NSHM Knowledge Campus, Kolkata - Group of Institutions

Pharmacy

Part A : Institutional Information

1 Name and Address of the Institution

NSHM Knowledge Campus, Kolkata - Group of Institutions,
124, B.L. Saha Road, Kolkata - 700 053

2 Name and Address of Affiliating University

West Bengal University of Technology

3 Year of establishment of the Institution:

2005

4 Type of the Institution:

○ University	◉ Affiliated
○ Deemed University	○ Any other(Please Specify)
○ Autonomous	

5 Ownership Status:

○ Central Government	☐ Trust
○ State Government	☐ Society
○ Grant In Aided	☐ Section 25 Company
◉ Self financing	☐ Any Other(Please Specify)

6 Other Academic Institutions of the Trust/Society/etc., if any

Name of Institutions	Year of Establishment	Programs of Study	Location
NSHM College of Management & Technology	2008	BBA,BCA,BHM,MHA,BSC MEDICAL INSTRUMENTATION,MSC STATISTICS,MASTERS PUBLIC HEALTH,MSC ENVIRONMENTAL SCIENCES,BSc,Msc HOSPITALITY MANAGEMENT	Kolkata
NSHM Institute of Media & Design	2006	BMS,multimedia science	Kolkata
NSHM Knowledge Campus, Kolkata - Group of Institutions	2010	MBA	Kolkata

7 Details of all the programs being offered by the Institution under consideration:

Name of Program	Program Applied level	Start of year	Year of AICTE approval	Initial Intake	Intake Increase	Current Intake	Accreditation status	From	To	Program for consideration	Program for Duration
BPharm	UG	2005	2005	60	Yes	100	Granted accreditation for 3 years for the period (specify period)	2019	2022	Yes	4

Sanctioned Intake for Last Five Years for the BPharm	
Academic Year	**Sanctioned Intake**
2021-22	100
2020-21	100
2019-20	100
2018-19	100
2017-18	120
2016-17	120

PG pharmaceutics	PG	2009	2009	10	Yes	15	Eligible but not applied	--	--	No	2

Sanctioned Intake for Last Five Years for the PG pharmaceutics	
Academic Year	**Sanctioned Intake**
2021-22	15
2020-21	15
2019-20	24
2018-19	24
2017-18	24
2016-17	24

PG Pharmacology	PG	2010	2010	18	Yes	15	Eligible but not applied	--	--	No	2

Name of Program	Program Applied level	Start of year	Year of AICTE approval	Initial Intake	Intake Increase	Current Intake	Accreditation status	From	To	Program for consideration	Program for Duration

Sanctioned Intake for Last Five Years for the PG Pharmacology	
Academic Year	**Sanctioned Intake**
2021-22	15
2020-21	15
2019-20	24
2018-19	24
2017-18	24
2016-17	24

8 Programs to be considered for Accreditation vide this application:

S No	Level	Discipline	Program
1	Under Graduate	Pharmacy	Pharmacy

9 Total number of employees

A. Regular* Employees (Faculty and Staff):

Items	2021-22		2020-21		2019-20	
	MIN	MAX	MIN	MAX	MIN	MAX
Faculty in Pharmacy (Male)	20	20	16	16	18	18
Faculty in Pharmacy (Female)	11	11	6	6	9	9
Faculty in Science & Humanities (Male)	6	6	7	7	6	6
Faculty in Science & Humanities (Female)	6	6	6	6	6	6
Non-teaching staff (Male)	7	7	7	7	9	9
Non-teaching staff (Female)	0	0	0	0	0	0

B. Contractual* Employees (Faculty and Staff):

Items	2021-22		2020-21		2019-20	
	MIN	MAX	MIN	MAX	MIN	MAX
Faculty in Pharmacy (Male)	1	1	1	1	1	1
Faculty in Pharmacy (Female)	0	0	0	0	0	0
Faculty in Science & Humanities (Male)	0	0	0	0	0	0
Faculty in Science & Humanities (Female)	0	0	0	0	0	0
Non-teaching staff (Male)	0	0	0	0	0	0
Non-teaching staff (Female)	0	0	0	0	0	0

10 Total number of Pharmacy students:

UG	☑ Shift1	☐ Shift2
PG	☑ Shift1	☐ Shift2
Diploma	☐ Shift1	☐ Shift2

UG Shift-1

Total number of Pharmacy students	**2021-22**	**2020-21**	**2019-20**
Total No. of Boys	329	347	344
Total No. of Girls	114	113	130
Total	**443**	**460**	**474**

PG Shift-1

Total number of Pharmacy students	**2021-22**	**2020-21**	**2019-20**
Total No. of Boys	26	41	40
Total No. of Girls	22	35	50
Total	**48**	**76**	**90**

11 Vision of the Institution:

To be a knowledge hub of global excellence

12 Mission of the Institution:

To bring prosperity to the society and enhance the quality of life by imparting knowledge and advancing knowledge & skill, unleashing creative abilities and inculcating responsible and responsive values and attitudes.

13 Contact Information of the Head of the Institution and NBA coordinator, if designated:

Head of the Institution	
Name	Dr. Subhasis Maity
Designation	Director
Mobile No.	9903250735
Email ID	subhasis.maity@nshm.com

NBA Coordinator, If Designated

Name	Satarupa Acharjee Sengupta
Designation	Associate Professor
Mobile No.	9432180917
Email ID	satarupa.acharjee@nshm.com

PART B: Criteria Summary

Critera No.	Criteria	Total Marks	Institute Marks
1	VISION, MISSION AND PROGRAM EDUCATIONAL OBJECTIVES	50	50.00
2	PROGRAM CURRICULUM AND TEACHING - LEARNING PROCESSES	150	150.00
3	COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS)	100	100.00
4	STUDENTS' PERFORMANCE	180	159.37
5	FACULTY INFORMATION AND CONTRIBUTIONS	175	153.35
6	FACILITIES	120	120.00
7	CONTINUOUS IMPROVEMENT	75	72.62
8	STUDENT SUPPORT SYSTEMS	50	50.00
9	GOVERNANCE, INSTITUTIONAL SUPPORT AND FINANCIAL RESOURCES	100	100.00
	Total	**1000**	**955**

Part B

1 VISION, MISSION AND PROGRAM EDUCATIONAL OBJECTIVES (50)

Total Marks 50.00

1.1 State the mission & vission (5)

Total Marks 5.00

Institute Marks : 5.00

Vision of the institute	To be a knowledge hub of global excellence
Mission of the institute	To bring prosperity to the society and enhance the quality of life by imparting knowledge and advancing knowledge & skill, unleashing creative abilities and inculcating responsible and responsive values and attitudes.
Vision of the Department	NSHM College of Pharmaceutical Technology offers high quality technical education by providing strong teaching & excellent learning environment in order to transform the young learners into globally competitive industry ready professionals
Mission of the Department	

Mission No.	Mission Statements
M1	To imbibe proactive professionalism among the students by providing high quality of Under Graduate & Post Graduate programme in Pharmaceutical Technology.
M2	To promote persuation of innovative knowledge, collaborative activities and hands on training in pharmaceutical equipments.
M3	To facilitate students competing for professional careers and higher studies.

1.2 State the Program Educational Objectives (PEOs) (5)

Total Marks 5.00

Institute Marks : 5.00

PEO No.	Program Educational Objectives Statements
PEO1	Establish themselves as successful professionals in the profession of pharmacy with confidence and global competitiveness making intellectual contributions towards it.
PEO2	Persued advanced studies acquiring higher qualifications and applying his/her knowledge with experience towards an advanced professional degree.
PEO3	Attained capabilities as successful team member using effective communications and teamwork skills
PEO4	Engaged in a career for lifelong learning with professional & personal & growth, superior work ethics and good character.

1.3 Indicate where the Vision, Mission and PEOs are published and disseminated among stakeholders (15)

Total Marks 15.00

Institute Marks : 15.00

1. Vision,mission and PEOs are effectively communiced with the management, faculty, alumni, parents, employers and students through meetings, emails.

2. Vision,mission and PEOs are displayed in the department office, department library & laboratories.

3. Vision,mission and PEOs are well published in the department page of the institute website

Institute website : https://goikol.nshm.com/nba.php

College website: www.nshm.com

4.Additionally the dissemination of PEOs to all the stakeholders of the program is done through faculty meetings, student awareness & counseling seminars, student induction program, and parent meetings.

1.4 State the process for defining the Vision & Mission and PEOs of the program (10)

Total Marks 10.00

Institute Marks : 10.00

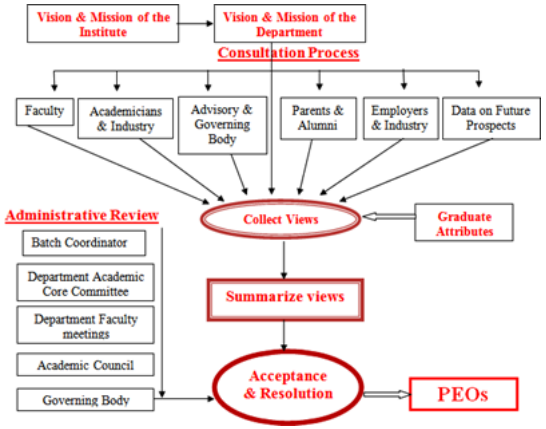
The Program Educational Objectives are established through a consultation process involving the core constituents such as: Students, Alumni, Faculty, Employer & Parents. The PEOs are established through the following steps:

Step 1: Vision and Mission of the Department are taken as a basis to interact with various stakeholders and graduate attributes defined by NBA are also kept in view.

Step 2: Batch Coordinator consults the key constituents and collects their views and submits the views to the department's Academic Core Committee.

Step 3: Department's Academic Core Committee summarizes the collected views in the Faculty meetings and expresses its opinion on the views and further forwards the same to Institute's Academic Council through the Principal.

Step 4: Institute's Academic Council deliberates on the views expressed by the Department's Academic Core Committee and formulate the accepted reviews based on which PEOs are established and resolved through the Governing Body members.



1.5 Establish consistency of PEOs with Mission of the Institute (15)

Total Marks 15.00

Institute Marks : 15.00

The Mission of the department is to provide high quality innovative education through U.G. programme in pharmaceutical technology so that the students prosper in their career or pursue higher education to compete in the professional world.

The following table establishes the ratio and level of correspondence between the objectives and mission components of the Institute.

	Proactive professionalism	Innovation & Research Aptitude	Team work & Industrial Orientation	RATIONALE
PEOs	M1	M2	M3	

PEO-1 - Establish themselves as successful professionals in the profession of pharmacy with confidence and global competitiveness and made intellectual contributions to it.	3	2	3	Mission component M1and M3 highly correlates withPEO 1 as proactive professsionalism and teamwork and industrial orientation facilitatates students competing for careers and higher studies
PEO-2 Carried out advanced studies and acquired higher qualifications applying his or her knowledge and experience towards an advanced professional degree	2	3	2	Mission component 2 highly correlates with PEO2 as innovation and resarch aptitude in students faciltates them towards acquiring higher qualifications.
PEO-3 Attained capabilities as successful team members using effective communications and teamwork skills.	3	2	3	Mission components 1 and 3 highly correlates with PEO3 as proactive professsionalism, teamwork ability and industrial orientation enables graduates to be successful team members

PEO-4 Pursued a career for life-long learning with personal & professional growth, superior work ethics and character	3	3	1	Mission components 1 and 2 highly correlates with PEO-4 as proactive professionalism ,innovation and research aptitude in graduates facilitates a successful career with life long learning. learning

PEO Statements	M1	M2	M3
Establish themselves as successful professionals in the profession of pharmacy with confidence and global competitiveness making intellectual contributions towards it.	3	2	3
Persued advanced studies acquiring higher qualifications and applying his/her knowledge with experience towards an advanced professional degree.	2	3	2
Attained capabilities as successful team member using effective communications and teamwork skills	3	2	3
Engaged in a career for lifelong learning with professional & personal & growth, superior work ethics and good character.	3	3	1

2 PROGRAM CURRICULUM AND TEACHING - LEARNING PROCESSES (150)

Total Marks 150.00

2.1 Program Curriculum (40)

Total Marks 40.00

2.1.1 Delivery of Syllabus Contents and compliance of the curriculum for attainment of POs (10)

Institute Marks : 10.00

Institute follows the well-structured and systematic process in design, development and revision of curricula.

The institute is under MAULANA ABUL KALAM UNIVERSITY OF TECHNOLOGY(formerly West Bengal University of Technology) where semester and credit based system is followed which is globally accepted.

The Institute assesses the need for the revision, to update the subjects and topics which meet the demands of latest development and recent advances happening in the field of pharmacy, the extent and depth of the change, the actual matter which needs to be incorporated and the one which has become redundant which needs to be scrapped out.

The institute is approved by All India Council of Technical Education (AICTE) and Pharmacy Council of India (PCI), however, the institute follows the curricula as designed by MAKAUT (WBUT).

So the institute does not have any right to restructure the curricula. However, when there is a need arising to redesign the curriculum, the institute has always taken initiative for the same, and the institute has the system of obtaining feedback forms on curriculum from students, alumni, parents and academic peers, industry persons. The feedback forms are collected by Departmental Academic Committee, then forwarded to the Academic Council and finally analyzed by the members of the Institutional Board of Studies.

Based on the feedback collected from the student and academic peers, the proposed curriculum is charted out by the institutional Board of Studies. The proposed syllabus is then forwarded to the University for its Approval.

On feedback and suggestion, academic council of MAKAUT initiate restructuring of the curriculam Until the curriculum is revised, the proposed revision is included in the beyond-syllabus teaching methodology like teacher seminar, student seminar, remedial classes, industrial visits, seminar by distinguished guests.

To carry out roles of pharmacist effectively, pharmacists need to be well prepared on how to deal with patients behavior and psychology. The understanding of patient socio-behavioral aspects in the medication use process is paramount to achieving optimal clinical and humanistic outcomes from therapy.

For this purpose the curriculum has included subjects like Pharmacy practise and Pharmacology. These subjects provide knowledge about the rationale behind selection of drug, information about therapeutic uses, side effects of drugs and how to do patient counsellling

Furthermore, topics such as Herbal Drug Technology, Industrial Pharmacy, Quality Assurance, Biostatistics and research methodology, NDDS and social and preventive pharmacy are included in B. Pharm. Syllabus to cater to the changing trends of health care industry

In order to enrich the existing domain knowledge of students elective subjects have been introduced in 8th semester like computer aided drug design,Advanced Instrumentation Techniques and pharmaceutical marketing management.

Pharmaceutical Jurisprudence and Ethics• is also included in the syllabus that gives idea about regulatory aspects in pharmacy especially laws related to drugs and cosmetics and other aspects of pharmacy.

Syllabus has been updated in 2017-18 admission session,the contents of which are as follows.

Syllabus has been updated in 2020-21 and 2021-22 with minor modifications;however the contents remain same

- **Curriculum Structure**

Semester I

Course Code	Name of the course	No. of hours	Tutorial	Full Marks	Credit points
THEORY					
PT105	Human Anatomy and Physiology I– Theory	3	1	100	4
PT101	Pharmaceutical Analysis I – Theory	3	1	100	4
PT106	Pharmaceutics I – Theory	3	1	100	4
PT103	Pharmaceutical Inorganic Chemistry – Theory	3	1	100	4
PRACTICAL					
PT195	Human Anatomy and Physiology – Practical	4	-	100	2
PT191	Pharmaceutical Analysis I – Practical	4	-	100	2
PT196	Pharmaceutics I – Practical	4	-	100	2
PT193	Pharmaceutical Inorganic Chemistry – Practical	4	-	100	2
SESSIONAL*					
HU181	Communication skills – Theory	2	-	100	2

PTB184/ M183	Remedial Biology/ Remedial Mathematics – Theory	2	-	100	2
HU182	Communication skills – Practical	2	-	100	1
PTB185	Remedial Biology – Practical	2	-	100	1
Total		**36**	**4**		**30**

The students who have studied Mathematics / Physics / Chemistry at HSC will be appearing for Remedial Biology course.

The students who have studied Physics / Chemistry / Biology (Botany / Zoology) at HSC will be appearing for Remedial Mathematics course. * Non University Examination (NUE)

SEMESTER 01

PT105. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

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

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Course Content:

Unit-I 10hours

•Introduction to human body

Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

•Cellular level of organization

Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

•Tissue level of organization

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit II 10 Hours

- **Integumentary system**

  Structure and functions of skin

•Skeletal system

Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system, Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction.

- **Joints**

  Structural and functional classification, types of joints movements and its articulation

Unit III 10hours

- **Body fluids and blood**

  Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticuloendothelial system.

•Lymphatic system

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system.

UnitIV 08hours

- **Peripheral nervous system**:

  Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system.

  Origin and functions of spinal and cranial nerves.

•Special senses

Structure and functions of eye, ear, nose and tongue and their disorders.

Unit-V 07hours

- **Cardiovascular system**

  Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

PT195. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones

6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC)count
8. Enumeration of total red blood corpuscles (RBC)count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, NewYork
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MIUSA
4. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother’s medical publishers, NewDelhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother’s medical publishers, NewDelhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother’s medical publishers, NewDelhi.

Reference Books (Latest Editions)

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MIUSA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) byDr. C.C. Chatterrje ,Academic Publishers Kolkata

PT101. PHARMACEUTICAL ANALYSIS (Theory)

45 Hours

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

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

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- develop analytical skills

Course Content:

UNIT-I **10Hours**

a. **Pharmaceutical analysis**- Definition and scope
   i. Different techniques of analysis
   ii. Methods of expressing concentration
   iii. Primary and secondary standards.
   iv. Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and cericammonium sulphate
b. **Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures
c. Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

UNIT-II 10Hours

- **Acid base titration**: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves
- **Non aqueous titration**: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III 10Hours

- **Precipitation titrations**: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.
- **Complexometric titration**: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
- **Gravimetry**: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
- Basic Principles, methods and application of diazotization titration.

UNIT-IV 08Hours

Redox titrations

a. Concepts of oxidation and reduction
b. Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

UNIT-V 07Hours

- **Electrochemical methods of analysis**
  - **Conductometry-** Introduction, Conductivity cell, Conductometric titrations, applications.
  - **Potentiometry -** Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.
  - **Polarography** - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications.

PT191. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours / Week

I Limit Test of the following

(1) Chloride

(2) Sulphate

(3) Iron

(4) Arsenic

II Preparation and standardization of

(1) Sodium hydroxide

(2) Sulphuric acid

(3) Sodium thiosulfate

(4) Potassium permanganate

(5) Ceric ammoniumsulphate

III Assay of the following compounds along with Standardization of Titrant

(1) Ammonium chloride by acid base titration

(2) Ferrous sulphate by Cerimetry

(3) Copper sulphate by Iodometry

(4) Calcium gluconate by complexometry

(5) Hydrogen peroxide by Permanganometry

(6) Sodium benzoate by non-aqueous titration

(7) Sodium Chloride by precipitation titration

IV Determination of Normality by electro-analytical methods

(1) Conductometric titration of strong acid against strong base

(2) Conductometric titration of strong acid and weak acid against strong base

(3) Potentiometric titration of strong acid against strong base

Recommended Books: (Latest Editions)

1. A.H. Beckett & J.B. Stenlakes, Practical Pharmaceutical Chemistry Vol I &II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Drivers Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

PT106. PHARMACEUTICS- I (Theory)

45 Hours

Scope: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

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

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilitiesand pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

Course Content:

UNIT–I **10Hours**

- **Historical background and development of profession of pharmacy**: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
- **Dosage forms:** Introduction to dosage forms, classification and definitions
- **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.
- **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT–II 10Hours

- **Pharmaceutical calculations**: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point depression and molecular weight method.
- **Powders:** Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.
- **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

UNIT–III 08Hours

- **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.

• Biphasicliquids:

- **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome, evaluation.
- **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome, evaluation.

UNIT–IV 08Hours

- **Suppositories**: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.
- **Pharmaceutical incompatibilities**: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

UNIV–V 07Hours

- **Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosage forms

PT196 PHARMACEUTICS I (Practical)

3 Hours / week

1 .Syrups

a) Simple Syrup~~IP'66~~

b) Compound syrup of Ferrous Phosphate~~BPC'68~~

2. Elixirs a) Piperazine citrate elixir.

b) Paracetamol pediatric elixir.

3. Linctus a) Terpin Hydrate Linctus~~IP'66~~

b) Iodine Throat Paint (Mandles Paint)

4. Solutions

5. **Suspensions**

a) Strong solution of ammonium acetate

b) Cresol with soap solution

c) Lugol's solution

a) Calamine lotion

b) Magnesium Hydroxide mixture

c) Aluminimum Hydroxide gel

6. **Emulsions** a) Turpentine Liniment

b) Liquid paraffin emulsion

7. Powders and Granules

a) ORS powder(WHO)

b) Effervescent granules

c) Dusting powder

d) Divided powders

8. Suppositories

a) Glycero gelatin suppository

b) Coca butter suppository

c) Zinc Oxide suppository

9. Gargles and Mouthwashes

a) Iodine gargle

b) Chlorhexidine mouthwash

10. Semisolids

a) Sulphur ointment

b) Non staining-iodine ointment with methylsalicylate

Carbopalgel

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, NewDelhi.
3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea& Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, NewYork.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions andSuspensions, Marcel Dekker, INC, New York

PT 103 PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

45 Hours

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Objectives: Upon completion of course student shall be able to

- know the sources of impurities and methods to determine the impurities ininorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

Course Content:

UNIT I **10Hours**

- **Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

General methods of preparation, assay for the compounds superscripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes

UNIT II 10Hours

- **Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
- **Major extra and intracellular electrolytes**: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.

