) Industrial & Job safety analysis for various production equipment & machinery vi) Managing emergency procedures First Aid				
	Total Periods	**120**		**10**	**08**

Text Books:

- Cooper and Gunn's- Dispensing for pharmacy students
- A text book Professional Pharmacy by N.K.Jain and S.N.Sharma
- L. Lachman, H.A. Lieberman and J.L. Kanig, Theory and Practice of Industrial Pharmacy Varghese Publishing House, Mumbai, 3rd edition, 1991
- Ansel's pharmaceutical dosage forms and Drug delivery systems, 8th edition, 2004, Lippincott Williams & Wilkins, USA
- Micheal E Aulton, Pharmaceutics - The science of dosage form design, 1st edition, 1998, Churchill living stone
- Martin, J. Swarbrick & A. Cammarata, "Physical Pharmacy" Lea and Febiger, Philadelphia, III Edition, 1983
- C.V.S. Subrahmanyam, Essentials of Physical Pharmacy, Vallabh Prakashan, Delhi, 2005
- Blake, R.P., "Industrial Safety", Prentice Hall, 1953.
- Lees, F.P., "Loss Prevention in Process Industries", 2nd Edition, Butterworth Heinemann, 1996
- Mechanical and Industrial Measurements R.K. Jain
- Industrial Instrumentation and Control S.K. Singh
- http://ncerthelp.com/cbse%20notes/class%2011/physics/Physics%20Notes%20Class%2011%20CHAPTER%202%20UNITS%20AND%20MEASUREMENTS%20.pdf
- http://saba.kntu.ac.ir/eecd/ecourses/inst%2086/Projects/Velocity%20Measurement/Velocity%20Measuremnt.pdf
- http://enggyd.blogspot.in/2011/05/pressure-measuring-instruments.html
- http://nptel.ac.in/courses/101106040/chapter%205.pdf
- http://www.engineeringtoolbox.com/flow-meters-d 493.html

Reference Books

1. A.R. Gennaro, Remington: The Science and Practice of Pharmacy, 20th Edition,Vol. 1, Lippincott Williams & Wilins, Philadelphia, 2004.
2. E.A. Rawlins, Bentely's Textbook of Pharmaceutics, 8Th Edition, Baillere Tindill, London,2002.
3. The Prevention of Food Adult eration Act 1954 with Rules.
4. Vijay Malik Drugs & Cosmetic Act 1940, 10 Th edition.
5. Introduction to Pharmaceutical dosage forms by Howard C. Ansel

6. Remington's Pharmaceutical Sciences.
7. Register of General Pharmacy by Cooper and Gunn
8. General Pharmacy by M. L. Schroff

PHARMA TECHNOLOGY
FIRST YEAR
PAPER – II: PHARMACEUTICAL TECHNOLOGY – I (PRACTICALS)
TIME SCHEDULE

S.No	Name of the Unit	No of Periods	Weight age
1	Determination of particle size of powders by Sieve analysis	10	
2	Determination of particle size by optical micro scope	10	
3	Determination of Bulk density & Tapped density of powders.	10	
4	Determination of viscosity of Liquids using Ostwald's viscometer	10	
5	Preparation of syrups, solutions & labelling	10	
6	Preparation of suspensions, emulsions & labelling	10	
7	Performance of IPQC in compressed tablets	10	
8	Performance of IPQC in filled capsules	10	
9	-visual inspection of uncoated & coated tablets. -Defects in uncoated & coated tablets, identification & rectification	10	
10	Evaluation of specific gravity of syrup	10	
11	Visual inspection of Ampoules & vials-Leak test	10	
12	IPQC in liquid preparation	10	
	Total periods	**120**	

Reference Books:

1. Pharmaceutical Dosage Forms: Parenteral Medications, Volume I, Kenneth E. Avis, Herbert A. Lieberman (Editor), Leon Lachman (Editor)
2 Pharmaceutical Dosage Forms: Disperse Systems, Volume 1 -Leon Lachman, Herbert A. Lieberman
3. The Theory and Practice of Industrial Pharmacy by Lachman and Lieberman (3rd Edition)
4. Hard capsules, development and technology. Edited by K. Ridgway. The Pharmaceutical Press: London, UK. 1987. 320 pp. ISBN 085369-159

PHARMA TECHNOLOGY
FIRST YEAR
PAPER – III: PHARMACEUTICAL CHEMISTRY & QUALITY MANAGEMENT SYSTEMS (THEORY)
TIME SCHEDULE , WEIGHTAGE & BLUE PRINT

S.No	Name of the Unit	No of Periods	Weight age in marks	Short Answer Questions	Essay/ Problem Questions
I	**To have a detailed knowledge about basics of Pharmaceutical Science and Chemistry inclusive of** i)Organic Nomenclature System ii)Interaction of light with matter.	15	08	01	01
II	**Basic Analytical chemistry fundamentals including –** i)Balancing chemical equations ii) Chemical equilibrium iii) Acid and base chemistry iv)Reduction and oxidation chemistry	20	10	02	01
III	i)Organization of Quality control lab in industry and process flow ii)Introduction to sampling, types and sample preparation methods (solid and liquid).	15	08	01	01
IV	**Good Laboratory Practices (GLP)** i) Glassware and other utensils cleaning, drying and storage ii) weighing and measuring procedures and documentation iii)calibration, preventive maintenance and regular use maintenance iv)Introduction to Installational Qualification, Operational Qualification and Performance Qualification (IQ, OQ &PQ)	10	08	01	01
V	**Wet lab** i) Volumetric analysis. ii) Gravimetric analysis iii) Water analysis iv)Moisture analyser	15	08	01	01

VI	**Spectral analysis** i)IR spectroscopy ii)UV spectroscopy, iii) Introduction to Ash valves and their types	15	08	01	01
VII	**Chromatography** i) Paper Chromatography ii) Thin Layer Chromatography iii) HPLC iv) Gas Chromatography	15	08	01	01
VIII	**Quality Management Systems** i)Introduction to Quality Management Systems. ii) ICH -Q10 guidelines iii) Raw material quality control, conceptual scientific knowledge ➢ Identification Tests ➢ Limit Tests iv) Introduction to OOS, OOT, CAPA 5) Introduction to Analytical methods, validation vi)Basics of – ➢ Root cause analysis ➢ FMEA ➢ Auditing cGMP.	15	10	02	01
	Total	120		10	08

Textbooks and Reference Books:

- Inorganic Pharmaceutical Chemistry (Practical), 2nd Edition, Dr. A. S Dhake & D. P. Belsare
- Vogel's Text Book of Quantitative Analysis, 5th edition
- Vogel's Quantitative Inorganic Analysis
- www.fda.gov/downloads/Drugs/.../Guidances/ucm073517.pdf
- Pharmaceutical Manufacturing Handbook: Production and Processes by Shayne Cox Gad

PHARMA TECHNOLOGY
FIRST YEAR
PAPER – III: PHARMACEUTICAL CHEMISTRY & QUALITY MANAGEMENT SYSTEMS (PRACTICAL)

S.no	Name of the Experiment	No. of Periods	Weightage of Marks
1	Lab glass ware a) Identification b) Handling of pipette, Burette, dilutions c) Care and maintenance d) Uses	10	
2	Weighing skills a) Types of weighing balances b) Calibration of weighing balances c) how to perform weighing for analytical tests	10	
3	Sample preparation skills a) Sample grinding b) Ultra sonication c) Filtration d)Centrifugation	10	
4	Preparation of a) Percentage solution b) Normal solution c)Molar solution	10	
5	Basic Inorganic salt analysis	10	
6	Basic functional group analysis	10	
7	Acid-Base titrations	10	
8	Water analysis, Limit tests	15	
9	Gravimetric analysis	15	
10	Chromatographic separation by using TLC or paper chromatography	10	
11	a) Good documentation practices practical b) SOP's	10	
	Total periods	**120**	50

Textbooks and Reference Books:

1. Inorganic Pharmaceutical Chemistry (Practical), 2nd Edition, Dhake & Belsare.
2. Vogel's Text Book of Quantitative Analysis, 5th Ed.
3. Vogel's Quantitative Inorganic Analysis.
4. http://www.mgel.msstate.edu/pdf/solutions.pdf
5. www.nabl-india.org/nabl/file_download.php?filename=20141208**112**9-NABL-**122**...
6. http://vlab.amrita.edu/?sub=3&brch=63&sim=154&cnt=1
7. https://www.chem.wisc.edu/deptfiles/OrgLab/handouts/CHEM 344 TLC info.pdf
8. https://pharmout.net/downloads/white-paper-how-to-implement-good-documentation-practices.pdf
9. http://apps.who.int/prequal/trainingresources/pq_pres/stakeholders_2011/presentations/day_2/good_documentation_practices.pdf