- **Dental products**: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

UNIT III 10Hours

- **Gastrointestinal agents**

Acidifiers: Ammonium chloride* and Dil. HCl

Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture

Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations

UNIT IV 08Hours

- **Miscellaneous compounds**

Expectorants: Potassium iodide, Ammonium chloride*

Emetics: Copper sulphate*, Sodium potassium tartarate

Haematinics: Ferrous sulphate*, Ferrous gluconate

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite333

Astringents: Zinc Sulphate, Potash Alum

UNIT V 07Hours

- **Radiopharmaceuticals**: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I^{131}, Storage conditions, precautions & pharmaceutical application of radioactive substances.

PT193 PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)

4 Hours / Week

I Limit tests for following ions

Limit test for Chlorides and Sulphates Modified limit test for Chlorides and Sulphates Limit test for Iron

Limit test for Heavy metals Limit test for Lead

Limit test for arsenic

II **Identification test**

Magnesium hydroxide Ferrous sulphate Sodium bicarbonate Calcium gluconate Copper sulphate

III **Test forpurity**

Swelling power of Bentonite

Neutralizing capacity of aluminum hydroxide gel

Determination of potassium iodate and iodine in potassium Iodide

IV **Preparation of inorganicpharmaceuticals**

Boric acid Potash alum Ferrous sulphate

Recommended Books (Latest Editions)

1. A.H. Beckett & J.B. Stenlakes, Practical Pharmaceutical Chemistry Vol I&II, Stahlone Press of University of London, 4th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Drivers Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

HU 181 COMMUNICATION SKILLS (Theory)

30 Hours

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Objectives:

Upon completion of the course the student shall be able to

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and NonVerbal)
3. Effectively manage the team as a teamplayer
4. Develop interviewskills
5. Develop Leadership qualities andessentials

Course content:

UNIT–I **07Hours**

- **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback,Context
- **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotionalbarriers
- **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings,Environment

UNIT–II 07Hours

- **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication
- **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT–III 07Hours

- **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations
- **Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication
- **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

UNIT–IV 05Hours

- **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview
- **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

UNIT–V 04Hours

- **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

HU182 COMMUNICATION SKILLS (Practical)

2 Hours / week

The following learning modules are to be conducted using Wordsworth® English language lab software

Basic communication covering the following topics

MeetingPeople, AskingQuestions, MakingFriends, Whatdidyoudo?, Do'sandDont's

Pronunciations covering the following topics

Pronunciation(ConsonantSounds)Pronunciation andNouns

-

Advanced Learning

-

EffectiveCommunicationWriting Skills

-

Recommended Books: (Latest Edition)

1. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House 2018 (AICTE Recommended Textbook 2018)
2. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education,2011
3. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press,2011
4. Organizational Behaviour, Stephen .P. Robbins, 1st Edition, Pearson,2013
5. Brilliant- Communication skills, Gill Hasson, 1st Edition, Pearson Life,2011
6. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy
1. Ramesh, 5th Edition, Pearson,2013
2. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD,2010
3. Communication skills for professionals, Konar nira, 2nd Edition, New arrivals – PHI, 2011

4. Personality development and soft skills, Barun K Mitra, 1st Edition, Oxford Press, 2011
5. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
6. Soft skills and professional communication, Francis Peters SJ, 1st Edition, McGraw Hill Education, 2011
7. Effective communication, John Adair, 4th Edition, Pan MacMillan,2009
8. Bringing out the best in people, Aubrey Daniels, 2nd Edition, Mc Graw Hill,1999

PTB 184 REMEDIAL BIOLOGY (Theory)

30 Hours

Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

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

- know the classification and salient features of five kingdoms of life
- understand the basic components of anatomy & physiology of plant
- know understand the basic components of anatomy & physiology animal with special reference to human

UNIT I 07Hours

Living world:

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae,Virus,

Morphology of Flowering plants

- Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.
- General Anatomy of Root, stem, leaf of monocotyledons & Dicotylidones.

UNIT II 07Hours

Body fluids and circulation

- Composition of blood, blood groups, coagulation of blood
- Composition and functions of lymph
- Human circulatory system
- Structure of human heart and blood vessels
- Cardiac cycle, cardiac output and ECG

Digestion and Absorption

- Human alimentary canal and digestive glands
- Role of digestive enzymes
- Digestion, absorption and assimilation of digested food

Breathing and respiration

- Human respiratory system
- Mechanism of breathing and its regulation
- Exchange of gases, transport of gases and regulation of respiration
- Respiratory volumes

UNIT III **07Hours**

Excretory products and their elimination

- Modes of excretion
- Human excretory system- structure and function
- Urine formation
- Rennin angiotensin system

Neural control and coordination

- Definition and classification of nervous system
- Structure of a neuron
- Generation and conduction of nerve impulse
- Structure of brain and spinal cord
- Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

Chemical coordination and regulation

- Endocrine glands and their secretions
- Functions of hormones secreted by endocrine glands

Human reproduction

- Parts of female reproductive system
- Parts of male reproductive system
- Spermatogenesis and Oogenesis
- Menstrual cycle

UNIT IV 05Hours

Plants and mineral nutrition:

- Essential mineral, macro and micronutrients
- Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis

- Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

UNIT V 04Hours

Plant respiration: Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development

- Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators

Cell - The unit of life

- Structure and functions of cell and cell organelles. Cell division

Tissues

- Definition, types of tissues, location and functions.

Text Books

a. Text book of Biology by S. B.Gokhale

b. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books

a. A Text book of Biology by B.V. Sreenivasa Naidu

b. A Text book of Biology by Naidu and Murthy

c. Botany for Degree students By A.C. Dutta.

d. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthakrishnan.

e. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

PTB 185 REMEDIAL BIOLOGY (Practical)

30 Hours

1. Introduction to experiments in biology

a) Study of Microscope

b) Section cutting techniques

c) Mounting and staining

d) Permanent slide preparation

2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

Reference Books

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava.

3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof.M.J.H.Shafi

M 183 REMEDIAL MATHEMATICS (Theory)

30 Hours

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

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

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

Course Content:

UNIT–I **06Hours**

- ### Partial fraction

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

- ### Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

- ### Function*:*

Real Valued function, Classification of real valued functions,

- ### Limits and continuity:

Introduction , Limit of a function, Definition of limit of a function (-

definition) ,lim $\frac{x^n - a^n}{} = na^{n-1}$, lim $\frac{\sin}{} 1$, = $x \quad a \quad x \quad a$ 0

UNIT–II **06Hours**

- ### Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices insolving Pharmacokinetic equations.

UNIT–III 06Hours

- **Calculus Differentiation** :

Introductions,Derivativeofafunction,Derivativeofaconstant, Derivativeofaproductofaconstantandafunction,Derivativeofthesumordifferenceoftwofunctions, Derivativeoftheproductoftwofunctions(productformula), Derivativeofthequotientoftwofunctions

(Quotient formula) –**Without Proof**, Derivative of x^n *w.r.t*x, where *n* is any rational number, Derivative of e^x,, Derivative of loge *x* , Derivative of a^x,Derivative of trigonometric functions from first principles **(without Proof)**, Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application.

UNIT–IV 06Hours

- **Analytical Geometry**

Introduction: Signs of the Coordinates, Distance formula,

Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line

Integration: Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

UNIT-V 06Hours

- **Differential Equations** : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, **Application in solving Pharmacokinetic equations**
- **Laplace Transform** : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, **Application in solving Chemical kinetics and Pharmacokinetics equations**

Recommended Books (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal
5. Advanced Engineering Mathematics by Dr. Chandrika Prasad & Dr. Reena Garg, Khanna Publishing House, New Delhi.

SEMESTER - 02

PT 215 HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

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

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

Course Content:

Unit I **10 hours**

- Nervous system

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts,reflex activity)

Unit II 06 hours

- **Digestive system**

Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

- Energetics

Formation and role of ATP, Creatinine Phosphate and BMR.

Unit III

- **Respiratory system** **10 hours**

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration

Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

- Urinary system

Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

Unit IV 10 hours

- **Endocrinesystem**

Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Unit V 09 hours

- **Reproductive system**

Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

- Introduction to genetics

Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance

PT 298 HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc

4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feed back mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MIUSA
4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology byTortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, NewDelhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother’s medical publishers, NewDelhi.

Reference Books:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MIUSA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,AcademicPublishers Kolkata

PT 213 PHARMACEUTICAL ORGANIC CHEMISTRY –I (Theory)

45 Hours

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

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

1. write the structure, name and the type of isomerism of the organic compounds
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability ofcompounds,
4. identify/confirm the identification of organiccompound

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT-I 07 Hours

- **Classification, nomenclature and isomerism**

Classification of Organic Compounds

Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds)

Structural isomerisms in organic compounds

UNIT3-II 10 Hours

- **Alkanes*, Alkenes* and Conjugateddienes***

SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP^2 hybridization in alkenes

E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E1 verses E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT-III 10 Hours

- **Alkyl halides***

SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

- **Alcohols*-** Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propyleneglycol

UNIT-IV 10 Hours

- **Carbonyl compounds* (Aldehydes andketones)**

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT-V 08 Hours

- **Carboxylicacids***

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and esters

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

- **Aliphatic amines* -** Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

PT 296 PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical)

4 Hours / week

1. Systematic qualitative analysis of unknown organic compounds like:

I. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation,etc.

II. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test

III. Solubility test

IV. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.

V. Melting point/Boiling point of organic compounds

VI. Identification of the unknown compound from the literature using melting point/ boiling point.

VII. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.

VIII. Minimum 5 unknown organic compounds to be analysed systematically.

2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison andBoyd
2. Organic Chemistry by I.L. Finar ,Volume-I
3. Textbook of Organic Chemistry byB.S. Bahl & Arun Bahl.
4. Organic Chemistry byP.L.Soni
5. Practical Organic Chemistry byMann and Saunders.
6. Vogel's text book of Practical OrganicChemistry
7. Advanced Practical organic chemistry byN.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampmanand Kriz.
9. Reaction and reaction mechanism byAhluwaliah/Chatwal.

PT 214 BIOCHEMISTRY (Theory)

45 Hours

Scope: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives: Upon completion of course student shell able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Content:

UNIT I **08 Hours**

- ## Biomolecules

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

- ## Bioenergetics

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP

UNIT II 10 Hours

- **Carbohydrate metabolism**

Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance

HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance

Hormonal regulation of blood glucose level and Diabetes mellitus

- ## Biological oxidation

Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation.

Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT III 10 Hours

- **Lipid metabolism**

β-Oxidation of saturated fatty acid (Palmitic acid)

Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid)

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

- Amino acid metabolism

General reactions of amino acid metabolism:Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

UNIT IV 10 Hours

- **Nucleic acid metabolism and genetic information transfer**

Biosynthesis of purine and pyrimidine nucleotides

Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome

Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis

Genetic code, Translation or Protein synthesis and inhibitors

UNIT V 07 Hours

- **Enzymes**

Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

Enzyme inhibitors with examples

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation

Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions

PT 297 BIOCHEMISTRY (Practical)

4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose,Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Recommended Books (Latest Editions)

1. Principles of Biochemistry by Lehninger.

2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by RamaRao.
6. Textbook of Biochemistry byDeb.
7. Outlines of Biochemistry by Conn andStumpf
8. Practical Biochemistry byR.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry byDavid T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medicalstudents by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

PT 216 PATHOPHYSIOLOGY (THEORY)

45 Hours

Scope: Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives: Upon completion of the subject student shall be able to –

1. Describe the etiology and pathogenesis of the selected disease states
2. Name the signs and symptoms of the diseases and
3. Mention the complications of the diseases.

Course Content

Unit I **10 Hours**

- **Basic principles of Cell injury and Adaptation:**

Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury**,** Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage)**,** Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia)**,** Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis &Alkalosis, Electrolyteim balance

- **Basic mechanism involved in the process of inflammation andrepair:**

Introduction, Clinical signs of inflammation, Different types of Inflammation,Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's,Mediators of inflammation,Basic principles of wound healing in the skin,Pathophysiology of Atherosclerosis

Unit II **10 Hours**

- Cardiovascular System:

Hypertension, congestive heart failure, ischemic heart disease (angina,myocardial infarction, atherosclerosis and arteriosclerosis)

- **Respiratory system:**Asthma, Chronic obstructive airwaysdiseases.
- **Renal system:**Acute and chronicrenalfailure

Unit III **10 Hours**

Haematological Diseases:

Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia

- **Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormones
- **Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.
- **Gastrointestinal system:** Peptic Ulcer

Unit IV **8 Hours**

- Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.
- **Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout
- **Principles of cancer:** classification, etiology and pathogenesis of cancer

- **Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, Gout
- **Principles of Cancer:** Classification, etiology and pathogenesis of Cancer

UnitV **7Hours**

- **Infectious diseases:** Meningitis,Typhoid, Leprosy, Tuberculosis Urinary tract infections
- **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhea

Recommended Books (Latest Editions)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins &Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier;2014.
2. HarshMohan;Textbook of Pathology;6thedition;India;JaypeePublications;2010.
3. Laurence B, Bruce C, Bjorn K. ;Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill;2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; unitedstates;
5. Williamand Wilkins, Baltimore;1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone;2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company;2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical;2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company;1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Recommended Journals

1. The Journal of Pathology. ISSN: 1096-9896(Online)
2. The American Journal of Pathology. ISSN:0002-9440
3. Pathology. 1465-3931(Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology.ISSN-0377-4929.

HU282ENVIRONMENTALSCIENCES(Theory)

30 hours

Scope: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

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

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Course Content:

Unit-I 10 hours

The Multidisciplinary nature of environmental studies Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems

Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources;

f) Land resources: Role of an individual in conservation of natural resources

Unit-II 10 hours

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-III 10 hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books (Latest edition):

1. M.P. Poonia & S.C. Sharma, Environmental Studies, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)
2. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers
3. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd.Bikaner.
4. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,
5. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
6. Clark R.S., Marine Pollution, Clanderson PressOxford
7. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Mumbai,1196p
8. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
9. Down of Earth, Centre for Science and Environment
10. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi (2018)

PTC 203 COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hrs

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

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

1. know the various types of application of computers inpharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

Course Content:

UNIT–I 06 hours

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division

UNIT–II

06 hours

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

UNIT–III 06 hours

Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

UNIT –IV 06 hours

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V 06 hours

Computers as data analysis in Preclinical development: Chromatographic dada analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)

PTC 293. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.

2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MSWORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Recommended books (Latest edition):

1. Computer Application in Pharmacy – William E. Fassett – Lea and Febiger,600 South Washington Square, USA, (215)922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins– Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C. Rastogi- CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath– Cary N. Prague – Wiley Dreamtech India (P)Ltd.,4435/7,Ansari Road, Daryagani, New Delhi -110002
5. Handbook of Computer Fundamentals, R.S. Salaria, Khanna Publishing House, New Delhi.

SEMESTER - III

PT 314. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)

45 Hours

Scope: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

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

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. prepare organic compounds

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT I 10 Hours

- **Benzene and its derivatives**
  - A. Evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel’srule
  - B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.
  - C. Effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction

D. Structure and uses of DDT, Saccharin, BHC and Chloramine

UNITII 10 Hours

- **Phenols*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols
- **Aromatic Amines* -** Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts
- **Aromatic Acids* –**Acidity, effect of substituents on acidity and important reactions of benzoic acid.

UNIT III 10 Hours

- **Fats and Oils**

a. Fatty acids –reactions.
b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

UNIT IV 08 Hours

- **Polynuclear Hydrocarbons:**

Structure and medicinal uses of Naphthalene*, Phenanthrene*,Anthracene*, Diphenyl methane, Triphenyl methane.

UNIT V 07 Hours

- **Cycloalkanes***

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

PT 394. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

4 Hrs/week

I. Experiments involving laboratory techniques
    - Recrystallization
    - Steam distillation
II. Determination of following oil values (including standardization of reagents)
    - Acid value
    - Saponification value

- Iodine value

III Preparation of compounds

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
- 2,4,6-Tribromo aniline/Para bromo acetanilide fromAniline/
- Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction

- Cinnammic acid from Benzaldehyde by Perkin reaction
- *P*-Iodo benzoic acid from *P*-amino benzoic acid

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison andBoyd
2. Organic Chemistry by I.L. Finar ,Volume-I
3. Textbook of Organic Chemistry byB.S. Bahl & Arun Bahl.
4. Practical Organic Chemistry byMann and Saunders.
5. Vogel's text book of Practical Organic Chemistry
6. Introduction to Organic Laboratory techniques by Pavia, Lampman andKriz.

PT 316. PHYSICAL PHARMACEUTICS-I (Theory)

45 Hours

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

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

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **10 Hours**

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

UNIT-II 10 Hours

States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT-III 08 Hours

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilization, detergency, adsorption at solid interface.

UNIT-IV 08 Hours

Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

UNIT-V 07 Hours

pH, Buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

PT 396. PHYSICAL PHARMACEUTICS – I (Practical)

4 Hrs/week

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl_4 andwater
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and dropweight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated charcoal
9. Determination of critical micellar concentration of surfactants
10. .Determination of stability constant and donor acceptor ratio ofPABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric- Glycine complex by pH titration method

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene,Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger,Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms.Disperse systems, volume 1, 2, 3. Marcel DekkarInc.
7. Physical Pharmaceutics by Ramasamy C andManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam,J. Thimmasettee
9. Physical Pharmaceutics by C.V.S.Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K.Khar

PT 319. PHARMACEUTICAL MICROBIOLOGY (Theory)

45 Hours

Scope: Studyofallcategoriesofmicroorganisimsespeciallyfortheproductio nofalchol antibiotics, vaccines, vitamins enzymesetc..

Objectives: Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterlization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Course content:

Unit I **10 Hours**

Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes

Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).

Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy

Unit II 10 Hours

Identification of bacteria using staining techniques (simple, Gram's &Acid fast staining) and biochemical tests (IMViC).

Study of principle, procedure, merits, demerits and applications of physical, chemical, gaseous, radiation and mechanical method of sterilization.

Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.

Unit III 10 Hours

Study of morphology,classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit IV 08 Hours

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins B12

Unit V 07Hours

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

PT 399. PHARMACEUTICAL MICROBIOLOGY (Practical)

4 Hrs/week

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Recommended Books (Latest edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelzar, Chan Kreig, Microbiology, Tata McGraw Hilledn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed.Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher andDistribution.
8. Peppler: MicrobialTechnology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananth narayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverlycompany

PT 317. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

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

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course content:

Broad overview should be covered only on the following unit systems

UNIT-I 10 Hours

- **Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.
- **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.
- **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

UNIT-II 10 Hours

- **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.
- **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.
- **Distillation:** Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT-III 08 Hours

- **Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.
- **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

UNIT-IV 08 Hours

- **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtzfilter.
- **Centrifugation:** Objectives, principle &applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT-V 07 Hours

- **Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selection for Pharmaceutical plant construction, Types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

PT 397 - PHARMACEUTICAL ENGINEERING (Practical)

4 Hours/week

I. Determination of radiation constant of brass, iron, unpainted and painted glass.
II. Steam distillation – To calculate the efficiency of steam distillation.
III. To determine the overall heat transfer coefficient by heat exchanger.
IV. Construction of drying curves (for calcium carbonate and starch).
V. Determination of moisture content and loss on drying.
VI. Determination of humidity of air – i) From wet and dry bulb temperatures – use of Dew point method.
VII. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, dehumidifier.
VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations

Construction of various size frequency curves including arithmetic and logarith

IX. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/viscosity)
XII. To study the effect of time on the Rate of Crystallization.
XIII. To calculate the uniformity Index for given sample by using Double Cone Blender.

SEMESTER IV

PT414. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)

45 Hours

Scope: This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Objectives: At the end of the course, the student shall be able to

1. understand the methods of preparation and properties of organic compounds
2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. know the medicinal uses and other applications of organic compounds

Course Content:

Note: To emphasize on definition, types, mechanisms, examples, uses/applications

UNIT-I **10 Hours**

Stereo isomerism

Optical isomerism –

Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules

DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers

Reactions of chiral molecules

Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute

UNIT-II 10 Hours

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems)

Methods of determination of configuration of geometrical isomers.

Conformational isomerism in Ethane, n-Butane and Cyclohexane.

Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

Stereospecific and stereoselective reactions

UNIT-III 10 Hours

Heterocyclic compounds:

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene

Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

UNIT-IV 8 Hours

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

UNIT-V 07 Hours

Reactions of synthetic importance

Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.

Oppenauer-oxidation and Dakin reaction.

Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation

Recommended Books (Latest Editions)

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

PT416. PHYSICAL PHARMACEUTICS-II (Theory)

45Hours

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

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

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I 07 Hours

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.

UNIT-II 10 Hours

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudo plastic, dilatant, plastic, thixotropic, thixotropic in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III 10 Hours

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

UNIT-IV 10Hours

Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT-V 10 Hours

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

PT 496. PHYSICAL PHARMACEUTICS- II (Practical)

3 Hrs/week

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopicmethod
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspendingagent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid byusing Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosa J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

PT 418. PHARMACOLOGY-I (Theory)

45 Hrs

Scope: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

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

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.

3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Course Content:

UNIT-I **08 hours**

1.General Pharmacology

a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.
b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT-II 12 Hours

General Pharmacology

a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
b. Adverse drug reactions.
c. Drug interactions (pharmacokinetic and pharmacodynamic)
d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT-III 10 Hours

2. **Pharmacology of drugs acting on peripheral nervous system**
    a. Organization and function of ANS.
    b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.
    c. Parasympathomimetics, Parasympatholytics, Sympathomimetics,sympatholytics.
    d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
    e. Local anesthetic agents.
    f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV 08 Hours

3. **Pharmacology of drugs acting on central nervous system**
    a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
    b. General anesthetics and pre-anesthetics**.**
    c. Sedatives, hypnotics and centrally acting muscle relaxants.
    d. Anti-epileptics
    e. Alcohols and disulfiram

UNIT-V 07 Hours

3. **Pharmacology of drugs acting on central nervous system**
    a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxietyagents, anti-manics and hallucinogens.
    b. Drugs used in Parkinsons disease and Alzheimer’s disease.
    c. CNS stimulants and nootropics.
    d. Opioid analgesics and antagonists
    e. Drug addiction, drug abuse, tolerance and dependence.

PT 498. PHARMACOLOGY-I (Practical)

4Hrs/Week

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by software's and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rangand Dale's Pharmacology,.Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
9. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

PT 412.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)

45 Hours

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

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

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

Course Content:

UNIT-I **10 Hours**

Introduction to Pharmacognosy:

a. Definition, history, scope and development of Pharmacognosy
b. Sources of Drugs – Plants, Animals, Marine &Tissue culture
c. Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

UNIT-II **10 Hours**

Cultivation, Collection, Processing and storage of drugs of natural origin:

Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications.

Polyploidy, mutation and hybridization with reference to medicinal plants

Conservation of medicinal plants

UNIT-III **07 Hours**

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy. Edible vaccines

UNIT IV **10 Hours**

Pharmacognosy in various systems of medicine:

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

UNIT V **08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey

Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

PT 492. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)

4 Hours/Week

1. Analysis of crude drugs by chemical tests: **(**i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and paliside ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crudedrugs
9. Determination of moisture content of crudedrugs
10. Determination of swelling index andfoaming

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers& Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

PT 413. Industrial Pharmacy I (Theory)

45 Hours

Scope: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

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

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms

3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality.

Course content:

3 hours/ week

UNIT-I 07 Hours

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. ***Physical properties:*** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism
b. ***Chemical Properties:*** Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significant

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT-II 10 Hours

Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects incoating.
c. Quality control tests: In process and finished product tests

Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT-III 08 Hours

Capsules:

a. ***Hard gelatin capsules:*** Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.
b. ***Soft gelatin capsules:*** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

UNIT-IV 10 Hours

Parenteral Products:

a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity
b. Production procedure, production facilities and controls, aseptic processing
c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.
d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-V 10 Hours

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

PT 493. Industrial Pharmacy I (Practical) 4 Hours/week

1. Preformulation studies on paracetamol/aspirin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Quality control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

SEMESTER - V

PT 513A. MEDICINAL CHEMISTRY – I (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

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

1. understand the chemistry of drugs with respect to their pharmacological activity
2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. know the Structural Activity Relationship (SAR) of different class of drugs
4. write the chemical synthesis of some drugs

Course Content:

UNIT- I 10 Hours

Introduction to Medicinal Chemistry

History and development of medicinal chemistry

Physicochemical properties in relation to biological action

Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

Drug metabolism

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

UNIT- II **10 Hours**

Drugs acting on Autonomic Nervous System Adrenergic

Neurotransmitters: Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Atenolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III **10 Hours**

Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Ethopropazine hydrochloride.

UNIT- IV **08 Hours**

Drugs acting on Central Nervous System

A. **Sedatives and Hypnotics:**

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Pentobarbital, Secobarbital

Miscelleneous:

Amides & imides: Glutethmide. Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. **Antipsychotics**

Phenothiazines: SAR of Phenothiazeines - Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

Anticonvulsants: SAR of Anticonvulsants**,** mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital.

Hydantoins: Phenytoin*, Mephenytoin, Ethotoin **Oxazolidine diones:** Trimethadione, Paramethadione **Succinimides:** Phensuximide, Methsuximide, Ethosuximide*

Urea and monoacylureas: Phenacemide, Carbamazepine* **Benzodiazepines**: Clonazepam

Miscellaneous: Primidone, Valproic acid , Gabapentin, Felbamate

UNIT – V **07 Hours**

Drugs acting on Central Nervous System General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

PT593 MEDICINAL CHEMISTRY – I (Practical)

4 Hours/Week

IPreparation of drugs/ intermediates

I. 1,3-pyrazole
II. 1,3-oxazole
III. Benzimidazole
IV. Benztriazole
V. 2,3- diphenyl quinoxaline
VI. Benzocaine
VII. Phenytoin
VIII. Phenothiazine
IX. Barbiturate
II. **Assay of drugs**

1. Chlorpromazine
2. Phenobarbitone
3. Atropine
4. Ibuprofen
5. Aspirin
6. Furosemide

III. **Determination of Partition coefficient for any two drugs**

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

PT 513B. MEDICINAL CHEMISTRY – II (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

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

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*).Only structure and Chemical name of the highlighted compounds need to be discussed.

UNIT- I **10** Hours

Antihistaminic agents: Histamine, receptors and their distribution in the humanbody

H1–antagonists: SAR of classical H1 antagonists, Diphenhydramine hydrochloride*, Doxylamines cuccinate, Clemastine fumarate, Tripelenamine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

H2-antagonists: Cimetidine*, Famotidine, Ranitidin.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin **Plant products:** Etoposide, Vinblastin sulphate, Vincristin sulphate **Miscellaneous:** Cisplatin, Mitotane.

UNIT – II **10 Hours**

Anti-anginal:

Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.

Calcium channel blockers: SAR of 1,4-dihydropyridines, Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine.

Diuretics:

Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide. Thiazides: SAR of thiazide diuretics, Chlorthiazide*, Hydrochlorothiazide,

Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid. Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT- III **10 Hours**

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol

Coagulant & Anticoagulants: Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Tezosentan.

UNIT- IV **08 Hours**

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Diethyl stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, levo-Norgestrel, Levonorgestrol

Corticosteroids: **SAR of corticosteroids,** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT – V **07 Hours**

Antidiabetic agents:

Insulin and its preparations

Sulfonyl ureas: SAR of Sulfonyl ureas, Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acrabose, Voglibose.

Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives; Cocaine, Meprylcaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine,

Anilide derivatives: Lignocaine (lidocaine), Mepivacaine, Ropivacaine.

Miscellaneous: Diperodon, Dibucaine.*

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel

PT 518 PHARMACOLOGY-II (Theory)

45 Hours

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

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

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases

Unit-II 10 hours

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-III 10 hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books (Latest edition):

1. M.P. Poonia & S.C. Sharma, Environmental Studies, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)
2. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers
3. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd.Bikaner.
4. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,
5. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
6. Clark R.S., Marine Pollution, Clanderson PressOxford
7. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Mumbai,1196p
8. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
9. Down of Earth, Centre for Science and Environment
10. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi (2018)

PTC 203 COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hrs

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

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

1. know the various types of application of computers inpharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

Course Content:

UNIT–I 06 hours

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division

Text Box: Concept of Information Systems and Software : Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

UNIT–II

06 hours

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

UNIT–III 06 hours

Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

UNIT –IV 06 hours

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V 06 hours

Computers as data analysis in Preclinical development: Chromatographic dada analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)

PTC 293. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MSWORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Recommended books (Latest edition):

1. Computer Application in Pharmacy – William E. Fassett – Lea and Febiger,600 South Washington Square, USA, (215)922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins– Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C. Rastogi- CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath– Cary N. Prague – Wiley Dreamtech India (P)Ltd.,4435/7,Ansari Road, Daryagani, New Delhi -110002
5. Handbook of Computer Fundamentals, R.S. Salaria, Khanna Publishing House, New Delhi.

SEMESTER - III

PT 314. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)

45 Hours

Scope: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

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

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,

4. prepare organic compounds

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT I 10 Hours

- **Benzene and its derivatives**
  - A. Evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel'srule
  - B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.
  - C. Effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction
  - D. Structure and uses of DDT, Saccharin, BHC and Chloramine

UNITII 10 Hours

- **Phenols*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols
- **Aromatic Amines* -** Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts
- **Aromatic Acids* –**Acidity, effect of substituents on acidity and important reactions of benzoic acid.

UNIT III 10 Hours

- **Fats and Oils**

a. Fatty acids –reactions.
b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

UNIT IV 08 Hours

- **Polynuclear Hydrocarbons:**

Structure and medicinal uses of Naphthalene*, Phenanthrene*,Anthracene*, Diphenyl methane, Triphenyl methane.

UNIT V 07 Hours

- **Cycloalkanes***

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

PT 394. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

4 Hrs/week

I. Experiments involving laboratory techniques
  - Recrystallization
  - Steam distillation

II. Determination of following oil values (including standardization of reagents)
   - Acid value
   - Saponification value

- Iodine value

III Preparation of compounds

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
- 2,4,6-Tribromo aniline/Para bromo acetanilide fromAniline/
- Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction
- Cinnammic acid from Benzaldehyde by Perkin reaction
- *P*-Iodo benzoic acid from *P*-amino benzoic acid

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison andBoyd
2. Organic Chemistry by I.L. Finar ,Volume-I
3. Textbook of Organic Chemistry byB.S. Bahl & Arun Bahl.
4. Practical Organic Chemistry byMann and Saunders.
5. Vogel's text book of Practical Organic Chemistry
6. Introduction to Organic Laboratory techniques by Pavia, Lampman andKriz.

PT 316. PHYSICAL PHARMACEUTICS-I (Theory)

45 Hours

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

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

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **10 Hours**

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

UNIT-II 10 Hours

States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT-III 08 Hours

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilization, detergency, adsorption at solid interface.

UNIT-IV 08 Hours

Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

UNIT-V 07 Hours

pH, Buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

PT 396. PHYSICAL PHARMACEUTICS – I (Practical)

4 Hrs/week

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl_4 andwater
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and dropweight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated charcoal
9. Determination of critical micellar concentration of surfactants
10. .Determination of stability constant and donor acceptor ratio ofPABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric- Glycine complex by pH titration method

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene,Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger,Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms.Disperse systems, volume 1, 2, 3. Marcel DekkarInc.
7. Physical Pharmaceutics by Ramasamy C andManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam,J. Thimmasettee
9. Physical Pharmaceutics by C.V.S.Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K.Khar

PT 319. PHARMACEUTICAL MICROBIOLOGY (Theory)

45 Hours

Scope: Studyofallcategoriesofmicroorganisimsespeciallyfortheproductio nofalchol antibiotics, vaccines, vitamins enzymesetc..

Objectives: Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterlization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Course content:

Unit I **10 Hours**

Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes

Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).

Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy

Unit II 10 Hours

Identification of bacteria using staining techniques (simple, Gram's &Acid fast staining) and biochemical tests (IMViC).

Study of principle, procedure, merits, demerits and applications of physical, chemical, gaseous, radiation and mechanical method of sterilization.

Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.

Unit III 10 Hours

Study of morphology,classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit IV 08 Hours

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins B12

Unit V 07Hours

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

PT 399. PHARMACEUTICAL MICROBIOLOGY (Practical)

4 Hrs/week

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Recommended Books (Latest edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelzar, Chan Kreig, Microbiology, Tata McGraw Hilledn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed.Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher andDistribution.
8. Peppler: MicrobialTechnology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananth narayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverlycompany

PT 317. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

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

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course content:

Broad overview should be covered only on the following unit systems

UNIT-I 10 Hours

- **Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.
- **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

- **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

UNIT-II 10 Hours

- **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.
- **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.
- **Distillation:** Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT-III 08 Hours

- **Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.
- **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

UNIT-IV 08 Hours

- **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtzfilter.
- **Centrifugation:** Objectives, principle &applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT-V 07 Hours

- **Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selection for Pharmaceutical plant construction, Types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

PT 397 - PHARMACEUTICAL ENGINEERING (Practical)

4 Hours/week

I. Determination of radiation constant of brass, iron, unpainted and painted glass.
II. Steam distillation – To calculate the efficiency of steam distillation.
III. To determine the overall heat transfer coefficient by heat exchanger.
IV. Construction of drying curves (for calcium carbonate and starch).

V. Determination of moisture content and loss on drying.
VI. Determination of humidity of air – i) From wet and dry bulb temperatures – use of Dew point method.
VII. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, dehumidifier.
VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations

Construction of various size frequency curves including arithmetic and logarith

IX. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/viscosity)
XII. To study the effect of time on the Rate of Crystallization.
XIII. To calculate the uniformity Index for given sample by using Double Cone Blender.

SEMESTER IV

PT414. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)

45 Hours

Scope: This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Objectives: At the end of the course, the student shall be able to

1. understand the methods of preparation and properties of organic compounds
2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. know the medicinal uses and other applications of organic compounds

Course Content:

Note: To emphasize on definition, types, mechanisms, examples, uses/applications

UNIT-I **10 Hours**

Stereo isomerism

Optical isomerism –

Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules

DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers

Reactions of chiral molecules

Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute

UNIT-II 10 Hours

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems)

Methods of determination of configuration of geometrical isomers.

Conformational isomerism in Ethane, n-Butane and Cyclohexane.

Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

Stereospecific and stereoselective reactions

UNIT-III 10 Hours

Heterocyclic compounds:

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene

Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

UNIT-IV 8 Hours

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

UNIT-V 07 Hours

Reactions of synthetic importance

Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.

Oppenauer-oxidation and Dakin reaction.

Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation

Recommended Books (Latest Editions)

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

PT416. PHYSICAL PHARMACEUTICS-II (Theory)

45Hours

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

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

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **07 Hours**

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.

UNIT-II 10 Hours

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudo plastic, dilatant, plastic, thixotropic, thixotropic in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III 10 Hours

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

UNIT-IV 10Hours

Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT-V 10 Hours

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

PT 496. PHYSICAL PHARMACEUTICS- II (Practical)

3 Hrs/week

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopicmethod
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspendingagent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid byusing Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosa J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

PT 418. PHARMACOLOGY-I (Theory)

45 Hrs

Scope: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

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

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Course Content:

UNIT-I **08 hours**

1.General Pharmacology

a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.
b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT-II 12 Hours

General Pharmacology

a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
b. Adverse drug reactions.
c. Drug interactions (pharmacokinetic and pharmacodynamic)
d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT-III 10 Hours

2. **Pharmacology of drugs acting on peripheral nervous system**
   a. Organization and function of ANS.
   b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.
   c. Parasympathomimetics, Parasympatholytics, Sympathomimetics,sympatholytics.
   d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
   e. Local anesthetic agents.
   f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV 08 Hours

3. **Pharmacology of drugs acting on central nervous system**
   a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
   b. General anesthetics and pre-anesthetics**.**
   c. Sedatives, hypnotics and centrally acting muscle relaxants.

d. Anti-epileptics
e. Alcohols and disulfiram

UNIT-V 07 Hours

3. **Pharmacology of drugs acting on central nervous system**
    a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxietyagents, anti-manics and hallucinogens.
    b. Drugs used in Parkinsons disease and Alzheimer's disease.
    c. CNS stimulants and nootropics.
    d. Opioid analgesics and antagonists
    e. Drug addiction, drug abuse, tolerance and dependence.

PT 498. PHARMACOLOGY-I (Practical)

4Hrs/Week

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by software's and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rangand Dale's Pharmacology,.Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
9. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

PT 412.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)

45 Hours

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

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

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

Course Content:

UNIT-I **10 Hours**

Introduction to Pharmacognosy:

a. Definition, history, scope and development of Pharmacognosy
b. Sources of Drugs – Plants, Animals, Marine &Tissue culture
c. Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

UNIT-II **10 Hours**

Cultivation, Collection, Processing and storage of drugs of natural origin:

Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications.

Polyploidy, mutation and hybridization with reference to medicinal plants

Conservation of medicinal plants

UNIT-III **07 Hours**

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy. Edible vaccines

UNIT IV **10 Hours**

Pharmacognosy in various systems of medicine:

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

UNIT V **08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey

Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

PT 492. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)

4 Hours/Week

1. Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and paliside ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crudedrugs
9. Determination of moisture content of crudedrugs
10. Determination of swelling index andfoaming

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers& Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.

6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

PT 413. Industrial Pharmacy I (Theory)

45 Hours

Scope: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

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

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality.

Course content:

3 hours/ week

UNIT-I 07 Hours

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. ***Physical properties:*** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism
b. ***Chemical Properties:*** Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significant

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT-II 10 Hours

Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects incoating.
c. Quality control tests: In process and finished product tests

Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT-III 08 Hours

Capsules:

a. ***Hard gelatin capsules:*** Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.
b. ***Soft gelatin capsules:*** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

UNIT-IV 10 Hours

Parenteral Products:

a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity
b. Production procedure, production facilities and controls, aseptic processing
c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.
d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-V 10 Hours

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

PT 493. Industrial Pharmacy I (Practical) 4 Hours/week

1. Preformulation studies on paracetamol/aspirin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Quality control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

SEMESTER - V

PT 513A. MEDICINAL CHEMISTRY – I (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

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

1. understand the chemistry of drugs with respect to their pharmacological activity
2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. know the Structural Activity Relationship (SAR) of different class of drugs
4. write the chemical synthesis of some drugs

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

Only structure and Chemical name of the highlighted compounds need to be discussed.

UNIT- I 10 Hours

Introduction to Medicinal Chemistry

History and development of medicinal chemistry

Physicochemical properties in relation to biological action

Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

Drug metabolism

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

UNIT- II **10 Hours**

Drugs acting on Autonomic Nervous System Adrenergic

Neurotransmitters: Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Atenolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III **10 Hours**

Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Ethopropazine hydrochloride.

UNIT- IV **08 Hours**

Drugs acting on Central Nervous System

A. **Sedatives and Hypnotics:**

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Pentobarbital, Secobarbital

Miscelleneous:

Amides & imides: Glutethmide. Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. **Antipsychotics**

Phenothiazines: SAR of Phenothiazeines - Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

Anticonvulsants: SAR of Anticonvulsants**,** mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital.

Hydantoins: Phenytoin*, Mephenytoin, Ethotoin **Oxazolidine diones:** Trimethadione, Paramethadione **Succinimides:** Phensuximide, Methsuximide, Ethosuximide*

Urea and monoacylureas: Phenacemide, Carbamazepine* **Benzodiazepines**: Clonazepam

Miscellaneous: Primidone, Valproic acid , Gabapentin, Felbamate

UNIT – V **07 Hours**

Drugs acting on Central Nervous System General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

PT593 MEDICINAL CHEMISTRY – I (Practical)

4 Hours/Week

IPreparation of drugs/ intermediates

I. 1,3-pyrazole
II. 1,3-oxazole
III. Benzimidazole
IV. Benztriazole
V. 2,3- diphenyl quinoxaline
VI. Benzocaine
VII. Phenytoin
VIII. Phenothiazine
IX. Barbiturate
II. **Assay of drugs**

1. Chlorpromazine
2. Phenobarbitone
3. Atropine
4. Ibuprofen
5. Aspirin
6. Furosemide

III. **Determination of Partition coefficient for any two drugs**

Recommended Books (Latest Editions)

1. Wilson and Giswold’s Organic medicinal and Pharmaceutical Chemistry.
2. Foye’s Principles of Medicinal Chemistry.
3. Burger’s Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington’s Pharmaceutical Sciences.
6. Martindale’s extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.

8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

PT 513B. MEDICINAL CHEMISTRY – II (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

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

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*).Only structure and Chemical name of the highlighted compounds need to be discussed.

UNIT- I **10** Hours

Antihistaminic agents: Histamine, receptors and their distribution in the humanbody

H1–antagonists: SAR of classical H1 antagonists, Diphenhydramine hydrochloride*, Doxylamines cuccinate, Clemastine fumarate, Tripelenamine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

H2-antagonists: Cimetidine*, Famotidine, Ranitidin.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin **Plant products:** Etoposide, Vinblastin sulphate, Vincristin sulphate **Miscellaneous:** Cisplatin, Mitotane.

UNIT – II **10 Hours**

Anti-anginal:

Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.

Calcium channel blockers: SAR of 1,4-dihydropyridines, Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine.

Diuretics:

Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide. Thiazides: SAR of thiazide diuretics, Chlorthiazide*, Hydrochlorothiazide,

Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid. Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT- III **10 Hours**

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol

Coagulant & Anticoagulants: Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Tezosentan.

UNIT- IV **08 Hours**

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Diethyl stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, levo-Norgestrel, Levonorgestrol

Corticosteroids: **SAR of corticosteroids,** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT – V **07 Hours**

Antidiabetic agents:

Insulin and its preparations

Sulfonyl ureas: SAR of Sulfonyl ureas, Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acrabose, Voglibose.

Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives; Cocaine, Meprylcaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine,

Anilide derivatives: Lignocaine (lidocaine), Mepivacaine, Ropivacaine.

Miscellaneous: Diperodon, Dibucaine.*

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel

PT 518 PHARMACOLOGY-II (Theory)

45 Hours

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

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

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases

1. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
2. Demonstrate the various receptor actions using isolated tissue preparation
3. Appreciate correlation of pharmacology with related medical sciences

Course Content:

UNIT-I 10Hours

1. **Pharmacology of drugs acting on cardio vascular system**
   a. Introduction to hemodynamic and electrophysiology ofheart.
   b. Drugs used in congestive heart failure
   c. Anti-hypertensive drugs.
   d. Anti-anginal drugs.
   e. Anti-arrhythmic drugs.
   f. Anti-hyperlipidemic drugs.

UNIT-II **10Hours**

1. Pharmacology of drugs acting on cardio vascular system

   a. Drug used in the therapy of shock.
   b. Hematinics, coagulants and anticoagulants.
   c. Fibrinolytics and anti-platelet drugs
   d. Plasma volume expanders

2. **Pharmacology of drugs acting on urinary system**
   a. Diuretics
   b. Anti-diuretics.

UNIT-III **10Hours**

1. Autocoids and related drugs

   a. Introduction to autacoids and classification
   b. Histamine, 5-HT and their antagonists.

c. Prostaglandins, Thromboxanes and Leukotrienes.

d. Angiotensin, Bradykinin and Substance P.

e. Non-steroidal anti-inflammatory agents

f. Anti-gout drugs

g. Antirheumatic drugs

UNIT-IV **10 hours**

5. Pharmacology of drugs acting on endocrine system

a. Basic concepts in endocrine pharmacology.

b. Anterior Pituitary hormones- analogues and their inhibitors.

c. Thyroid hormones- analogues and their inhibitors.

d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.

d. Insulin, Oral Hypoglycemic agents and glucagon.

e. ACTH and corticosteroids.

UNIT-V **05hours**

5. Pharmacology of drugs acting on endocrine system

a. Androgens and Anabolic steroids.

b. Estrogens, progesterone and oral contraceptives.

c. Drugs acting on the uterus.

6. Bioassay

a. Principles and applications of bioassay.

b. Types of bioassay

c. Bioassay of insulin, oxytocin, vasopressin

PT 598 PHARMACOLOGY-II (Practical)

4Hrs/Week

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frogrectus abdominis muscle and rat ileum respectively.

7. Bioassay of histamine using guinea pig ileum bymatching method.
8. Bioassay of oxytocin using rat uterine horn by interpolationmethod.
9. Bioassay of serotonin using rat fundus strip bythree point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD2 value using guinea pigileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

PT 512 PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

45Hours

Scope: The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

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

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbalformulation.
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents

Course Content:

UNIT-I **9 Hours**

Metabolic pathways in higher plants and their determination

a. Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, mevalonic pathways.
b. Study of utilization of radioactive isotopes in the investigation of Biosynthetic studies.

UNIT-II **17 Hours**

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,

Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta

Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis

Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,

Tannins: Catechu, Pterocarpus

Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony

Glycosides: Senna, Aloes, Bitter Almond

Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

UNIT-III **06 Hours**

Isolation, Identification and Analysis of Phytoconstituents

a. Terpenoids: Menthol, Citral, Artemisin
b. Glycosides: Glycyrhetinic acid & Rutin
c. Alkaloids: Atropine, Quinine, Reserpine, Caffeine
d. Resins: Podophyllotoxin, Curcumin

UNIT IV **10 Hours**

Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

PT 592 PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)

4 Hours/Week

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
    a. Caffeine - from tea dust.
    b. Starch from Potato
    c. Atropine from Belladonna
    d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin

(iii) Colophony (iv) Aloes (v) Myrrh

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

PT 516 PHARMACEUTICAL JURISPRUDENCE (Theory)

45 Hours

Scope: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

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

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT-I 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.**

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT-II **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H and H1, M, N, P,T,U, V, X, Y, Part XII B, Sch F

A) Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

UNIT-III **10 Hours**

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution andfunctions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties

- **Medicinal and Toilet Preparation Act –1955**: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

- **Narcotic Drugs and Psychotropic substances Act-1985 and Rules**: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, Offences and Penalties

UNIT-IV **08 Hours**

- **Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties
- **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Stocking of Animals, Performance of Experiments, Records, Offences and Penalties
- **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)- 2013.

Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

UNIT-V **07 Hours**

- **Pharmaceutical Legislations –** A brief review of Health survey and development committee, Brief note on Hathi committee and Mudaliar committee
- **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath
- **Medical Termination of Pregnancy Act** – a brief review
- **Introduction to Intellectual Property Rights (IPR)** – a brief review

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9. Bare Acts of the said laws published by Government. Reference books (Theory)

SEMESTER – VI

PT 613. MEDICINAL CHEMISTRY – III (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

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

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biologicalactivity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.

4. Know the importance of SAR of drugs.

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

UNIT – I 10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

β-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin

Tetracyclines: Tetracycline,Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT – II 10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

Macrolide: Erythromycin Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrugs design.

Antimalarials: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Mefloquine.

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.

UNIT – III 10 Hours

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents:

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Ribavirin, Saquinavir, Indinavir, Ritonavir.

UNIT – IV 08 Hours

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine,.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

UNIT – V **07 Hours**

Introduction to Drug Design

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hanschanalysis.

Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

PT 693. MEDICINAL CHEMISTRY- III (Practical)

4 Hours / week

I	Preparation of drugs and intermediates	
1	Sulphanilamide	
2	7-Hydroxy, 4-methyl coumarin	
3	Chlorobutanol	
4	Triphenyl imidazole	
5	Tolbutamide	
6	Hexamine	
II	Assay of drugs	
1	Isonicotinic acid hydrazide	

2	Chloroquine	
3	Metronidazole	
4	Dapsone	
5	Chlorpheniramine maleate	
6	Benzyl penicillin	
III	Preparation of medicinally important compounds or intermediates by Microwave irradiation technique	
IV	Drawing structures and reactions using chem draw®	
V	Determination of physicochemical properties such as logP, clogP,	MR

Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry. Burger's Medicinal Chemistry, Vol I to IV.
3. Introduction to principles of drug design- Smith and Williams.
4. Remington's Pharmaceutical Sciences.
5. Martindale's extra pharmacopoeia.
6. Organic Chemistry by I.L. Finar, Vol. II.
7. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
8. Indian Pharmacopoeia.
9. Text book of practical organic chemistry- A.I.Vogel.

PT-618. PHARMACOLOGY-III (Theory)

45 Hours

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immunopharmacology and in addition, emphasis on the principles of toxicology and chrono-pharmacology.

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

1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. Comprehend the principles of toxicology and
3. Appreciate correlation of pharmacology with related medical sciences.

Course Content:

UNIT-I **12hours**

1. Pharmacology of drugs acting on Respiratory system

   a. Anti -asthmatic drugs
   b. Drugs used in the management of COPD
   c. Expectorants and antitussives
   d. Nasal decongestants
   e. Respiratory stimulants

2. Pharmacology of drugs acting on the Gastrointestinal Tract

   a. Antiulcer agents.
   b. Drugs for constipation and diarrhea.
   c. Appetite stimulants and suppressants.
   d. Digestants and carminatives.
   e. Emetics and anti-emetics.

UNIT-II 10hours

3. Chemotherapy

a. General principles of chemotherapy.
b. Sulfonamides and cotrimoxazole.
c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

UNIT-III 10hours

3. Chemotherapy

a. Antitubercular agents
b. Antileprotic agents
c. Antifungal agents
d. Antiviral drugs
e. Anthelmintics
f. Antimalarial drugs
g. Antiamoebic agents

UNIT-IV 08hours

3. Chemotherapy

l. Urinary tract infections and sexually transmitted diseases.
m. Chemotherapy of malignancy.

4. Immunopharmacology

   a. Immunostimulants
   b. Immunosuppressant

Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

UNIT-V 05hours

5. Principles of toxicology

a. Definition and basic knowledge of acute, subacute and chronic toxicity.

b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity

6. Chronopharmacology

a. Definition of rhythm and cycles.

b. Biological clock and their significance leading to chronotherapy

PT-698 PHARMACOLOGY-III (Practical)

4Hrs/Week

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by usingsemi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

**Experiments are demonstrated by simulated experiments/videos*

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology

6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

PT 612. HERBAL DRUG TECHNOLOGY (Theory)

45 hours

Scope: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

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

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

Course content:

UNIT-I **15 Hours**

Herbs as raw materials

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs

Selection, identification and authentication of herbal materials Processing of herbal raw material

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine

a. Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy
b. Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

UNIT-II 7 Hours

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-III 13 Hours

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations :

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT- IV 05 Hours

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.

UNIT-V 05 Hours

General Introduction to Herbal Industry

Herbal drugs industry: Present scope and future prospects.

Schedule T – Good Manufacturing Practice of Indian systems of medicine

Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

PT 692. HERBAL DRUG TECHNOLOGY (Practical)

4 hours/ week

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari

5. Pharmacognosy & Phytochemistry by V.D.Rangari

6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)

7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

PT 616. BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)

45 Hours

Scope: This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein.

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

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

Course Content:

UNIT-I **10 Hours**

Introduction to Biopharmaceutics

Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

UNIT- II 10 Hours

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- III 10 Hours

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - K_E ,$t_{1/2}$,V_d,AUC,Ka, Cl_t and CL_R- definitions methods of eliminations, understanding of their significance and application

UNIT- IV 08 Hours

Multicompartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and mainetnance doses and their significance in clinical settings.

UNIT- V 07 Hours

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity.

c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition.USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company,Pennsylvania 1989.
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia

PT-619. PHARMACEUTICAL BIOTECHNOLOGY (Theory)

45 Hours

Scope:

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

Objectives: Upon completion of the subject student shall be able to;

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries

4. Appreciate the use of microorganisms in fermentation technology

Unit I 10 Hours

a) Brief introduction to Biotechnologywith reference to Pharmaceutical Sciences.
b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
d) Brief introduction to Protein Engineering.
e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
f) Basic principles of genetic engineering.

Unit II 10 Hours

a) Study of cloning vectors, restriction endonucleases and DNA ligase.

b) Recombinant DNA technology. Application of genetic engineering in medicine.

c) Application of r DNA technology and genetic engineering in the production of:

i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.

d) Brief introduction to PCR

Unit III 10 Hours

Types of immunity- humoral immunity, cellular immunity

a) Structure of Immunoglobulins

b) Structure and Function of MHC

c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.

d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.

e) Storage conditions and stability of official vaccines

f) Hybridoma technology- Production, Purification and Applications

Unit IV 08Hours

a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.

b) Genetic organization of Eukaryotes and Prokaryotes

c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.

d) Introduction to Microbial biotransformation and applications.

e) Mutation: Types of mutation/mutants.

Unit V 07 Hours

a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.

b) Large scale production fermenter design and its various controls.

c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,

d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substituties.

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal

Society of Chemistry.

5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.

6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi.

PT 611. PHARMACEUTICAL QUALITY ASSURANCE (Theory)

45Hours

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

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

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

Course content:

UNIT – I **12 Hours**

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines **Quality by design (QbD)**: Definition, overview, elements of QbD program, tools **ISO 9000 & ISO14000**: Overview, Benefits, Elements, steps for registration **NABL accreditation** : Principles and procedures

UNIT – II 08Hours

Organization and personnel: Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

Equipments and raw materials: Equipment selection, purchase specifications, maintenance of stores for raw materials.

UNIT – III 10 Hours

Quality Control: Quality control test for containers, rubber closures and secondary packing materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

UNIT – IV 06 Hours

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

UNIT – V 09 Hours

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

Recommended Books: (Latest Edition)

1. Quality Assurance Guide byorganization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.

3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. Total Quality Management, M.P. Poonia & S.C. Sharma, Khanna Books Publishing.
5. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
6. How to Practice GMP's – P P Sharma.
7. ISO 9000 and Total Quality Management – Sadhank G Ghosh
8. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
9. Good laboratory Practices – Marcel Deckker Series
10. ICH guidelines, ISO 9000 and 14000 guidelines

SEMESTER – VII

PT 711. INSTRUMENTAL METHODS OF ANALYSIS (Theory)

45 Hours

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.

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

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

Course Content:

UNIT –I **10 Hours**

UV Visible spectroscopy

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi component analysis

Fluorimetry

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

UNIT –II 10 Hours

IR spectroscopy

Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations

Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications

Nepheloturbidometry- Principle, instrumentation and applications

UNIT –III 10 Hours

Introduction to chromatography

Adsorption and partition column chromatography-Methodology, advantages, disadvantages and applications.

Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.

Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications

Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

UNIT –IV 08 Hours

Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.

UNIT –V 07 Hours

Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications

Gel chromatography- Introduction, theory, instrumentation and applications

Affinity chromatography- Introduction, theory, instrumentation and applications

Flame Photometry-Principle, interferences, instrumentation and applications

PT 791. INSTRUMENTAL METHODS OF ANALYSIS (Practical)

4 Hours/Week

1	Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2	Estimation of dextrose by colorimetry
3	Estimation of sulfanilamide by colorimetry
4	Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5	Assay of paracetamol by UV- Spectrophotometry
6	Estimation of quinine sulfate by fluorimetry
7	Study of quenching of fluorescence
8	Determination of sodium by flame photometry

9	Determination of potassium by flame photometry
10	Determination of chlorides and sulphates by nephelo turbidometry
11	Separation of amino acids by paper chromatography
12	Separation of sugars by thin layerchromatography
13	Separation of plant pigments by column chromatography
14	Demonstration experiment on HPLC
15	Demonstration experiment on Gas Chromatography

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.KSharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry byA.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

PT 716A. INDUSTRIAL PHARMACYII (Theory)

45 Hours

Scope: This course is designed to impart fundamental knowledge on pharmaceutical product development and translation 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
4. Understand the approval process and regulatory requirements for drug products

Course Content:

UNIT-I **8 Hours**

Pilot plant scale up techniques: 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, SUPAC guidelines.

UNIT-II 12 Hours

Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE /

SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

UNIT-III 12 Hours

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

Regulatory requirements for drug approval: 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 studies, Clinical Research Protocols, Data Presentation for FDA Submissions, Management of Clinical Studies.

UNIT-IV 07 Hours

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to GLP

UNIT-V 06Hours

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Recommended Books: (Latest Editions)

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_ Affairs.
2. International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php (http://www.iraup.com/about.php)
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought bylearning plus, inc. available at http.//www.cgmp.com/ra.htm. (http://www.cgmp.com/ra.htm)

PT-718. PHARMACY PRACTICE (Theory)

45 Hours

Scope: In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

Objectives: Upon completion of the course, the student shall 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 community pharmacy;
10. appreciate the concept of Rational drugtherapy.

Unit I: 10 Hours

a) Hospital and it's organization

Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

b) Hospital pharmacy and its organization

Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

c) Adverse drug reaction

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.

d) Community Pharmacy

Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

Unit II: 10 Hours

a) Drug distribution system in a hospital

Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

b) Hospital formulary

Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

c) Therapeutic drug monitoring

Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

d) Medication adherence

Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

e) Patient medication history interview

Need for the patient medication history interview, medication interview forms.

f) Community pharmacy management

Financial, materials, staff, and infrastructure requirements.

Unit III: 10 Hours

a) Pharmacy and therapeutic committee

Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

b) Drug information services: Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

c) Patient counseling

Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist

d) Education and training program in the hospital

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, and Role of pharmacist in the interdepartmental communication and community health education.

e) Prescribed medication order and communication skills

Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

Unit IV 8 Hours

a) Budget preparation and implementation

Budget preparation and implementation

a) Clinical Pharmacy

Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, 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.

b) Over the counter (OTC) sales

Introduction and sale of over the counter, and Rational use of common over the counter medications.

Unit V 7 Hours

a) Drug store management and inventory control

Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

b) Investigational use of drugs

Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

c) Interpretation of Clinical Laboratory Tests

Blood chemistry, hematology, and urinalysis

Recommended Books (Latest Edition):

1. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills,* 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger;

1986.

4. Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
5. Scott LT. *Basic skills in interpreting laboratory data*, 4thed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. *Health Education and Community Pharmacy,* 18th ed. India: CBS Publishers & Distributers; 2008.

Journals:

1. Therapeutic drug monitoring. ISSN: 0163-4356
2. Journal of pharmacy practice. ISSN : 0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900 (online)
4. Pharmacy times (Monthly magazine)

PT 716B: NOVEL DRUG DELIVERY SYSTEMS (Theory)

45 Hours

Scope: This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

Objectives: Upon completion of the course student shall be able

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

Course content:

Unit-I **10 Hours**

Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug deliverysystems.

Unit-II 10 Hours

Microencapsulation: Definition, advantages and disadvantages, microspheres / microcapsules, microparticles, methods of microencapsulation, applications

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump

Unit-III 10 Hours

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

Unit-IV 10Hours

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

Unit-V 05 Hours

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts

Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

Recommended Books: (Latest Editions)

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

Journals

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian Drugs (IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel & Decker)
5. International Journal of Pharmaceutics (Elsevier Sciences)

SEMESTER – VIII

PT 817. BIOSTATISITCS AND RESEARCH METHODOLOGY (Theory)

45 Hours

Scope: To understand the applications of Biostatics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel**.**

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

- Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)
- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems**.**

Course content:

Unit-I **10 Hours**

Introduction: Statistics, Biostatistics, Frequency distribution

Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples

Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems

Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

Unit-II 10 Hours

Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x

= a + by, Multiple regression, standard error of regression– Pharmaceutical Examples **Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems

Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples

Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

Unit-III 10 Hours

Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test

Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph **Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

Unit-IV 8 Hours

Blocking and confounding system for Two-level factorials

Regression modeling: Hypothesis testing in Simple and Multiple regression models **Introduction to Practical components of Industrial and Clinical Trials Problems**: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Formulation development and Clinical trial approach

Unit-V 7Hours

Design and Analysis of experiments:

Factorial Design: Definition, 22, 23design. Advantage of factorial design **Response Surface methodology**: Central composite design, Historical design, Optimization Techniques

Recommended Books (Latest edition):

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
4. Design and Analysis of Experiments –Wiley Students Edition, Douglas and C. Montgomery

PT-818. SOCIAL AND PREVENTIVE PHARMACY

Hours: 45

Scope:

The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Objectives:

After the successful completion of this course, the student shall be able to:

- Acquire high consciousness/realization of current issuesrelated to health and pharmaceutical problems within the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related to health and pharmaceutical issues

Course content:

Unit I: 10 Hours

Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health

Hygiene and health: personal hygiene and health care; avoidable habits

Unit II: 10 Hours

Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

Unit III: 10 Hours

National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

Unit IV: 08 Hours

National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program

Unit V: 07 Hours

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Recommended Books (Latest edition)*:*

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

Recommended Journals:

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland

PT 810A. PHARMA MARKETING MANAGEMENT (Theory)

45 Hours

Scope:

The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.

Course Objective: The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

Unit I 10 Hours

Marketing:

Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.

Pharmaceutical market:

Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation& targeting.Consumer profile; Motivation and prescribing habits of the physician; patients choice of physician and retail pharmacist.Analyzing the Market;Role of market research.

Unit II 10 Hours

Product decision:

Classification, product line and product mix decisions, product life cycle,product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.

Unit III 10 Hours

Promotion:

Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

Unit IV 10 Hours

Pharmaceutical marketing channels:

Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR):

Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

Unit V 10 Hours

Pricing:

Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order)and NPPA (National Pharmaceutical Pricing Authority).

Emerging concepts in marketing:

Vertical & Horizontal Marketing; RuralMarketing; Consumerism; Industrial Marketing; Global Marketing.

Recommended Books: (Latest Editions)

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, IndianContext,Macmilan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.

PT 810B. COMPUTER AIDED DRUG DESIGN (Theory)

45Hours

Scope: This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

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

- Design and discovery of lead molecules
- The role of drug design in drug discovery process
- The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
- The design of new drug molecules using molecular modeling software

Course Content:

UNIT-I **10 Hours**

Introduction to Drug Discovery and Development

Stages of drug discovery and development

Lead discovery and Analog Based Drug Design

Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

UNIT-II 10 Hours

Quantitative Structure Activity Relationship (QSAR)

SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

UNIT-III 10 Hours

Molecular Modeling and virtual screening techniques

Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,

Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.