PHARMA TECHNOLOGY

PART B – VOCATIONAL SUBJECTS

SECOND YEAR

PAPER – I: PHARMACOLOGY& PHARMACEUTICALS REGULATIONS (THEORY)

TIME SCHEDULE, WEIGHTAGE & BLUE PRINT

S.No	Name of the Unit	No of Periods	Weightage in marks	Short Answer Questions	Essay/ Problem Questions
I	A) Introduction to Pharmacopoeias i) Indian Pharmacopoeia ii) British Pharmacopoeia iii) United states Pharmacopoeia iv) Drug and drug product monograph from I.P B) General Pharmacology i) Introduction ii) Routes of drug administration iii) Bioavailability iv) Basic introduction to drug interactions	15	10	1 1	– 1
II	A) Drugs used in disorders of GIT i) Digestives & anti-flatulents ii) Emetics iii) Laxatives iv) Pharmacotherapy of peptic ulcers B) Drugs acting on respiratory system i) Pharmacotherapy of cough ii) Anti asthmatics	15	08	1	1
III	A) Drugs acting on Cardiovascular system i) Antihypertensives ii) Pharmacotherapy of angina pectoris B) Drugs acting on blood and blood components i) Anticoagulants	15	08	1	1

	ii) Antiplatelet agents				
IV	a) Drugs acting on CNS i) Analgesics ii) Sedatives and hypnotics iii) General anesthetics b) Drugs acting on renal system i) Diuretics	13	08	1	1
V	Drugs acting on Endocrine system i) Anterior pituitary hormones ii) Thyroid hormones & anti thyroid drugs iii) Antidiabetics iv) Adreno cortico steroids	12	08	1	1
VI	A) Antibiotics, anti-infectives & antiseptics B) Immunity & immunological products	20	10	1 1	1
VII	A) Drug control administration in India, organization & DCGI B) Drugs and cosmetics act & rules-overview	15	08	1	1
VIII	A) ICH guidelines, overview & important information from each guideline B) Introduction to WHO organization	15	08	1	1
	Total	**120**		**10**	**08**

Textbooks and Reference books:

1. Pharmacology and Pharmacotherapeutics R. Satoskar, Nirmala N. Rege, S.D Bhandarkar
2. Essentials of Medical Pharmacology by KD Tripathi
3. Pharmacology for Medical Graduates, Tara V Shanbhag, Smita Shenoy
4. Rang & Dale's Pharmacology
5. Pharmacy Regulations E-book, Text book of Pharmacy law practice - S. Balasubramanian
6. Pharmacy law and ethics- Dr. Shailee V. Tiwari, Sonali.S, Shinde, Dr. Md. Rageeb Md. Usman Dr. Aniket P. Sarkate

PHARMA TECHNOLOGY
SECOND YEAR
PAPER – I: PHARMACOLOGY (PRACTICAL)

S.No	Name of the Unit	No of Periods	Weightage in marks	Short Answer Questions	Essay/ Problem Questions
1	Layout of animal house & caging and outdoor housing of Lab animals	10			
2	Feeding of lab animals	08			
3	Bedding of lab animals	08			
4	Breeding of lab animals	08			
5	Handling of lab animals	12			
6	Collection of blood from lab animals	10			
7	Anaesthesia of lab animals	10			
8	Sanitization of lab animals	06			
9	Record keeping in animal house	10			
10	Effect of drugs on Isolated frog's heart (any 5)	20			
11	Pyrogen testing	14			
12	Gastric acid secretion	14			
	Total	**120**			

Recommendation:

Simulated experiments may be used.

PHARMA TECHNOLOGY
SECOND YEAR
PAPER – II: PHARMACEUTICAL TECHNOLOGY (THEORY)

TIME SCHEDULE, WEIGHTAGE & BLUE PRINT

S.No	Name of the Unit	No of Periods	Weightage in marks	Short Answer Questions	Essay/ Problem Questions
I	**Introduction to Pharmaceutical Industry** a. Plant Layout b. Different departments in a Pharmaceutical Industry. c. Scope in Pharma Industry. d. List various Pharma companies with their major products.	20	08	01	01
	Basic Pharmaceutical Unit Operations				
II	**a. Size separation** i) Definition and scope ii) Types of sifters iii) Operation, cleaning and maintenance of sifters **b. Milling** i) Definition and scope ii) Types of mills iii) Operation, cleaning and maintenance of mills **c. Mixing and Granulation** i) Definition and scope ii) Types of Granulators iii) Operation, cleaning and maintenance of granulators	15	10	25	01
III	**a. Drying** i) Definition and scope ii) Types of dryers iii) Operation, cleaning and maintenance of dryers **b. Blending** i) Definition and scope ii) Types of blenders iii) Operation, cleaning and maintenance of blenders	10	08	01	01
IV	**a. Compression** i) Definition and scope ii) Types of compression machines	20	10	02	01

	iii) Operation, cleaning and maintenance of compression machines and line equipment's. **b. Capsule Filling** i) Definition and scope ii) Types of capsule filling machines iii) Operation, cleaning and maintenance of capsule filling machines. iv) Defects in Filled Capsules v) Handling of empty capsule shells **c. Tablet Coating** i) Definition and scope ii) Types of coating machines iii) Operation, cleaning and maintenance of coating machines iv) Defects in coated tablets v) Inspection of coated tablets				
V	**Suspension Manufacturing** i) Process flow diagram of manufacturing. ii) Classifications of suspensions iii) Formulations of suspensions iv) Preparation of different types of suspensions v) Stability of suspensions	15	08	01	01
VI	**Emulsion Manufacturing** i) Process flow diagram of manufacturing ii) Classification of emulsions iii) Formulation of emulsion one from each iv) Preparation of Emulsions v) Stability of Emulsions	10	08	01	01

VII	**Injectable Manufacturing.** **a) Introduction to aseptic areas.** **b) Growing procedures for sterile area entry and working.** **c) Process flow diagram for aseptic manufacturing** **d) Sterilization:** i) Definition and scope ii) Types of sterilization processes iii) Operation, cleaning and maintenance of * Auto clave * Dry heat sterilizers * Laminar hoods * Isolators * Autoclave **e) Ampoule/ vial washing and**	15	08	01	01
VIII	**Semi-solid Manufacturing and Filling:** **a)** Process flow diagram for ointments, creams and Gels. **b)** Operation, cleaning and maintenance of manufacturing tanks, transfer pumps, lines and homogenizers and mills. **c)** Different Types of Filling machines (For e.g.: tubes, jars, etc.)- Operation, cleaning and maintenance of filling machines and associated line equipment's. **d)**Filling & sealing of semi-solid dosage forms	15	08	01	01
	Total	**120**		**10**	**08**

Text Books and References:

1. Cooper and Gunn's- Dispensing for pharmacy students
2. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma
3. L. Lachman, H.A. Lieberman and J.L. Kanig, Theory and Practice of Industrial Pharmacy Varghese Publishing House, Mumbai, 3rd edition, 1991
4. Ansel's pharmaceutical dosage forms and Drug delivery systems, 8th edition, 2004, Lippincott Williams & Wilkins, USA
5. Micheal E Aulton, Pharmaceutics - The science of dosage form design, 1st edition, 1998, Churchill living stone
6. Martin, J. Swarbrick & A. Cammarata, "Physical Pharmacy" Lea and Febiger, Philadelphia, III Edition, 1983
7. C.V.S. Subrahmanyam, Essentials of Physical Pharmacy, Vallabh Prakashan, Delhi, 2005
8. Blake, R.P., "Industrial Safety", Prentice Hall, 1953.
9. Lees, F.P., "Loss Prevention in Process Industries", 2nd Edition, Butterworth Heinemann, 1996