UNIT-IV 08 Hours

Informatics & Methods in drug design

Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT-V 07 Hours

Molecular Modeling: Introduction to molecular mechanics and quantum mechanics.Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Recommended Books (Latest Editions)

1. Robert GCK, ed., “Drug Action at the Molecular Level” University Prak Press Baltimore.
2. Martin YC. “Quantitative Drug Design” Dekker, New York.
3. Delgado JN, Remers WA eds “Wilson & Gisvolds’s Text Book of Organic Medicinal & Pharmaceutical Chemistry” Lippincott, New York.
4. Foye WO “Principles of Medicinal chemistry ‘Lea & Febiger.
5. Koro Ikovas A, Burckhalter JH. “Essentials of Medicinal Chemistry” Wiley Interscience.
6. Wolf ME, ed “The Basis of Medicinal Chemistry, Burger’s Medicinal Chemistry” John Wiley & Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
8. Smith HJ, Williams H, eds, “Introduction to the principles of Drug Design” Wright Boston.
9. Silverman R.B. “The organic Chemistry of Drug Design and Drug Action” Academic Press New York.

PT 810C ADVANCED INSTRUMENTATION TECHNIQUES

45 Hours

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

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

- understand the advanced instruments used and its applications in druganalysis
- understand the chromatographic separation and analysis of drugs.
- understand the calibration of various analytical instruments
- know analysis of drugs using various analytical instruments.

Course Content:

UNIT-I **10 Hours**

Nuclear Magnetic Resonance spectroscopy

Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

Mass Spectrometry- Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, applications

UNIT-II 10 Hours

Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X- Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X ray, Crystallography, powder diffraction, structural elucidation and applications.

UNIT-III 10 Hours

Calibration and validation-as per ICH and USFDA guidelines

Calibration of following Instruments

Electronic balance, UV-Visible spectrophotometer, IR, spectrophotometer,Fluorimeter, Flame Photometer, HPLC and GC

UNIT-IV 08 Hours

Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

Extraction techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

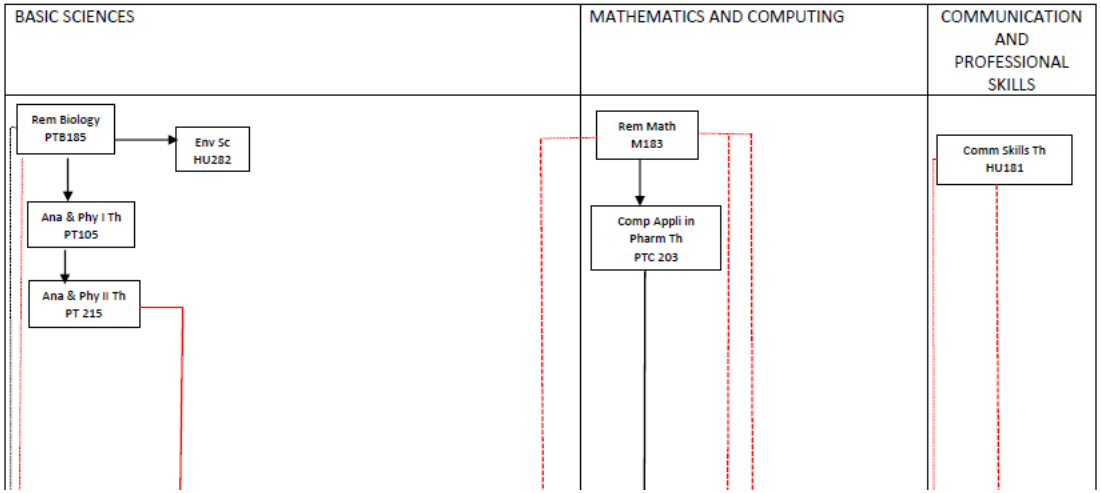
UNIT-V 07 Hours

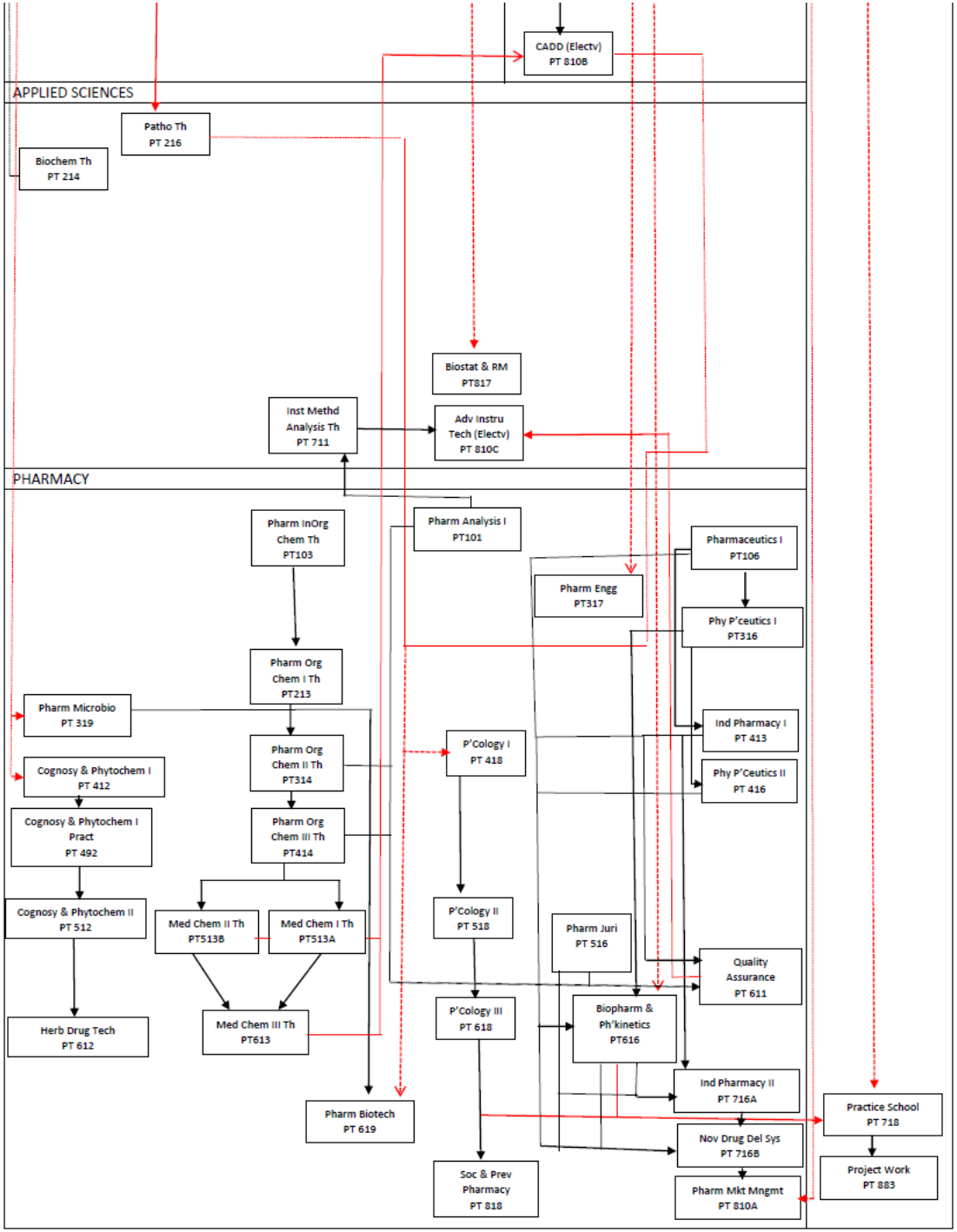
Hyphenated techniques-LC-MS/MS, GC-MS/MS,

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.KSharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry byA.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein.

SCHEMATICS OF THE PREREQUISITES OF THE COURSES IN THE CURRICULAM




CADD (Electv)
PT 810B
APPLIED SCIENCES
Patho Th
PT 216
Biochem Th
PT 214
Biostat & RM
PT817
Inst Methd
Analysis Th
PT 711
Adv Instru
Tech (Electv)
PT 810C
PHARMACY
Pharm InOrg
Chem Th
PT103
Pharm Analysis I
PT101
Pharmaceutics I
PT106
Pharm Engg
PT317
Phy P'ceutics I
PT316
Pharm Org
Chem I Th
PT213
Pharm Microbio
PT 319
Ind Pharmacy I
PT 413
Pharm Org
Chem II Th
PT314
P'Cology I
PT 418
Phy P'Ceutics II
PT 416
Cognosy & Phytochem I
PT 412
Cognosy & Phytochem I
Pract
PT 492
Pharm Org
Chem III Th
PT414
Cognosy & Phytochem II
PT 512
Med Chem II Th
PT513B
Med Chem I Th
PT513A
P'Cology II
PT 518
Pharm Juri
PT 516
Quality
Assurance
PT 611
Herb Drug Tech
PT 612
Med Chem III Th
PT613
P'Cology III
PT 618
Biopharm &
Ph'kinetics
PT616
Ind Pharmacy II
PT 716A
Practice School
PT 718
Pharm Biotech
PT 619
Nov Drug Del Sys
PT 716B
Project Work
PT 883
Soc & Prev
Pharmacy
PT 818
Pharm Mkt Mngmt
PT 810A

PROGRAM CURRICULAM GROUPING BASED ON DIFFERENT COMPONENTS

COURSE COMPONENT	CURRICULUM CONTENT (% OF TOTAL NO. OF CREDITS OF PROGRAM	TOTAL NO. OF CONTACT HRS	TOTAL NO. OF CREDITS	PO	PEO
PHARMACY	67.24 %	162	156	PO1, PO2, PO3, PO4, PO5, PO6, PO 7, PO8, PO9, PO10, PO 11	PEO1, PEO3, PEO4
BASIC SCIENCES	10.14%	21	18	PO1, PO2, PO5, PO6, PO7, PO10, PO11	PEO1, PEO2
APPLIED SCIENCES	10.14%	25	29	PO1, PO2, PO5, PO10, PO11	PEO1, PEO2, PEO4
MATHEMATICS AND COMPUTING	5.97%	16	14	PO1, PO2, PO10	PEO1, PEO2
COMMUNICATION AND PROFESSIONAL SKILLS	5.97%	28	15	PO4, PO8, PO9	PEO1, PEO3, PEO4

Program Curriculam subjects and their relavance to Programme outcomes														
Semester-1	COURSE NO	PAPER CODE	COURSE NAME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	COURSE-1	PT 105	Human Anatomy and Physiology I-Theory	H	H	_	_	L	_	_	_	_	_	_
	COURSE-2	PT101	Pharmaceutical Analysis I-Theory	H	H	_	_	_	_	_	_	_	H	_
	COURSE-3	PT106	Pharmaceutics I-Theory	H	H	_	_	M	M	_	_	_	M	_
	COURSE-4	PT 103	Pharmaceutical Inorganic chemistry Theory	H	M	_	_	L	_	_	_	_	_	_
	COURSE-5	PT 195	Human Anatomy and Physiology Practical	H	H	_	_	M	_	_	_	_	M	L

	COURSE-6	PT 191	Pharmaceutical Analysis I – Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-7	PT 196	Pharmaceutics I – Practical	_	H	_	_	_	M	_	H	L	_	_
	COURSE-8	PT193	Pharmaceutical Inorganic Chemistry – Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-9	HU 181	Communication skills – Theory	_	_	_	H	_	_	_	H	H	_	_
	COURSE-10	PTB184	Remedial Biology-Theory	H	_	_	_	_	M	L	_	_	_	_
	COURSE-11	M183	Remedial Mathematics – Theory	H	H	_	_	_	_	_	_	_	_	_
	COURSE-12	HU182	Communication skills – Practical	_	_	_	H	_	_	_	_	H	_	_
	COURSE-13	PTB 185	Remedial Biology – Practical	H	_	_	_	_	M	L	_	_	H	_
Semester-2	COURSE-14	PT 215	Human Anatomy and Physiology II Theory	H	_	_	_	L	_	_	_	_	_	L
	COURSE-15	PT 213	Pharmaceutica l Organic Chemistry I – Theory	H	M	_	_	_	_	_	_	_	_	_
	COURSE-16	PT 214	Biochemistry Theory	H	_	_	_	_	_	_	_	_	M	_
	COURSE-17	PT 216	Pathophysiolo gy – Theory	H	_	_	_	H	_	_	_	_	_	M
	COURSE-18	PTC203	Computer Applications in Pharmacy Theory	H	H	_	_	_	_	_	_	_	H	_
	COURSE-19	PTC 293	Computer Applications In Pharmacy Practical	_	H	_	_	_	_	_	_	_	H	_
	COURSE-20	PT 296	Pharmaceutica l Organic Chemistry I– Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-21	PT 297	Biochemistry – Practical	H	H	_	_	M	_	_	_	_	_	_
	COURSE-22	PT 298	Human Anatomy and Physiology II –Practical	H	H	_	_	M	_	_	_	_	_	H
	COURSE-23	HU 282	Environmenta l sciences – Theory	_	_	_	_	_	M	H	_	_	_	_
Semester-3	COURSE-24	PT 314	Pharmaceutical Organic Chemistry II – Theory	H	H	_	_	_	_	_	_	_	M	_

	COURSE-25	PT 316	Physical Pharmaceutics I – Theory	H	H	_	_	_	_	_	_	H	_
	COURSE-26	PT 319	Pharmaceutical Microbiology-Theory	M	H	M	_	L	H	H	_	_	_	_
	COURSE-27	PT 317	Pharmaceutical Engineering Theory	H	H	H	L	_	_	H	_	_	H	_
	COURSE-28	PT 394	Pharmaceutical Organic Chemistry II – Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-29	PT 396	Physical Pharmaceutics I – Practical	_	H	H	_	_	_	_	_	_	H	_
	COURSE-30	PT 399	Pharmaceutical microbiology Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-31	PT 397	Pharmaceutical Engineering Practical	_	H	M	_	_	H	_	_	_	H	_
Semester-4	COURSE-32	PT 412	Pharmacognosy and phytochemistry -I Theory	H	_	_	_	M	_	_	_	_	_	_
	COURSE-33	PT 413	Industrial Pharmacy I – Theory	H	_	_	_	_	_	_	_	_	_	_
	COURSE-34	PT 414	Pharmaceutical organic chemistry II-Theory	H	H	_	_	L	_	_	_	_	_	_
	COURSE-35	PT 418	Pharmacology I – Theory	H	_	_	_	_	_	_	_	_	_	_
	COURSE-36	PT 492	Pharmacognosy and Phytochemistry I–Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-37	PT 493	Industrial Pharmacy I – Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-38	PT 496	Physical Pharmaceutics II – Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-39	PT 498	Pharmacology I – Practical	H	H	_	_	_	_	H	M	_	H	_
	COURSE-40	PT 416	Physical pharmaceutics II Theory	H	H	_	_	_	_	_	_	_	H	_
Semester-5	COURSE-41	PT 513A	Medicinal Chemistry I – Theory	H	_	_	_	H	_	_	_	_	_	_
	COURSE-42	PT 513B	Medicinal Chemistry II – Theory	H	_	_	_	H	_	_	_	_	_	_
	COURSE-43	PT 518	Pharmacology II – Theory	H	H	_	_	_	_	_	H	_	_	M
	COURSE-44	PT 512	Pharmacognosy and Phytochemistry II– Theory	H	H	_	_	_	_	_	H	_	_	M
	COURSE-45	PT 516	Pharmaceutical Jurisprudence – Theory	_	_	_	_	_	H	_	_	_	_	_
	COURSE-46	PT 593	Medicinal Chemistry I – Practical	H	H	_	_	_	_	_	_	_	H	_

	COURSE-47	PT 598	Pharmacology II – Practical	H	H	_	_	_	_	_	_	_	_	_
	COURSE-48	PT 592	Pharmacognosy and Phytochemistry II – Practical	H	H	_	_	_	_	_	_	_	H	_
Semester-6	COURSE-49	PT 613	Medicinal Chemistry III – Theory	H	_	_	_	M	_	_	_	0	H	0
	COURSE-50	PT 618	Pharmacology III – Theory	H	_	_	_	_	_	_	_	_	_	H
	COURSE-51	PT 612	Herbal Drug Technology – Theory	H	_	_	_	H	H	_	_	_	_	_
	COURSE-52	PT 616	Biopharmaceutics and Pharmacokinetics – Theory	H	_	M	_	M	M	_	_	_	_	H
	COURSE-53	PT 619	Pharmaceutical Biotechnology – Theory	H	L	_	_	M	M	_	_	_	_	H
	COURSE-54	PT 611	Quality Assurance –Theory	_	_	H	_	M	H	_	_	L	L	_
	COURSE-55	PT 693	Medicinal chemistry III – Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-56	PT 698	Pharmacology III – Practical	H	H	_	_	M	_	_	_	_	_	_
	COURSE-57	PT 692	Herbal Drug Technology – Practical	H	H	_	_	_	_	_	_	_	H	_
Semester-7	COURSE-58	PT 711	Instrumental Methods of Analysis – Theory	H	H	_	_	_	_	_	_	_	H	_
	COURSE-59	PT 716A	Industrial Pharmacy II – Theory	H	M	M	M	_	H	H	_	_	_	_
	COURSE-60	PT 718	Pharmacy Practice – Theory	H	H	_	H	_	H	_	H	H	_	_
	COURSE-61	PT 716B	Novel Drug Delivery System – Theory	H	H	_	_	_	_	_	_	_	L	_
	COURSE-62	PT 791	Instrumental Methods of Analysis – Practical	H	H	_	_	_	_	_	_	_	H	_
	COURSE-63	PT 781	Practise school	H	H	M	_	M	M	M	M	H	_	_
Semester-8	COURSE-64	PT 817	Biostatistics and Research Methodology	H	H	_	_	_	_	_	_	_	H	_
	COURSE-65	PT818	Social and Preventive Pharmacy	–	_	_	_	H	H	_	_	_	_	_
	COURSE-66	PT 810A	Pharma Marketing Management(Elective)*	H	_	_	_	L	L	_	_	_	_	_
	COURSE-67	PT 810B	Computer Aided Drug Design(Elective)*	H	_	_	_	_	_	_	_	_	H	_
	COURSE-68	PT 810C	Advanced Instrumentation Techniques(Elective)*	H	H	_	_	_	_	_	_	_	H	_
	COURSE-69	PT 883	Project Work	H	H	H	_	M	M	M	M	H	H	_
TOTAL				59	47	9	5	23	18	9	8	7	35	9

2.1.2 State the delivery details of the contents beyond the Syllabus for the attainment of POs (20)

Institute Marks : 20.00

2021-22

S.No	Gap	Action Taken	Date-Month-Year	Resource Person with Designation	No of students Present	Relevance to POs
1	Enrichment of (	Interactive onlli	26/08/2021	Prof. (Dr.) Svante Winberg,	400	PO1,5,7,9,11
2	Enrichment of (	Interactive onlii	27/08/2021	Prof. (Dr.) Eric Chan Chun `	400	PO1,5,7,9, 11
3	Exposure to th(	Interactive onlii	27/08/2021	Prof. (Dr.) Gill Diamond Prc	400	PO 3, 5,6,7,9,1
4	Exposure to th(	Interactive onlii	26/08/2021	Prof. (Dr.) G. D. Gupta, Dire	400	PO 3, 5,6,7,9,1

2020-21

S.No	Gap	Action Taken	Date-Month-Year	Resource Person with Designation	No of students Present	Relevance to POs
1	industry orienta	interactive sem	25/07/2020	Mr MS Nath Executive Dire(	400	PO7,11
2	application of d	Interactive web	25/7/2020	Dr Subrata Deb,Chair and A	400	7,1

2019-20

S.No	Gap	Action Taken	Date-Month-Year	Resource Person with Designation	No of students Present	Relevance to POs
1	Enrichment of (	Interactive offlii	28/02/2020	Prof. Sumanta Chaterjee, N	350	PO1,5,7,9
2	Exposure to la	Interactive onlii	28/02/2020	Dr. Jayanta Chattopadhyay,	350	PO1,5,7,9
3	Adaptability to '	Interactive offlii	28/02/2020	Dr. Rima Mukherjee, Psych	350	PO3, 4, 6, 8
4	Exposure to la	Interactive offlii	28/02/2020	Dr. B Santosh Kumar, Scier	350	PO 5,6,7,8,11
5	Mentoring emp	Interactive offlii	28/02/2020	Mr. Kaushik Ghosh, Chief C	350	PO 6,8, 9,11

2.1.3 Adherence to Academic Calendar (10)

Institute Marks : 10.00

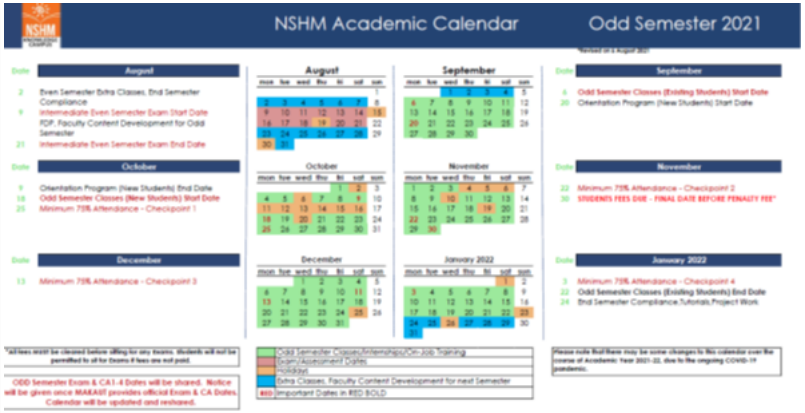
The academic calendar is prepared in accordance to the MAKAUT academic calendar in consultation with the faculty members and looks into the maximum delivery options so as to benefit the students. The teachers prepare their individual Academic and Teaching plan for their respective subjects in accordance with the schedule of the notified academic calendar. The teaching plan is verified by the batch co-ordinator as well as director. There is sufficient flexibility in the teaching plan to incorporate new ways of teaching The academic calendar follows the MAKAUT University class schedule, holiday schedule, the internal examination schedule and the final examination schedule in totality.