10. Mechanical and Industrial Measurements R.K. Jain
11. Industrial Instrumentation and Control S.K. Singh

PHARMA TECHNOLOGY
SECOND YEAR
PAPER – II: PHARMACEUTICAL TECHNOLOGY (PRACTICAL)
TIME SCHEDULE, WEIGHTAGE & BLUE PRINT

S. No	Name of the Unit	No of Periods	Weightage in Marks
1	Preparation of Tablets using the following unit Operations i. Weighing ii. Sifting iii. Wet Granulation iv. Dry Granulation v. drying vi. sizing & milling vii. compression viii. coating	10	
2	a) Evaluation of granules & tablets for following parameters i. LOD ii. Bulk density & tapped density iii. Particle size distribution by analysis sieve analysis iv. Angle of Repose to find flow of granules b) Compression of lubricated blend into tablets. i. Adjustment of fill weight of blend ii. Adjustment of hardness of tablet iii. Compression & sampling c) Physical evaluation of Tablets i. Weight variation ii. Tablet dimensions - Variations-length, width, thickness iii. Hardness iv. Friability v. Disintegration Time d) Identifying the parts, setting up and dismantling of & tablet compression machine & capsule filling machine.	10 05 10 05	
3	Preparation & evaluation of monophasic liquid oral dosage form	10	
4	Preparation & Evaluation of Suspension	10	
6	Preparation of an autoclave sterilization cycle load	10	
7	Developing skills of working in glove box isolator	10	
8	Gowning practices & working in sterile area /aseptic area	10	
9	Preparation & evaluation of o/w & w/o cream	10	
10	Preparation & evaluation of Gels	10	
	TOTAL	**120**	**50**

PHARMA TECHNOLOGY
SECOND YEAR
PAPER – III: PHARMACEUTICAL ENGINEERING (THEORY)

TIME SCHEDULE, WEIGHTAGE & BLUE PRINT

S. No	Name of the Unit	No of Periods	Weightage in marks	Short Answer Questions	Essay/ Problem Questions
I	**Size Reduction:** Definition, Mechanism of size reduction, classification of size reduction, principles, working & construction of i. cutter mill ii. Roller mill iii. Ball mill	15	08	01	01
II	**Mixing:** Definition, mechanism of mixing, ideal mixing, random mixing, acceptable mixing. Principal, working & construction of i. Double Cone blender ii. Planetary Mixer iii. Sigma blade mixer	15	08	01	01
III	**Evaporation:** Definition, factors effecting evaporation. Principle, construction & working of i. Steam Jacket Kettle Evaporator ii. Horizontal Tube Evaporator	15	08	01	01
IV	**Distillation:** Definition, classification of distillation, study of: i. Simple Distillation ii. Flash Distillation iii. Fractional Distillation	15	08	01	01
V	**Filtration:** Definition, mechanism of filtration, factors effecting filtration,	15	10	02	01

	working of Buchner funnel & filter paper, sintered glass filter, membrane filles				
VI	**Transportation of solids:** **a)** Objectives of conveying (Transportation), classification of conveyors, construction and working of: i. Belt conveyer ii. Screw conveyer Advantages of conveying **b)**Fluid mechanics: i. Fluid flow ii. Pipes and fittings iii. Valves-types	10	08	01	01
VII	**Maintenance concepts:** Preventive and predictive maintenance, breakdown maintenance, spares inspection, keeping the machine efficiency, partnership with operator and maintenance, reliability centred maintenance, operator care, CLITA, how to direct mechanic	15	08	01	01
VIII	**a) Machine Elements:** structure, classification, applications and typical troubles of: bolt & nut, keys, bearing, gear, belt & pulleys, chain & joint b) Basics of electrical engineering i. Ohm's Law & its application ii. Concept of electrical circuit e.g., Series, parallel and mixed circuits Identification of AC & DC meters iii. Kirchhoff Laws & their application iv) Wheatstone bridge and its application	20	10	02	01
	Total	**120**		**10**	**08**

Reference Books:-

1. S.J Carter, Cooper and Gunn's Tutorial Pharmacy 6th edition, CBS Publishers, Delhi
2. Pharmaceutical unit Operations by CVS Subramanyam, Vallabha Prakashan Publications
3. Pharmaceutical Engineering by K. Sambamurthy
4. Introduction to Chemical Engineering by Walter L. Badger and Julius T. Banchero

PHARMA TECHNOLOGY
PART B – VOCATIONAL SUBJECTS
SECOND YEAR
PAPER – III : PHARMACEUTICAL ENGINEERING (PRACTICAL)

S.No	Name of the Unit	No of Periods	Weightage in Marks
1	Experiment to illustrate Size Reduction	10	
2	Experiment to illustrate solid-solid mixing, determination of mixing efficiency by different mixers	10	
3	Determination of rate of rate of evaporation	10	
4	Determination of rate of drying, and free moisture content bound moisture content	10	
5	Illustrate influence of various parameters on the time of Drying	10	
6	Demonstration of simple distillation	15	
7	Perform the experiment of filtration by using filtration by using paper and glass funnel	15	
8	Measurement of flow of fluids, pressure drop & temperature	10	
9	Demonstration of Insulated wires, cables & different type Joints	15	
10	Fire extinguishers demonstration	15	
	Total periods	**120**	50

PHARMA TECHNOLOGY
SECOND YEAR
MODEL QUESTION PAPERS
PAPER – I – PHARMACOLOGY&PHARMACEUTICAL REGULATIONS (THEORY)

Time: 3 hrs **Marks: 50**

SECTION – A

Note: i) Answer all questions **10 x 2 =20**

ii) Each question carries Two marks

1. Define Pharmacology**.**
2. Write the purpose of "Drugs and Cosmetics act".
3. Write the normal values of B.P. and Define Anti Hypertensives
4. Write the introduction to EMEA.
5. Define an Emetic.
6. Explain the terms i). SELF INSPECTION ii). PRODUCT RECALL
7. Give two examples of laxatives.
8. What is meant by "CONTINUOUS PROCESS VERIFICATION".
9. Write the definition of Analgesic and give two examples.
10. Define "PHARMACOPOEIA".

SECTION –B

Note: i) Answer any FIVE questions **5 x 6 = 30**

ii) Each question carries SIX marks

11. Explain the routes of drug administration.
12. Write a short note on Indian Drug Regulatory Agency.
13. Write the classification of sedatives.
14. Explain European Medical Agency.
15. Give a note on Pharmacotherapy of Angina pectoris.
16. Write about anti diabetics.
17. Give an explanation on the concepts of continuous process verification.
18. Classify diuretics and write their uses.

PHARMA TECHNOLOGY
SECOND YEAR
MODEL QUESTION PAPERS
PAPER-II – PHARMACEUTICAL TECHNOLOGY-II (THEORY)

Time: 3 hrs **Marks: 50**

SECTION – A

Note: i) Answer all questions **10 x 2 =20**

ii) Each question carries Two marks

1. Define TABLET.
2. Mention different types of Granulators.
3. What are the different types of filtration equipment in liquid oral manufacturing.
4. Write the Definition of SUSPENSION.
5. What is meant by aseptic area.
6. Give the definition of Sterilization.
7. Mention different types of filling machines for tubes.
8. Mention different types of semi solid dosage forms.
9. Mention different types of packaging for tablets.
10. Write the contents of a label.

SECTION –B

Note: i) Answer any FIVE questions **5 x 6 = 30**

ii) Each question carries SIX marks

11. Give the process flow diagram of tablets manufacturing and mention the Steps.
12. Write about tablet coating.
13. Explain “In process checks” in liquid oral manufacturing.
14. Discuss the various aspects of Emulsion manufacturing.
15. Write about different types of Sterilisation process.
16. Describe Lyophilisation in detail.
17. Write about operation cleaning and maintenance of filling machines.
18. Give a note on different types of packaging and labelling machines.

PHARMA TECHNOLOGY
SECOND YEAR
MODEL QUESTION PAPERS
PAPER – III- PHARMACEUTICAL ENGINEERING (THEORY)

Time: 3 hrs **Marks: 50**

SECTION – A

Note: i) Answer all questions **10 x 2 =20**

ii) Each question carries Two marks

1. Differentiate Mechanism, Attriction and impact in size reduction.
2. Ball mill is not useful for size reduction of fibrous material. Explain.
3. Define Distillation and give two applications of Distillation.
4. Mention the equipment for Solid-Solid Mixing.
5. What is ideal Mixing of Powders?
6. Mention two objectives of conveying of solids?
7. Give Principle of Filtration.
8. Define Preventive Maintenance.
9. Write the classes of machine elements.
10. Write the definition of Automation of Pharmaceutical operations.