19-20 session: The notified academic calendar was adhered to in the odd session ;however in light of pandemic situation, certain modifications were notified by the affiliating university(MAKAUT) which were also adhered to.

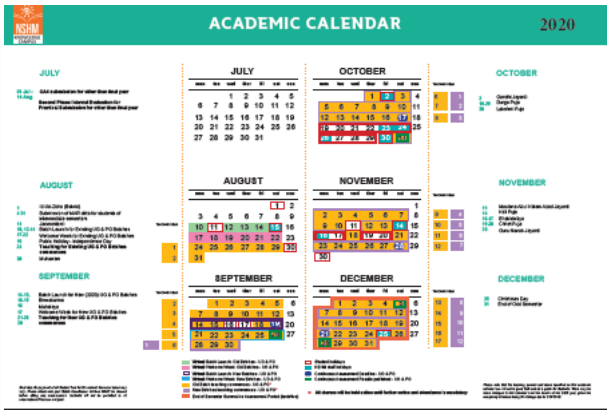
20-21 session: In light of pandemic situation, certain modifications were notified by the affiliating university(MAKAUT) which were adhered to.

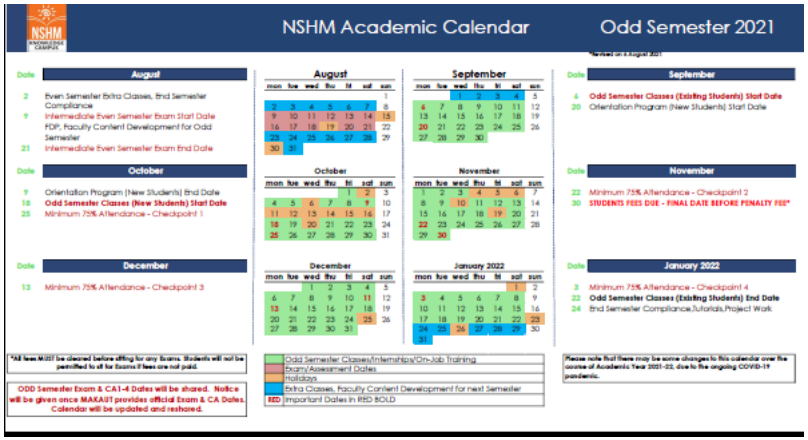
21-22 session has fully adhered to notified academic calendar of NSHM knowledge campus-GOI

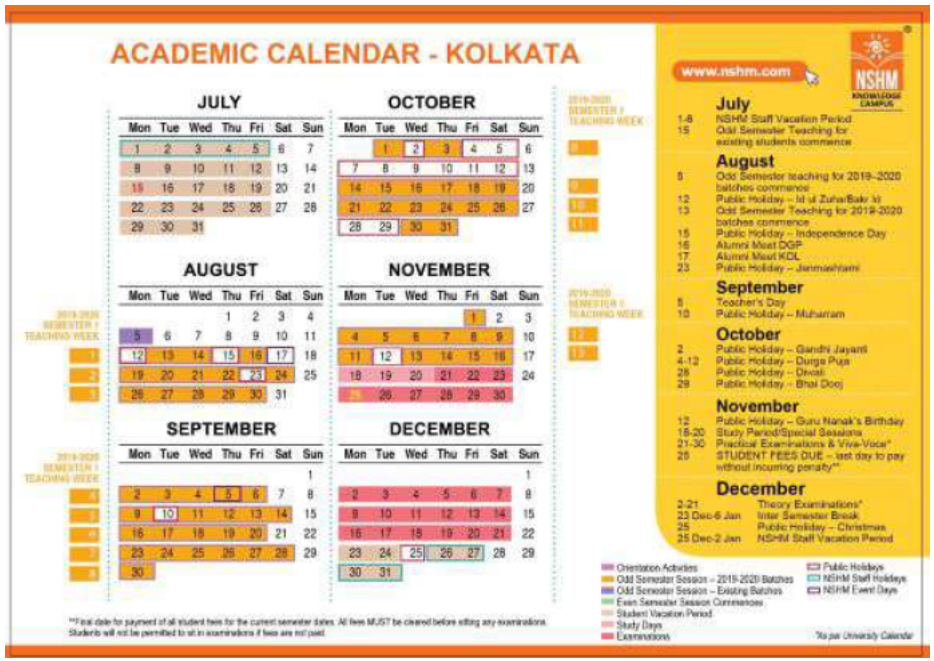
INITIATION OF CLASSES:


NSHM Academic Calendar
Odd Semester 2021


NSHM Academic Calendar
Version 1.0 release 31.1.22
Even Semester 2022


ACADEMIC CALENDAR
2020





2.2 Teaching-Learning Processes (110) Total Marks 110.00

2.2.1 Initiatives in teaching and learning process (25) Institute Marks : 25.00

The syllabus is prescribed by the MAKAUT universityand hence there is very little scope in going beyond syllabus.

The initiatives in teaching and learning process are done at two levels i.e. for theory classes and practical sessions separately. The mechanism and implementation have been described hereafter.

At the initiation of academic sessions, course outline of every course under BPharm program is uploaded on the learning management system(TCSION platform) which includes introduction of the course with lesson plans ,recommended books and faculty in charge .This gives the students an insight into the course before they come to the classes.

I] Theory classes: The backbone of domain knowledge relies mostly on the theory classes, lots of measures are taken to keep the lectures engaging and interactive. Some of the measures taken are:

1. Multimedia elements such as Power Point, Flash, Movie Maker, Animations etc. have been widely used .

2. During the pandemic period ,online classes have been taken in MS teams platform which is an highly interactive platform where students could raise their doubts and address their difficulties as good as a physical class.Along with regular slides,u tube vidoes have also been used to enable the students a practical orientation of the concepts they learn

3. In order to boost the interest of the students in their area of interest, assignments or projects on topics outside their curriculam are given to different group of students of the class which would help them in making the right career choice and help in seeking admission in future to an institution of repute.

4. Students whose marks are below the minimum pass marks are encouraged to attend tutorial classes and are asked to solve University question papers. These papers are then corrected by the subject in charge and the mistakes and solutions are explained to the students on one-on-one basis.

5. Other than these, course specific activities and approaches are adopted to infuse keen interest and enthusiasm in a subject to keep the students abreast with the changing scenario in the industry and to help them perform to the best of their abilities.

II] Practical sessions:

1. Students are evaluated regularly at every practical they perform, on the basis of performance, records ,viva and marks are allotted to each practical which is documented in practical records

2. Helping academically weaker students: Based on the periodic marks of the students, those securing lower marks are given additional revision turns to help them gain more experience and confidence.

3. During the pandemic period, practical videos have been prepared by respective faculties and shown to the students(along with explanation of principle) through MS teams platform so that the students can get an idea of the practicals.

Other than these common strategies; course-wise techniques are adopted by the subject teachers to inculcate enthusiasm in their subject. Some of these techniques involve competitions during practicals, real-life problem analysis and solving, making of charts & models etc.

2.2.2 Quality of internal semester question papers, assignments and evaluation (10)

Institute Marks : 10.00

B. Pharm. is a CBSGS (Credit Based Semester and Grading System) curriculum with percentage of marks for Semester and Internal examination being 70% and 30% respectively

- University Semester exam. papers are set by a panel of examiners appointed by the University
- Question papers are sent physically to the college on the day of examination (prior to COVID pandemic period, 2020-21)
- During the period, 2020-21 (odd Sem.) through 2021-22 (even Sem.), there was online exam. held at the end of each semester, wherein the questions were MCQs (multiple choice questions).
- These questions are collected and collated by the university from various subject faculties (randomly) from every college
- Faculties prepare the questions based on the syllabus and upload at the university portal link (separately sent to the respective faculties associated with question setting
- Selection of questions are done at the university end
- Question papers preparation is done by the exam. support system at the university
- These questions were made available to the students as subject question paper for requisite marks on the day of exam. by logging in through the student's portal at the university

Internal periodic examination papers are set by the subject teacher(s). These papers are reviewed by the Controller of Examination and after revision (if any) are submitted in sealed envelope to the examination section.

- Internal exam question paper comprises of objective and descriptive type questions
- Objective type questions comprise of multiple choice questions (MCQs) and the descriptive type questions include long essays, short essays and short answers
- During the period, 2020-21 (odd Sem.) through 2021-22 (even Sem.), the internal exam. in the form of MCQs through Google Form. and or assignments. The overall exam. was conducted online
- In all, 4 CAs are conducted for each subject, throughout the semester (virtual mode)
- Internal assessment question papers set by respective faculties are reviewed by the Controller of Exams. (COE) and team for quality and contents for the appropriateness in terms of quality, content and structure on random basis
- In the process, the review team looks for the questions that indicates attainment of course outcomes
- In all, 4 CAs are conducted for each subject, throughout the semester (physical mode)
- COs and mapped in the question paper for ready reference
- COs are mentioned in the class as well as displayed on question papers

Assignments and Evaluation

As an interactive learning tool, assignments helps facilitating a student in developing skill to information search, self-management of knowledge, collation of data. This in turn provides necessary platform to the student in becoming confident and self-reliant. As per the typical format, Internal Assessment question papers are set within stipulated syllabus covering minimum two to three COs. Internal Assessment question papers are set by

identifying Blooms learning levels, CO and PO mapping.

- Elaborate and out of the box type of questions are made to practice in the regular tutorials
- Faculties discuss, guide and train them to write the appropriate answers for long essay, short essay and very short answers
- Internal assessments papers are evaluated and shown to the students with respect to their presentation and also suggest the appropriate answer to the questions for better scoring, if required

Occasionally students are given slightly different kind of assignments in their respective subjects to upgrade their knowledge. These are evaluated by individual faculties within their perspective. Students showing special interest in a specific subject are given definite assignments by the respective subject faculties. As a result, the student is benefitted by getting an opportunity to learn a particular topic, gain extra knowledge by in depth literature search. Sometimes, after completion of the topic, students are further asked to deliver seminar on some small subtopic from the syllabus. Eventually, this helps them to overcome stage shock while understanding the topic in detail. Those students with good drawing or computer abilities are encouraged to prepare certain display charts and or posters This helps them in a better understanding of the subject. Relevant COs are associated with such activities

2.2.3 Quality of Students projects (15) Institute Marks : 15.00

Following the MAKAUT syllabus for B. Pharm. course, B. Pharm final year students (8th Sem.) undertake a project study independently and submit a short project report of the study carried. Usually this project is theory based, to pervade curiosity, keen interest and enthusiasm in a subject so as to keep the students abreast with the changing scenario in the industry and to help them perform to the best of their abilities. The research work is done in the college in the span of five months.

The topic of the Project Work can be anything from their existing subjects or the subjects mentioned in the PCI syllabus for 8th semester or any topic the supervisor thinks fit for the candidate. The students are given liberty to take up any topic associated with their Industrial Training, for those who have undergone the same in consultation with their respective supervisors. This short project is purposed to inculcate critical thinking by the students and to develop their learning and interpreting research capabilities, after reading several research papers/publications on the given area. The students are free to use the institute's library abundantly and also consult their supervisors on the topic in addition to rigorous internet surfing taking the help pf various search engines and other scientific database. Since the project is carried out by the student alone, they get the opportunity of developing self-confidence and smartness, which helps them to flourish by their own in the making of future professionals.

· The projects are varied and involve different subjects

· In the course of the project work, students learn to read the scientific papers, and analyse the data while reporting the same within a time frame

· On completion of work, students submit a report consisting of the Abstract, Introduction, Literature Search, Results & Discussion and Conclusion on the topic

· The students report to their respective guide every day, while the guide evaluates the progress of the work and assesses individual performance

· These reports are then corrected by the supervisor or the subject in charge and the mistakes and solutions are explained to the students on one-on-one basis

· The student's work in the form of reports and Microsoft ppt.s are evaluated by all the faculty members in the college

· The criteria for evaluation are choice of topic, understanding of topic, research and report preparation, presentation and defence

· The quality of these projects are evaluated based on its reflection on various Program Outcomes like PO1, PO2, PO3, PO5 and PO8

· From the results, it is observed that maximum students identified and understood the problem given to them. They tried their best to execute the project and apply the available scientific knowledge to interpret the data efficiently

· Simultaneously it is observed that some students could present the data well and defend their work in a proper technical manner. This helps in building confidence in themselves

· The students are encouraged to present their project work in conferences/seminars

· Thus, the objectives of assigning the projects is to make sure that the graduates attain the program outcome related to PO1, PO2, PO3, PO9 and PO10 with highest attainment; whereas PO5, PO6, PO7, and PO8 with medium attainment

· Further, these reports serve as the background literature survey on relevant topics while applying for research projects to various technical bodies like DST, DBT, CSIR, AICTE, AAYUSH, EMAMI and the likes

NOTE: DETAILED LIST OF PROJECT TOPICS UNDERTAKEN BY STUDENTS FOR THE 2018-19,2019-20,2020-21 AND CAY 2021-22 IS AVAILABLE IN THE DEPARTMENT OFFICE

2.2.4 Initiatives related to Industry and/or Hospital interaction (20)

Institute Marks : 20.00

- In order to enable the students attain a better carear ,institute hosts and organises interactive sessions with industry experts (who are well known names in their domain globally) either in the form of national/internal conferences /online webinars .
- It not only provides them an insight into the current pharmaceutical as well as multidisciplinery research but also exposes them to the latest trends in health care sector .
- Students can avail quality lectures from the highly experienced industry professionals. They can think upon the recent challenges the corporates are facing and can approach the industry. It keeps them updated on the current industrial trends and creates ample of job opportunities for them.
- The college has signed Memorandum of Understanding with pharmaceutical industries and central Universities to facilitate activities such as placement drives, health campaigns etc. undertaken by the college.

Professional society activities, events, conferences organized etc. for the year 2019- 2020			
DATE	SPEAKER	TOPIC	NUMBER OF STUDENTS
28.2.20	Prof. Sumanta Chaterjee, National Center For Biological Sciences (NCBS), Bangalore	Autism and "Astro"logy: New insights from recordings in human brain cells	400

	Dr. Jayanta Chattopadhyay, Professor, Department of Pharmaceutical Chemistry, Bengal School of Technology.	Current Drug Regulatory Affairs	400
	Mr. Kaushik Ghosh, Chief Operating Officer & Learning Head, Guide Guru	Control the Uncontrollable: Breaking the Myth Interview Clearing Techniques and Grooming	400
	Dr. B Santosh Kumar, Scientist - National Institute of Nutrition (NIN), Hyderabad	Nutrition to Nation: serving since 1918 and continues	400
	Dr. Rima Mukherjee, Psychiatrist, Founder and Director, Crystal Minds	Recent trends in mental healthcare	400
Professional society activities, events, conferences organized etc. for the year 2020- 2021			
25.7.20	Dr Subrata Deb,Chair and Associate professor,Dept of pharmaceutical sciences ,college of pharmacy,larkin University	Job opportunities of pharmacy students post covid situation	400
	Mr MS Nath, Executive director,AZZKA pharmaceuticals Gujrat	Inter-individual variability in drug metabolism and its potential role in covid -19 treatment	400
Professional society activities, events, conferences organized etc. for the year 2021- 2022			
26.8.21	Prof. (Dr.) Svante Winberg, Professor of Neuroendocrinology, Department of Neuroscience, Uppsala University, Sweden.	Fish as a Model in Biomedical and Biological Research	400
	Prof. (Dr.) G. D. Gupta, Director-cum-Principal, ISF College of Pharmacy, Moga, India	Research Advancement Resilience in the Pandemic Era	400
27.8.21	Prof. (Dr.) Eric Chan Chun Yong, Professor, Dept. of Pharmacy, National University of Singapore, Singapore.	Infigratinib is a Reversible Inhibitor and Mechanism-based Inactivator of Cytochrome P450 3A4	400
	Prof. (Dr.) Gill Diamond Professor, Department of Oral Immunology and Infectious Diseases University of Louisville School of Dentistry	Novel Strategies for Emerging Infectious Diseases	400

2.2.5 Initiatives related to skill Development programs/industry internship/summer training (10)

Institute Marks : 10.00

The institute has its own training cell which provides assistance to the students to enrol for industry internship. The students are councelled right at the inception of program on the importance of undergoing industrial/hospital training and are asked to mandatorily go for the same.

150 training hours have to be completed by the students during the couse of the program.

Training cell provides guidance to the group of students in selecting the industry and also arranges for local as well as outside state training of students.

The Cell further coordinates with industries for the confirmation of accommodation of training. On completion of the training, the students are asked to submit a report of the same and appear for a short individual interactive session with the Training Cell regarding their observations and experiences during the training.

THE DETAILS OF INDUSTRIAL/HOSPITAL TRAINING OF STUDENTS BATCH WISE IS AS FOLLOWS.

SESSION:18-19; NUMBER OF TRAINEES:121

Sl.	Name	Univ. Roll No.	Inside W. B	Outside WB	From	To
1	Abhinav Singh	162770210001		Mankind Pharmaceutical Ltd	03/01/2019	14/01/2019
2	Abhishek Chanda	162770210002	Albert david Ltd		07/01/2109	28/01/2019
4	Ananya Das	162770210004	1. Gluconate Health care Ltd. 2. AMRI Hospital Ltd.		07-01-2019 17-06-2019	12-01-2019 16-07-2019
9	Ankita Das	162770210010	Gluconate Health care Ltd		07/01/2019	12/01/2019
10	Anubhab Biswas	162770210011	Stadmed Pharmaceuticals Ltd		31/12/2018	05/01/2019
11	Arijeet Dutta	162770210013		Indchemi Health Specialities Pvt. Ltd.	01/07/2019	08/07/2019
12	Arka Bhattacharya	162770210014	Stadmed Pharmaceuticals Ltd		31/12/2108	05/01/2019
13	Arka Karmakar	162770210015		Alembik Pharmaceuticals Ltd.	03/01/2019	31/01/2019
14	Arkaprava Banerjee	162770210016	Stadmed Pharmaceuticals Ltd		31/12/2018	05/01/2019
15	Arkaprava Banerjee	162770210017				
19	Arpita Saha	162770210022		Alembik Pharmaceuticals Ltd.	03/01/2019	31/01/2019
20	Aungsuman Konar	162770210023	Mendine Pharmaceutical Pvt. Ltd.		20/01/2020	04/02/2020
21	Ayan Mondal	162770210024		Indchemie Ltd.	07/01/2019	21/01/2019
24	Binamra Biswas	162770210027	Mendine Pharmaceutical Pvt. Ltd.		20/01/2020	04/02/2020
25	Bushra Parveen	162770210028		Alembik Pharmaceuticals Ltd.	03/01/2019	31/01/2019
26	Debapriyo Das	162770210029	Mendine Pharmaceutical Pvt. Ltd.		20/01/2020	04/02/2020

27	Debarati Ghosh	162770210030	Bewell Laboratories Ltd.		14/01/2019	19/01/2019
28	Debopriya Bhowmik	162770210031		Glenmark Pharmaceutical Ltd.	27/12/2018	11/01/2019
29	Debosmita Das	162770210033	Burnet Pharmaceuticals Pvt. Ltd		24/06/2019	06/07/2019
30	Debtunya Bera	162770210034	Gluconate Health care Ltd		07/01/2019	12/01/2019
33	Durgesh Kumar Shah	162770210037		Mankind Pharmaceutical Ltd	03/01/2019	14/01/2019
34	Esha Das	162770210038	Gluconate Health care Ltd		07/01/2019	12/01/2019
35	Ishita Seal	162770210040		Alembik Pharmaceuticals Ltd.	03/01/2019	31/01/2019
36	Joydeb Dhabal	162770210041		Indchemie Ltd.	07/01/2019	21/01/2019
37	Kaustav Chatterjee	162770210043	Stadmed Pharmaceuticals Ltd		31/12/2109	05/01/2109
39	Kousik Kar	162770210046		Mankind Pharmaceutical Ltd	03/01/2019	14/01/2019
40	Kushal Adhikary	162770210047	Gluconate Health care Ltd		07/01/2019	12/01/2019
41	Mahima Mohta	162770210049		Glenmark Pharmaceutical Ltd.	12/06/2019	25/06/2019
42	Maitrish Ghosh	162770210050			12/06/2019	25/06/2019
43	Md.Salim Mondal	162770210051	Bewell Laboratories Ltd.		14/01/2019	19/01/2019
44	Md.Zeeshanur Islam	162770210052		Indchemie Ltd.	07/01/2019	21/01/2019
45	Monava Ghosh	162770210054	Gluconate Health care Ltd		07/01/2019	12/01/2019
46	Naqvi Haque	162770210055	Gluconate Health care Ltd		07/01/2019	12/01/2019
47	ANANYA BHADRA	27701917019		Indchemi Health Specialities Pvt. Ltd.	01/07/2019	08/07/2019
48	ANIRBAN GIRI	27701917017	Palsons Derma Pvt. Ltd.		10/01/2109	16/01/2109
49	ARNAB MAITY	27701917018	Palsons Derma pvt. Ltd.		21/01/2020	25/01/2020
50	BANI KUMAR JANA	27701917016	Stadmed Pharmaceuticals Ltd		31/12/2019	05/01/2019
51	DEBANJAN DAS	27701917015	Palsons Derma Pvt. Ltd.		10/01/2019	16/01/2019
52	DEBASHIS RANA	27701917014	Palsons Derma Pvt. Ltd.		10/01/2019	16/01/2019
53	HASANUJJAMAN KHAN	27701917013	Mendine Pharmaceuticals Pvt. Ltd.		07/01/2019	23/01/2019
54	MONALISHA DAS	27701917012	Greenco Bilogicals Pvt Ltd.		03/01/2019	12/01/2019
55	MOUMITA SANT	27701917011		Indoco Remedies Ltd.	07/01/2109	17/01/2019