SECTION –B

Note: i) Answer any FIVE questions **5 x 6 = 30**

ii) Each question carries SIX marks

11. What is meant by steam Distillation? What are its special advantages?
12. Describe construction and working of distillation operators for preparation of Distilled water.
13. Explain Construction and working of wall Mill.
14. Explain advantages and disadvantages of Size reduction.
15. Describe the working and construction of double cone blender.
16. Describe the principle and working of belt conveyer.
17. Describe the working of sintered glass filter.
18. a) Explain briefly about basics of Electrical Engineering.
    b) Discuss the concepts of Maintenance.

PHARMA TECHNOLOGY REQUIRED LAB EQUIPMENTS

S.No.	Item	Quantity per batch (30 students in a batch)
	Wet / Chemical Lab	Item Qty Required
1	Syringes (2ml, 5ml, 10ml) (Is it for lab?/if it is then required)	5 each
2	UV Analyser (Make: Perkin elmer/shimadzu/Thermo)	1
3	FT-IR (Make: Shimadzu/Thermo)	1
4	Mortar and Pessel (Type: Silica, SS-316L, Agate, Granite)	1
5	Halogen Moisture Analyzer	1
6	Seive Shaker	1
7	Seive meshes (All grade levels like 100, 150, 200, 250 etc,..)	2 each
8	Motor grinder	4
9	Silica(Costs less) / Platinum Crucibles (Costs more)	4 & 2
10	Muffle Furnace	1
11	Loss on Drying Machine with Vaccum, pressure gauge meter	1
12	Refractometer	1
13	Polarimeter	1
14	Auto titrator	1
15	Melting point	1
16	Capillary tubes	1
17	TLC chamber	1
18	Brook filed Viscometer	1
19	Black particle size analyzer	1
20	Density meter	1
21	Bulk density and Tapped density tester	1
22	Friabilator	1
23	Vernier callipers	5
24	Micrometer screw gauge	3
25	Karl Fisher Apparatus (Make: Metrom)	1
26	Particle Size Analyzer (Make: Malvern Master 2000)	1
27	Hardness Tester	1
28	Labelling Machine	1
29	Laboratory Microscopes(40X and 100X)	10
30	Barcode scanner	1
31	Torque tester	1
32	Induction cap sealer	1
33	Bursting strength	1
34	Pin hole tester	1
35	Differential scanning calorimeter	1
	Instrumentation	
1	HPLC (Make: Agilent/Waters/Shimadzu)	1 each

2	Mobile phase filteration kit with filters (MilliQ) with vaccum motor	1
3	Milli-Q / TKA water for HPLC	1 each
4	Syringe Filters (6,6-Nylon,PVTF, PVDFE, PTFE etc..)	1 each
5	Specific optical rotation Analyser (Make: Rudolph Autopol V/ Jasco 2000 or 3000)	1 (any one)
6	HPLC vials	1
7	Crimpers	1
8	Dissolution filters (1 micron)	1
9	Gas chromatographer	1
10	GC vials	1
11	GC injection needle	1
12	HPLC columns (Different sizes)	1 each
13	GC columns	1
14	Dissolution Apparatus	1
15	DT Apparatus	1
	Common for use in lab	
1	Analytical balance with printer	4
2	Pipettes (1mL, 2mL, 5 ml/10 ml)	1
3	Sonicators	1
4	Hot air oven	1
5	Rotary shaker	1
6	water bath	1
7	Glassware drying oven	1
8	Cleaning agents (soap/alconox etc)	1
9	Centrifuge	1
10	Centrifuge tubes	1
11	pH meter with ATC Probe/ Glass electrode	1
12	conductivity meter	1
13	Scale	1
14	Magnetic stirrers	1
15	Hot plate with magnetic stirrer	1
16	LOD bottles	1
17	Dessicator	1
18	Droppers	1
19	Vortex mixer	1
20	Lab equipped with Fume Hoods	1
21	Glassware for Lab	As required to run the lab
22	Burrette stand with white tile	1
	Saftey related	
1	Half Face Mask	4
2	Full Face Mask	4
3	Various Cartridges	4
4	Safety Goggles	4

5	Safety Shoes	4
6	Gum Boots	1
7	Chemical Absorbent	1
8	Self-Contained Breathing Apparatus	2
9	PVC Apron	2
10	Gloves (Nitrile, {Heat, acid, chemical} resitant, washing etc..)	2
11	Lab Coat	1 per trainee
12	Surgical Gloves (in Microbiology)	As required to run the lab
13	Eye washer with sprinkler/ Manual bottle eye washer	As required for safety in lab
14	CO_2 type Fire Extinguisher	2
15	ABC Type Fire Extinguisher	2

(B) List of on the job training sites

1. Pharmaceutical Industries
2. Pharmacy Colleges
3. Medical Colleges
4. Pharmacies

On job training syllabus – Pharmatechnology

Pharma industry area of training :

a .Pharmatech operators
b. Production supervisor
c. Warehouse assistant
d. Asistant formulation R&D
e. Assistant –analytical R&D
e. Assistant D & A.

GENERAL :

1. Training on standard operation procedures (SOPs)
2. Training on on-site safety procedures.
3. Training on good laboratory procedures (GLPs)
4. Training on documentation.
5. Communication skills and soft skills.

FORMULATION AREA:

1. Flow chart of a particular dosage form. Eg. Tablets
2. Training on all equipment in the flow: installation, operational and performance qualification of each equipment.
3. Setting and operation of each equipment and calibration
4. Dismantling, cleaning and re-installation of parts of equipment.

LIST OF COMPANIES FOR ON JOB TRAINING

1. DR Reddy's laboratories
2. Mylan
3. Aurobindo pharma
4. Hetero drugs.
5. MSN Laboratories
6. NATCO Laboratories
7. Neuheit Pharma Technologies Pvt Ltd.
8. Sri Krishna Pharma Technologies Pvt Ltd.

LIST OF COLLEGES

1. University College of Pharmaceutical Sciences, Kakatiya University.
2. Department of Pharmacy, Palamur University, Mahaboobnagar.

ANALYTICAL AREA:

1. Overview of various analytical techniques used in pharma industry.

2. Training and practical involvement in all analytical equipment used.

3. Wet lab analysis training.

4. Training to support analysis with sophisticated instruments such as HPLC & GC

5. Hands on experience v with all equipment

Pharma Technology Vocational Course

Qualifications required for post of lecturers:

1. B. Pharmacy with min. 55%
2. M. Pharmacy with min. 55%
3. M. Tech (TPFC) -Technology of Pharmaceuticals & Fine Chemicals), OU with min. 55%
4. Pharm. D with first class/second class

Qualifications required for Lab Assistant for Pharma Technology (Voc.) Institutions:

1. D. Pharmacy
2. Pharma Technology (vocational)

Vertical Mobility:

A) With Bridge course (vocational) subject to permission from state PCI & Pharmacy Council of India, New Delhi:

i. B. Pharmacy
ii. B. Vocational in Pharmaceutical Manufacturing
iii. Pharm. D
iv. D. Pharmacy
v. B. Sc (BZC)

B) Without Bridge course:

i. Paramedical courses - DMLT, DMST, DANS, DOA, DMPHW(M)- (KNR University with bridge counsel)
ii. B. Sc (MLT), B.A & B. Com
iii. B. Sc Microbiology
iv. B. Sc Biochemistry
v. B. Sc Bio-Technology
vi. M.Sc. MLT / Biochemistry / Microbiology / Biotechnology / M. Pharmacy [at P.G. Level]

List of Participants:
List of Subject Experts Committee – Pharma Technology Course

1.	Smt. B. Hemalatha, Sr. Lecturer in Pharmacy, Govt. Polytechnic College, Hyderabad 9849197613
2.	Smt. J. Supriya, Lecturer in Pharma Technology, K. Anji Reddy Voc. Junior College, Hyderabad 7997645515
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4.	Smt. G. Sruthi, Guest Faculty in Ph. T, CSNR GJC, Yadadri Bhuvanagiri 9121746516
5.	Sri. Mohd. Amer Khan, Guest Faculty in Ph. T, GJC Samsthan Narayanpur, Yadadri Bhuvanagiri 9398485202
6	**Verified & finalized by:** Prof. Shashikala, Rtd. Prof. University College of Technology, Osmania University, Hyderabad Phone: 9966661445
7	**Course Co-ordinator:** Dr. R. Jyothsna Rani, Principal & Lecturer S.I.V.E, O/o Commissioner of Intermediate Education, Telangana, Hyderabad Phone: 98484 43985

COMMISSIONER OF INTERMEDIATE EDUCATION