Sl.	Name	Univ. Roll No.	Inside W. B	Outside WB	From	To
1	Pritam Kundu	162770210060		Glenmark Pharmaceutical Ltd.	27/12/2018	11/01/2019
2	Priya Saha	162770210061		Golden Cross Ltd.	11/01/2019	22/01/2019
3	Rahul Dev Halder	162770210063		Glenmark Pharmaceutical Ltd.	27/12/2018	11/01/2019
4	Ramyani Mukherjee	162770210064	Bewell Laboratories Ltd.		14/01/2019	19/01/2019
5	Rana Saha	162770210065	Greenco Bilogicals Pvt. Ltd.		18/06/2018	05/07/2109
6	Reshmita Das	162770210066		Cipla Ltd. - I	01/07/2019	15/07/2019
7	Rishika Dutta	162770210067				
8	Rudranil Karmakar	162770210068		Glenmark Pharmaceuticals Ltd.	20/06/2019	04/07/2019
9	Ruma Das	162770210069	Deys Medical Stores (Mfg) Ltd.		01/01/2109	14/01/2019
10	Rupam Ghosh	162770210070	Greenco Bilogicals Pvt. Ltd.		18/06/2018	05/07/2109
11	Saheenur Rahman	162770210071		Golden Cross Ltd.	11/01/2019	22/01/2109
12	Sakil Ahamed	162770210072		Alkem laboratories Ltd	14/01/2109	19/01/2109
13	Sanchari Bandopadhyay	162770210073		Cipla Ltd. - I	01/07/2019	15/07/2015

14	Sanchari Dutta	162770210074	Deys Medical Stores Ltd.		17/07/2109	30/07/2019
15	Sanghita Ganguly	162770210075		Lupin Ltd.	19/06/2019	03/07/2019
16	Sanjana Roychowdhury	162770210076		Glenmark Pharmaceutical Ltd.	27/12/2018	11/01/2019
17	Santimoy Sen	162770210077	Greenco Bilogicals Pvt. Ltd.		18/06/2018	05/07/2019
18	Sharmistha Sarkar	162770210079		Lupin Ltd.	19/06/2019	03/07/2019
19	Shibanada Halder	162770210080	Mendine Pharmaceuticals Pvt. Ltd.		07/01/2019	23/01/2019
20	Shreelekha Banerjee	162770210081		Golden Cross Ltd.	11/01/2019	22/01/2109
21	Shreya Sharma	162770210082	Deys Medical Stores (Mfg) Ltd.		01/01/2109	14/01/2019
22	Shwambo Sengupta	162770210083		Glenmark Pharmaceutical Ltd.	09/01/2019	21/01/2019
23	Sibu Sen	162770210084	1. Deys Medical Stores (Mfg) Ltd. 2. AMRI Hospital Ltd.		17-01-2019 17-06-2019	31-01-2019 16-07-2019
24	Sidhanta Sil	162770210085		Glenmark Pharmaceutical Ltd.	27/12/2018	11/01/2109
25	Silpayan Dasadhikari	162770210086		Indchemi Health Specialities Pvt. Ltd.	01/07/2019	08/07/2019
26	Sk.Zeeshan Ali	162770210087		Indchemi Health Specialities Pvt. Ltd.	01/07/2019	08/07/2019
27	Sneha Pervin	162770210088	East India Works Ltd.		04/07/2019	18/07/2019
28	Sneha Sarkar	162770210089		Glenmark Pharmaceutical Ltd.	27/12/2018	11/01/2109
29	Somnath Das	162770210090		Glenmark Pharmaceutical Ltd.	09/01/2019	21/01/2109
30	Soumi Chatterjee	162770210091	Gluconate Health care Ltd		07/01/2019	12/01/2019
31	Soupayan Pal	162770210092	Deys Medical Stores (Mfg) Ltd.		17/01/2019	31/01/2019
32	Sourab Roy	162770210093		Glenmark Pharmaceutical Ltd.	09/01/2019	21/01/2019
33	Souvik Paul	162770210094		Glenmark Pharmaceutical Ltd.	09/01/2019	21/01/2109
34	Sreyanka Ghosh	162770210095		Glenmark Pharmaceutical Ltd.	09/01/2019	21/01/2109
35	Subarnarekha Maitra	162770210096		Glenmark Pharmaceutical Ltd.	09/01/2019	21/01/2109
37	Subhadip Jana	162770210098		Alkem laboratories Ltd	14/01/2109	19/01/2109
38	Subhajit Sarkar	162770210099	Mendine Pharmaceuticals Pvt. Ltd.		07/01/2019	23/01/2019
39	Subham Nath	162770210100	Greenco Bilogicals Pvt. Ltd.		18/06/2018	05/07/2109
40	Suchismita Patra	162770210101		Lupin Ltd.	19/06/2019	03/07/2019
41	Sudipta Modak	162770210102		Glenmark Pharmaceutical Ltd.	27/12/2018	11/01/2109
42	Sumi Jalan	162770210103		Glenmark Pharmaceutical Ltd.	09/01/2019	21/01/2109
43	Surojit Dutta	162770210104	Mendine Pharmaceuticals Pvt. Ltd.		07/01/2019	23/01/2019
44	Sushant Kumar	162770210105		Acme Lifetech pvt. Ltd.	04/01/2019	18/01/2019
45	Susovan Giri	162770210106		Alkem laboratories Ltd	14/01/2109	19/01/2109
46	Suvam Samanta	162770210107		Alkem laboratories Ltd	14/01/2109	19/01/2109
47	Suvarthi Bhattacharya	152770210117	Deys Medical Stores (Mfg) Ltd.		17/01/2019	31/01/2019
48	Suvodeep Naskar	162770210108		Acme Lifetech pvt. Ltd.	04/01/2019	18/01/2019
49	Swaranjit Chakraborty	162770210109		Acme Lifetech pvt. Ltd.	04/01/2019	18/01/2019
50	Swastik Mondal	162770210110		Indchemi Health Specialities Pvt. Ltd.	01/07/2019	08/07/2019
51	Swetangshu Golui	162770210111		Golden Cross Ltd.	11/01/2019	22/01/2109
52	Totan Roy	162770210113	Green co Bilogicals Pvt. Ltd.		20/06/2019	04/07/2019
53	Vidipta Dutta Roy	162770210114	Bewell Laboratories Ltd.		14/01/2019	19/01/2019
54	PIU JANA	27701917010		Indoco Remedies Ltd.	07/01/2109	17/01/2019
55	RIMA MUKHERJEE	2770191709	Gluconate Health care Ltd		07/01/2019	12/01/2019
56	RIYA SARKAR	2770191708	Gluconate Health care Ltd		07/01/2019	12/01/2019
58	SAKUNTALA GAYEN	2770191706	Palsons Derma Pvt. Ltd.		26/12/2018	01/01/2019
59	SAYAN SANT	2770191705		Indoco Remedies Ltd.	07/01/2019	17/01/2019
60	SOMA SARKAR	27701916004	Greenco Bilogicals Pvt Ltd.		03/01/2019	12/01/2019
61	SOURAV ROY	27701917144	Palsons Derma pvt. Ltd.		21/01/2020	25/01/2020

62	SOUVIK MANNA	2770191704		Indoco Remedies Ltd.	07/01/2109	17/01/2019
63	SUBHADIP GHORAI	2770191703		Indoco Remedies Ltd.	07/01/2109	17/01/2019
64	SUMANA MAJI	2770191702	Greenco Bilogicals Pvt Ltd.		03/01/2019	12/01/2019
66	TUSHI GOLDAR	2770191701		Indoco Remedies Ltd.	07/01/2109	17/01/2019

SESSION:19-20 NUMBER OF TRAINEES: 38

.	Name	Univ. Roll No.	Inside W. B	Outside WB	From	To	Duration
1	Kaushik Kumar Jana	27701916085		Glenmark Pharmaceuticals Ltd.	20/06/2019	04/07/2019	15 days
2	Abhinaba Maiti	27701917142	East India Pharmaceuticals Works Ltd.		04/07/2019	18/07/2019	15 days
3	Adrija Sarkar	27701917141	Deys Medical Stores Ltd.		17/07/2109	30/07/2019	14 days
4	Akash De	27701917139	Mendine Pharmaceuticals Pvt. Ltd.		13/06/2019	12/07/2019	30 days
5	Amrita Das	27701917137	Palsons Derma Pvt. Ltd.		01/07/2019	07/07/2109	7 days
6	Ankan Naskar	27701917135	Deys Medical Stores Ltd.		17/07/2109	30/07/2019	14 days
7	Arijit Mondal	27701917131	Palsons Derma Pvt. Ltd.		01/07/2019	07/07/2109	7 days
8	Arijit Patra	27701917130					
9	Arnab Kumar Rana	27701917128	Mendine Pharmaceuticals Pvt. Ltd.		13/06/2019	12/07/2019	30 days
10	Arpan Roy	27701917127	Burnet Pharmaceuticals Pvt. Ltd		24/06/2019	06/07/2019	13 days
11	Arpan Sarmadhikari	27701917126	Albert Devid Ltd.		01/07/2019	07/07/2019	7 days
12	Baishakhi Mondal	27701917125	East India Pharmaceuticals Works Ltd.		19/06/2019	03/07/2019	16 days
13	Bikram Biswas	27701917122	East India Pharmaceuticals Works Ltd.		19/06/2019	03/07/2019	16 days
14	Brahmajit Mondal	27701915024	Mendine Pharmaceuticals Pvt. Ltd.		13/06/2019	12/07/2019	30 days
15	Debamita Charan	27701917120	Palsons Derma Pvt. Ltd.		01/07/2019	07/07/2019	7 days
16	Debraj Paul	27701917118	Hygiea Pharmaceutical Manufacturing Pvt. Ltd.				
17	Fahima Narzish	27701917116	Stadmed Pharmaceuticals Ltd.		18/06/2019	12/07/2019	25 days
18	Gourab Sardar	27701917115					
19	Goutam Hazra	27701917114	Palsons Derma pvt. Ltd.				
20	Guru Charan Karak	27701917112	Hygiea Pharmaceutical Manufacturing Pvt. Ltd.				
21	Indraneel Das Adhikari	27701917111	Stadmed Pharmaceuticals Ltd.		18/06/2019	12/07/2019	25 days
22	Khushboo Kumari	27701917109	Mendine Pharmaceutical Pvt. Ltd.		22/01/2020	30/01/2020	09 days
23	Mayuri Ghosh	27701917107	Stadmed Pharmaceuticals Ltd.		18/06/2019	12/07/2019	25 days
24	Md Raja	27701917105	Drakt International Pvt Ltd.		14/01/2020	28/01/2020	15 days

25	Monalisa Chatterjee	27701917100	Mendine Pharmaceutical Pvt. Ltd.		22/01/2020	30/01/2020	09 days
26	Mrinmay Misra	27701917096		Glenmark Pharmaceuticals Ltd.	20/06/2019	04/07/2019	15 days
27	Naureen Afrose	27701917093		Glenmark Pharmaceuticals Ltd.	20/06/2019	04/07/2019	15 days
28	Nimmi Khatun	27701917092	Palsons Derma Pvt. Ltd.		01/07/2019	07/07/2109	7 days
29	Pallabi Panja	27701917091		Glenmark Pharmaceuticals Ltd.	20/06/2019	04/07/2019	15 days
30	Pinky Chowrasia	27701917087	Mendine Pharmaceutical Pvt. Ltd.		22/01/2020	30/01/2020	09 days
31	Poulami Chakraborty	27701917086	Deys Medical Stores Ltd		20/01/2020	04/02/2020	16 days
32	Prateep Sengupta	27701917085	Palsons Derma Pvt. Ltd.		01/07/2019	07/07/2109	7 days
33	Promita Chakraborty	27701917084		Glenmark Pharmaceuticals Ltd.	20/06/2019	04/07/2019	15 days
34	Naushad Iqbal	27701918009	Drakt International Pvt Ltd.		14/01/2020	28/01/2020	15 days
35	Deepanwita Gorai	27701918013	Drakt International Pvt. Ltd.		24/06/2019	09/07/2019	16 days
36	Arnab Ghosh	27701918014	Albert Devid Ltd.		01/07/2019	07/07/2019	7 days
37	Ananya Panda	27701918015	Drakt International Pvt. Ltd.		24/06/2019	09/07/2019	16 days
38	Sarif Ahammed	27701917071		Mankind Pharmaceuticals Ltd.	05/07/2019	31/07/2019	27 days

2.2.6 Continuous Evaluation Process (10)

Institute Marks : 10.00

The assessment is based on continuous evaluation throughout the semester via the following modes.

Sessional examination (theory): Four numbers of continuous assesments are are conducted ; in the first week of every four months throughout the semesters.(4 CAs per semester) . CAs are conducted as written examinations /assignments /quiz /group discussions.

Sessional examination (practical): Two numbers of practical continuous assesments are held at each semester to evaluate student performance throughtout the semesters. Routine laboratory experiments are evaluated on the basis of student performance, practical records and viva voce on the entire semester practical classes and Marks are allocated likewise.

End semester examination: conducted by university at the end of every semester.

Along with the above mentioned academic activities which are mandatory as per the University curriculam, special efforts are taken for the holistic development of the students. Students interested in a particular subject are given certain assignments by the respective teachers. This helps them to learn the process of gaining extra knowledge by in depth literature search. After completion of the topic, students are asked to deliver seminar on some small subtopic from the syllabus. This helps them to overcome stage fright and also understand the topic in detail. Students with good drawing or computer skills are encouraged to prepare certain display charts. This helps them in a better understanding of the subject.
In order to motivate the students to participate in research, students from the third year are given Mini Research Projects. The student presents the findings of the same in the form of a poster at the college level. Last year, this work has also been presented at various intercollegiate poster competitions. They have won prizes for the same.
Especially for the final year students, pre-placement talks are organized. The lectures conducted include talks in which students are guided for facing the interview, performing in the aptitude tests, writing resume etc. They are also counselled for Post Graduate studies in India and abroad along with information of the courses available.

2.2.7 Quality of Experiments (20)

Institute Marks : 20.00

B. Pharm. Being an experiment oriented course, calls Graduate level experiments are designed so as to understand the theoretical concepts. Practical classes help the students to plan and execute the experiments in a systematic time bound manner using appropriate techniques/equipment. As a result, this provides a chance for the students to gain hands on training and experience of using certain instrument, equipment and skills. This kind of experimental aptitude is a requirement of the course.

Per semesters two internal exams are taken and the students are evaluated by the teachers on the basis of their day to day class performance (experiments done), attendance as well as viva-voce in addition to experiment related synopsis.

A few highlights of quality of laboratories are enumerated below:

There are enough laboratories (Pharmachemistry – 4; Pharmaceutics – 4; Pharmacology – 2; Pharmacognosy – 1; Microbiology – 1) in the institute for the conduction of practicals during the stipulated time of the week in a session

i. The laboratories of the college are well spacious with required facilities & equipment
ii. All the instruments are calibrated periodically and usage is recorded in the respective log books
iii. Adequate numbers of computers are maintained independently in a lab. (wherever applicable)
iv. The number of equipment in the lab. and instrumentation room is sufficient and
v. well maintained
vi. Students are given demonstration and hands-on experience on equipment some of which are a part of their theory syllabus. Thus, students can correlate theoretical concepts with practical knowledge, enabling them to have a better understanding of the subject.
vii. The practical's of the overall program taken together from Sem. I to Sem. VIII involve skills addressing various Bloom Levels depending on the respective course and year of study (e.g. tabulation of Safe handling of chemicals, instruments and equipment is taught, wherever applicable
viii. Standard operating procedures (SOPs) are prepared and maintained for all the equipment. These facilities are also used for teaching and training the B. Pharm. students
ix. Students are oriented to refer Standard Operating Procedures (SOPs) before using any
x. instrument or equipment especially for those which are sophisticated
xi. Students are also explained the importance of documentation.
xii. Standard Operation Procedures (SOPs) are explained, safety precautions are taught
xiii. The students are trained for safe handling of chemicals, instruments and equipment as well as Good Laboratory Practices (GLP)
xiv. Safety precautions while operating equipment are explained
xv. After conduction of every practical, results obtained are discussed
xvi. The sophisticated instruments for the purpose of the research and post graduate programs are also utilized for under graduate practical and well maintained as per instrument manual requirements
xvii. Trouble shooting and maintenance is taught and demonstrated
xviii. Additionally, the institute has well equipped laboratories for the training of students and handling of research projects

Additionally, the college has a central instrument room having sophisticated instruments such as HPLC, FTIR, and UV Spectrophotometer, ELISA reader. College laboratories are well equipped with basic requirements as per the syllabus.

3 COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) (100)

Total Marks 100.00

3.1 Establish the correlation between the courses and the Program Outcomes (NBA defined Program Outcomes as mentioned in Annexure I) (20)

Total Marks 20.00

3.1.1 Course Outcomes (SAR should include course outcomes of one course from each semester of study, however, should be prepared for all courses) (5)

Institute Marks : 5.00

Note : Number of Outcomes for a Course is expected to be around 6.

Course Name :	**C1 03**	**Course Year :**	**2018-19**

Course Name	Statements

C1 03.1	Students will be able to understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
C1 03.2	Students will be able to understand the professional way of handling the prescription
C1 03.3	Students will be able to know the history of profession of pharmacy
C1 03.4	Students will be able to Prepare of various conventional dosage forms

Course Name :	**C1 15**	**Course Year :**	**2018-19**

Course Name	Statements
C1 15.4	Students will be able to Identify and confirm the identity of organic compound
C1 15.1	Students will be able to write the structure, name and the type of isomerism of the organic compound
C1 15.2	Students will be able to write the reaction, name the reaction and orientation of reactions
C1 15.3	Students will be able to account for reactivity/stability of compounds

Course Name :	**C2 03**	**Course Year :**	**2019-20**

Course Name	Statements
C2 03.1	Students will be able to Understand the importance and implementation of sterlization in pharmaceutical processing and industry
C2 03.2	Students will be able to learn sterility testing of pharmaceutical products

C2 03.3	Students will be able to carry out microbiological standardization of Pharmaceuticals.
C2 03.4	Students will be able to understand the cell culture technology and its applications in pharmaceutical industries
C2 03.5	Students will be able to understand methods of identification, cultivation and preservation of various microorganisms

Course Name :	**C2 09**	**Course Year :**	**2019-20**

Course Name	Statements
C2 09.1	Students will be able to to know the techniques in the cultivation and production of crude drugs
C2 09.2	Students will be able to to know the crude drugs, their uses and chemical nature
C2 09.3	Students will be able to know the evaluation techniques for the herbal drugs
C2 09.4	Students will be able to to carry out the microscopic and morphological evaluation of crude drugs

Course Name :	**C3 03**	**Course Year :**	**2020-21**

Course Name	Statements
C3 03.1	Students will be able to Understand the mechanism of drug action and its relevance in the treatment of different diseases.
C3 03.2	Students will be able to demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments.
C3 03.3	Students will be able to demonstrate the various receptor actions using isolated tissue preparation.

C3 03.4	Students will be able to appreciate correlation of pharmacology with related medical sciences.

Course Name :	**C3 09**	**Course Year :**	**2020-21**

Course Name	Statements
C3 09.1	Students will be able to understand the importance of drug design and different techniques of drug design.
C3 09.2	Students will be able to Understand the chemistry of drugs with respect to their biological activity.
C3 09.3	Students will be able to know the metabolism, adverse effects and therapeutic value of drugs.
C3 09.4	Students will be able to know the importance of SAR of drugs.

Course Name :	**C4 05**	**Course Year :**	**2021-22**

Course Name	Statements
C4 05.1	Students will be able to perform estimation of drugs in samples using different instrumental methods
C4 05.2	Students will be able to determine sodium and potassium by flame photometry
C4 05.3	Students will be able to determine chloride and sulphate by nephelo turbidometry
C4 05.4	Students will be able to perform separation of different components present in a sample by different chromatographic techniques

Course Name :	**C4 12**	**Course Year :**	**2021-22**

Course Name	Statements

C4 12.1	Students will be able to acquire and implement knowledge from various domains in the field of pharmaceutical technology
C4 12.2	Students will be able to develop a feasible idea/concept for carrying out short-term research work individually and conduct experiments by employing modern techniques and tools, analyse and interpret experimental outcomes
C4 12.3	Students will be able to acquire professional and industry-specific skills
C4 12.4	Students will be able to present and idea to the audience , cultivate communication skills and take active part in interaction

3.1.2 CO-PO matrices of courses selected in 3.1.1 (four matrices to be mentioned; one per semester from 1st to 8th semester; atleast one per year) (5)

Institute Marks : 5.00

1 . course name : C103

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C103.1	3	-	-	-	-	-	-	-	-	-	-
C103.2	-	3	-	-	-	-	-	-	-	-	-
C103.3	-	-	-	-	2	3	-	-	-	-	-
C103.4	-	-	-	-	-	-	-	-	-	2	-
Average	**3.00**	**3.00**	**0.00**	**0.00**	**2.00**	**3.00**	**0.00**	**0.00**	**0.00**	**2.00**	**0.00**

2 . course name : C115

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C115.4	3	2	-	-	-	-	-	-	-	-	-
C115.1	3	-	-	-	-	-	-	-	-	-	-
C115.2	3	-	-	-	-	-	-	-	-	-	-
C115.3	3	2	-	-	-	-	-	-	-	-	3
Average	**3.00**	**0.00**	**0.00**	**0.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**

3 . course name : C203

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C203.1	3	2	-	-	-	1	-	-	-	-	-
C203.2	2	-	-	-	1	3	-	-	-	-	-

C203.3	-	3	-	2	1	-	3	-	-	-	-
C203.4	-	2	1	-	3	-	-	-	-	-	-
C203.5	1	3	2	-	-	-	-	-	-	-	-
Average	**2.00**	**3.00**	**2.00**	**2.00**	**2.00**	**2.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**

4 . course name : C209

Course	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
C209.1	3	-	-	-	-	-	-	-	-	-	-
C209.2	3	-	-	-	-	-	-	-	-	-	-
C209.3	3	-	-	-	-	-	-	-	-	-	-
C209.4	3	-	-	-	2	-	-	-	-	-	-
Average	**3.00**	**0.00**	**0.00**	**0.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

5 . course name : C303

Course	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
C303.1	3	-	-	-	-	-	-	-	-	-	2
C303.2	3	3	-	-	-	-	-	-	-	-	-
C303.3	3	3	-	-	-	-	-	3	-	-	-
C303.4	3	-	-	-	-	-	-	-	-	-	2
Average	**3.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**0.00**	**0.00**	**2.00**

6 . course name : C309

Course	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
C309.1	3	-	-	-	-	-	-	-	-	3	-
C309.2	3	-	-	-	2	-	-	-	-	-	-
C309.3	3	-	-	-	2	-	-	-	-	-	-
C309.4	3	-	-	-	-	-	-	-	-	-	-
Average	**3.00**	**0.00**	**0.00**	**0.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**0.00**

7 . course name : C405

Course	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
C405.1	3	3	-	-	-	-	-	-	-	3	-

C405.2	3	3	-	-	-	-	-	-	-	-	-
C405.3	3	3	-	-	-	-	-	-	-	3	-
C405.4	3	3	-	-	-	-	-	-	-	3	-
Average	**3.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**0.00**

8 . course name : C412

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C412.1	3	-	-	-	-	-	-	-	-	-	-
C412.2	-	3	3	-	-	-	-	-	-	3	-
C412.3	-	-	-	-	2	2	2	3	-	-	-
C412.4	-	-	-	-	-	-	-	-	3	-	-
Average	**3.00**	**3.00**	**3.00**	**0.00**	**2.00**	**2.00**	**2.00**	**3.00**	**3.00**	**3.00**	**0.00**

3.1.3 Course-PO matrix of courses for all four years of study (10)

Institute Marks : 10.00

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C 122	3	3	0	0	2	0	0	0	0	0	3
C 123	0	0	0	0	0	2	3	0	0	0	0
C 206	0	3	3	0	0	0	0	0	0	3	0
C 207	3	3	0	0	0	0	0	0	0	3	0
C 209	3	0	0	0	2	0	0	0	0	0	0
C 212	3	3	0	0	3	0	0	0	0	0	3
C 213	3	3	0	0	0	0	0	0	0	3	0
C 214	3	3	0	0	0	0	0	0	0	3	0
C 215	3	3	0	0	0	0	0	0	0	3	0
C 216	3	3	0	0	0	0	3	2	0	3	0
C 217	3	3	0	0	0	0	0	0	0	3	0
C 301	3	0	0	PO4	3	0	0	0	0	0	0
C 302	3	0	0	0	3	0	0	0	0	0	0
C 303	3	3	0	0	0	0	0	3	0	0	2
C 304	3	3	0	0	0	0	0	3	0	0	2
C 305	0	0	0	0	3	3	0	3	0	0	0

C 306	3	3	0	0	0	0	0	0	0	3	0
C 307	3	3	0	0	0	0	0	0	0	0	0
C 309	3	0	0	0	2	0	0	0	0	3	0
C 308	3	3	0	0	0	0	0	0	0	3	0
C 310	3	0	0	0	0	0	0	0	0	0	3
C 311	3	0	0	0	3	3	0	0	0	0	0
C 312	3	0	2	0	2	2	0	0	0	0	3
C 313	3	1	0	0	2	2	0	0	0	0	3
C 314	0	0	3	0	2	3	0	0	1	1	0
C 315	3	3	0	0	0	0	0	0	0	3	0
C 316	3	3	0	0	2	0	0	0	0	0	0
C 317	3	3	0	0	0	0	0	0	0	3	0
C 401	3	3	0	0	0	0	0	0	0	3	0
C 402	3	2	2	2	0	2	3	0	0	0	0
C 403	3	3	0	3	0	3	0	3	3	0	0
C 404	3	3	0	0	0	0	0	0	0	1	0
C 405	3	3	0	0	0	0	0	0	0	3	0
C 406	3	3	0	0	2	2	2	2	3	0	0
C 407	3	3	0	0	0	0	0	0	0	3	0
C 408	0	0	0	0	3	3	0	0	0	0	0
C 409	3	0	0	0	1	1	0	0	0	0	0
C 410	3	0	0	0	0	0	0	0	0	3	0
C 411	3	3	0	0	0	0	0	0	0	3	0
C 412	3	3	3	0	2	2	2	3	3	3	0
C101	3	3	0	0	1	0	0	0	0	0	0
C102	3	3	0	0	0	0	0	0	0	3	0
C103	3	3	0	0	2	3	0	0	0	2	0
C104	3	2	0	0	1	0	0	0	0	0	0
C105	3	3	0	0	2	0	0	0	0	2	1
C106	3	3	0	0	0	0	0	0	0	3	0
C107	0	3	0	0	0	2	0	3	1	0	0
C108	3	3	0	0	0	0	0	0	0	3	0

C109	0	0	0	3	0	0	0	3	3	0	0
C110	3	0	0	0	0	2	1	0	0	0	0
C111	3	3	0	0	0	0	0	0	0	3	0
C112	0	0	0	3	0	0	0	0	3	0	0
C113	3	0	0	0	0	2	1	0	0	3	0
C114	3	0	0	0	1	0	0	0	0	0	1
C115	3	2	0	0	0	0	0	0	0	0	0
C116	3	0	0	0	0	0	0	0	0	2	0
C117	3	0	0	0	3	0	0	0	0	0	2
C118	3	3	0	0	0	0	0	0	0	3	0
C119	0	3	0	0	0	0	0	0	0	3	0
C120	3	3	0	0	0	0	0	0	0	3	0
C121	3	3	0	0	2	0	0	0	0	0	0
C201	3	3	0	0	0	0	0	0	0	0	0
C202	3	3	0	0	0	0	0	0	0	3	0
C203	2	3	2	2	2	2	3	0	0	0	0
C204	3	3	3	1	0	0	3	0	0	3	0
C205	3	3	0	0	0	0	0	0	0	3	0
C208	0	3	2	0	0	3	0	0	0	3	0
C210	3	0	0	0	0	0	0	0	0	0	0
C211	3	3	0	0	1	0	0	0	0	0	0

3.2 Attainment of Course Outcomes (40)

Total Marks 40.00

3.2.1 Describe the assessment processes used to gather the data upon which the evaluation of Course Outcome is based (10)

Institute Marks : 10.00

1) Assessment process is divided into two parts
a. Internal Assessment b. University Exam Assessment

- Thirty percent weightage is given for Internal Assessment and seventy percent weightage is given for University Assessment. This is in accordance with the weightage given in University curriculum.
- Internal Assessment : The course outcomes are assessed by the performance of students in the internal exams. The internal exams are divided into 4 continous assesments that cover all the course outcomes. This comprises of 30% of direct assessment
- Semester End Examination: It is an important tool for assessment of course outcomes. This examination consists of descriptive type questions and is conducted by the University.
- University does not provide average or median marks, hence the target attainment level for CO is set as follows.

Performance indicators	% Weightage	Assement tool	Completely Attained [3]	Attained [2]	Partially Attained [1]
DIRECT ASSESSMENT	70%	Course performance in University exams(Theory+Practical) SUMMATIVE	At least 75% of stdents Achieved High Competence level (>7 Grade Pt in 10 Pt scale) in Final Umiversityexamination and internal exams	At least 60% of students Achieved Moderate Competence level (< 7 & >6 Grade Pt in 10 Pt scale) in Final Umiversityexamination and internal exams	At least 50% of students Achieved Avg. Competence level (<6 Grade Pt in 10 Pt scale) in Final Umiversity examination and internal exams
	30%	Course performance in Internal exams (Theory+Practical) FORMATIVE			

3.2.2 Record the attainment of Course Outcomes of all courses with respect to set attainment levels (30)

Institute Marks : 30.00

Performance indicators	% Weightage Assement tool	3 : Completely attained	2 : Attained	1 : Partially attained
COURSE PERFORMANCE	(70% WEIGHTAGE) UNIVERSITY EXAM	At least 75% of students Achieved High Competence level (>7 Grade Pt in 10 Pt scale) in Final Umiversity examination and internal examination	At least 60% of students Achieved Moderate Competence level (< 7 & >6 Grade Pt in 10 Pt scale) in Final Umiversity examination Competence level (< 7 & >6 Grade Pt in 10 Pt scale) in Final Umiversity examination and internal examination	At least 50% of students Achieved Avg. Competence level (<6 Grade Pt in 10 Pt scale) in Final Umiversity and internal examination
	INTERNAL EXAM (30% WEIGHTAGE)			

CO ATTAINMENT CAYm1 2020-21

COURSE CODE	PAPER CODE	COURSE NAME		CO average	CO attainment level
C101	PT 105	Human Anatomy and Physiology I-Theory	Internal	0.9	3
			external	2.1	
C102	PT101	Pharmaceutical Analysis I-Theory	Internal	0.9	3
			external	2.1	
C103	PT106	Pharmaceutics I-Theory	Internal	0.9	3
			external	2.1	
C104	PT 103	Pharmaceutical Inorganic chemistry Theory	Internal	0.9	3
			external	2.1	
C105	PT 195	Human Anatomy and Physiology Practical	Internal	0.9	3
			external	2.1	
C106	PT 191	Pharmaceutical Analysis I – Practical	Internal	0.9	3
			external	2.1	
C107	PT 196	Pharmaceutics I – Practical	Internal	0.9	3
			external	2.1	
C108	PT193	Pharmaceutical Inorganic Chemistry – Practical	Internal	0.9	3
			external	2.1	
C109	HU 181	Communication skills – Theory	Internal	0.9	3
			external	2.1	
C110	PTB184	Remedial Biology	Internal	0.9	3
			external	2.1	
C111	M183	Remedial Mathematics – Theory	Internal	0.9	3
			external	2.1	
C112	HU182	Communication skills – Practical	Internal	0.9	3
			external	2.1	
C113	PTB 185	Remedial Biology – Practical	Internal	0.9	3
			external	2.1	
C114	PT 215	Human Anatomy and Physiology II Theory	Internal	0.9	3
			external	2.1	
C115	PT 213	Pharmaceutica l Organic Chemistry I – Theory	Internal	0.9	3
			external	2.1	
C116	PT 214	Biochemistry Theory	Internal	0.9	3
			external	2.1	
C117	PT 216	Pathophysiolo gy – Theory	Internal	0.9	3
			external	2.1	
C18	PTC203	Computer Applications in Pharmacy Theory	internal	0.9	3
			external	2.1	
C119	PTC 293	Computer Applications In Pharmacy Practical	Internal	0.9	3
			external	2.1	
C120	PT 296	Pharmaceutica l Organic Chemistry I– Practical Pharmaceutica l Organic Chemistry I– Practical	Internal	0.9	3
			external	2.1	
C121	PT 297	Biochemistry – Practical Biochemistry – Practical	Internal	0.9	3
			external	2.1	
C122	PT 298	Human Anatomy and	Internal	0.9	3

		Physiology II –Practical	external	2.1	
C123	HU 282	Environmenta l sciences – Theory	Internal	0.9	3
			external	2.1	
C201	PT 314	Pharmaceutical Organic Chemistry II – Theory	Internal	0.9	3
			external	2.1	
C 202	PT 316	Physical Pharmaceutics I – Theory	Internal	0.9	3
			external	2.1	
C 203	PT 319	Pharmaceutical Theory Microbiology	Internal	0.9	3
			external	2.1	
C204	PT 317	Pharmaceutical Engineering Theory	Internal	0.9	3
			external	2.1	
C 205	PT 394	Pharmaceutical Organic Chemistry II – Practical	Internal	0.9	3
			external	2.1	
C206	PT 396	Physical Pharmaceutics I – Practical	Internal	0.9	3
			external	2.1	
C207	PT 399	Pharmaceutical microbiology Practical	Internal	0.9	3
			external	2.1	
C208	PT 317	Pharmaceutical Engineering Theory	Internal	0.9	3
			external	2.1	
C209	PT 412	Pharmaceutical Organic Chemistry III– Theory	Internal	0.9	3
			external	2.1	
C210	PT 413	Industrial Pharmacy I – Theory	Internal	0.9	3
			external	2.1	
C211	PT 416	Physical Pharmaceutics II – Theory	Internal	0.9	3
			external	2.1	
C212	PT 418	Pharmacology I – Theory	Internal	0.9	3
			external	2.1	
C213	PT 412	Pharmacognosy and Phytochemistry I– Theory	Internal	0.9	3
			external	2.1	
C214	PT 493	Industrial Pharmacy I – Practical	Internal	0.9	3
			external	2.1	
C 215	PT 496	Physical Pharmaceutics II – Practical	Internal	0.9	3
			external	2.1	
C216	PT 498	Pharmacology I – Practical	Internal	0.9	3
			external	2.1	
C217	PT 492	Pharmacognosy and Phytochemistry I – Practical	Internal	0.9	3
			external	2.1	
C 301	PT 513A	Medicinal Chemistry I – Theory	Internal	0.9	3
			external	2.1	
C302	PT 513B	Medicinal Chemistry II – Theory	Internal	0.6	2.7
			external	2.1	
C303	PT 518	Pharmacology II – Theory	Internal	0.9	3
			external	2.1	
C304	PT 512	Pharmacognosy and Phytochemistry II– Theory	Internal	0.9	3
			external	2.1	
C305	PT 516	Pharmaceutical	Internal	0.9	3

		Jurisprudence – Theory	external	2.1	
C306	PT 593	Medicinal Chemistry I – Practical	Internal	0.9	3
			external	2.1	
C 307	PT 598	Pharmacology II – Practical	Internal	0.9	3
			external	2.1	
C308	PT 592	Pharmacognosy and Phytochemistry II – Practical	Internal	0.9	3
			external	2.1	
C 309	PT 613	Medicinal Chemistry III – Theory	Internal	0.9	3
			external	2.1	
C310	PT 618	Pharmacology III – Theory	Internal	0.9	3
			external	2.1	
C311	PT 612	Herbal Drug Technology – Theory	Internal	0.9	3
			external	2.1	
C312	PT 616	Biopharmaceutics and Pharmacokinetics – Theory	Internal	0.9	3
			external	2.1	
C 313	PT 619		Internal	0.9	3
		Pharmaceutical Biotechnology – Theory	external	2.1	
C 314	PT 611	Quality Assurance –Theory	Internal	0.9	3
			external	2.1	
C 315	PT 693	Medicinal chemistry III – Practical	Internal	0.9	3
			external	2.1	
C 316	PT 698	Pharmacology III – Practical	Internal	0.9	3
			external	2.1	
C 317	PT 692	Herbal Drug Technology – Practical	Internal	0.9	3
			external	2.1	
C 401	PT 711	Instrumental Methods of Analysis – Theory	Internal	0.9	3
			external	2.1	
C 402	PT 716A	Industrial Pharmacy II – Theory	Internal	0.6	2.7
			external	2.1	
C 403	PT 718	Pharmacy Practice – Theory	Internal	0.9	3
			external	2.1	
C 404	PT 716B	Novel Drug Delivery System – Theory	Internal	0.9	3
			external	2.1	
C 405	PT 791	Instrumental Methods of Analysis – Practical	Internal	0.9	3
			external	2.1	
C 406	PT 781	Practise school	Internal	0.9	3
			external	2.1	
C 407	PT 817	Biostatistics and Research Methodology	Internal	0.6	2.7
			external	2.1	
C 408	PT818	Social and Preventive Pharmacy	Internal	0.9	3
			external	2.1	
C 409	PT 810A	Pharma Marketing Management(Elective)*	internal	0.9	3
			external	2.1	
C 410	PT 810B	Computer Aided Drug Design(Elective)*	internal	0.9	3
			external	2.1	
C 411	PT 810C		Internal	0.9	3
		Advanced Instrumentation Techniques(Elective	external	2.1	
C 412	PT 883	Project Work	Internal	0.9	3

external	2.1

CO ATTAINMENT FOR CAYm2 2019-20 (NEW SYLLABUS wef 2017-18)					
COURSE CODE	PAPER CODE	COURSE NAME		CO average	CO attainment level
C101	PT 105	Human Anatomy and Physiology I-Theory	Internal	0.9	3
			external	2.1	
C102	PT101	Pharmaceutical Analysis I-Theory	Internal	0.9	3
			external	2.1	
C103	PT106	Pharmaceutics I-Theory	Internal	0.9	3
			external	2.1	
C104	PT 103	Pharmaceutical Inorganic chemistry Theory	Internal	0.9	3
			external	2.1	
C105	PT 195	Human Anatomy and Physiology Practical	Internal	0.9	3
			external	2.1	
C106	PT 191	Pharmaceutical Analysis I – Practical	Internal	0.9	3
			external	2.1	
C107	PT 196	Pharmaceutics I – Practical	Internal	0.9	2.51
			external	1.61	
C108	PT193	Pharmaceutical Inorganic Chemistry – Practical	Internal	0.9	3
			external	2.1	
C109	HU 181	Communication skills – Theory	Internal	0.9	1.6
			external	0.7	
C110	PTB184	Remedial Biology	Internal	0.9	2.88
			external	1.98	
C111	M183	Remedial Mathematics – Theory	Internal	0.9	3
			external	2.1	
C112	HU182	Communication skills – Practical	Internal	0.9	1.6
			external	0.7	
C113	PTB 185	Remedial Biology – Practical	Internal	0.9	2.88
			external	1.98	
C114	PT 215	Human Anatomy and Physiology II Theory	Internal	0.9	3
			external	2.1	
C115	PT 213	Pharmaceutica l Organic Chemistry I – Theory	Internal	0.9	3
			external	2.1	
C116	PT 214	Biochemistry Theory	Internal	0.9	3
			external	2.1	
C117	PT 216	Pathophysiolo gy – Theory	Internal	0.9	3
			external	2.1	
C18	PTC203	Computer Applications in Pharmacy Theory	internal	0.9	3
			external	2.1	
C119	PTC 293	Computer Applications In Pharmacy Practical	Internal	0.9	3
			external	2.1	
C120	PT 296	Pharmaceutica l Organic	Internal	0.9	3

		Chemistry I– Practical Pharmaceutica l Organic Chemistry I– Practical	external	2.1	
C121	PT 297	Biochemistry – Practical Biochemistry – Practical	Internal	0.9	3
			external	2.1	
C122	PT 298	Human Anatomy and Physiology II –Practical	Internal	0.9	3
			external	2.1	
C123	HU 282	Environmenta l sciences – Theory	Internal	0.9	2.65
			external	1.75	
C201	PT 314	Pharmaceutical Organic Chemistry II – Theory	Internal	0.9	3
			external	2.1	
C 202	PT 316	Physical Pharmaceutics I – Theory	Internal	0.9	3
			external	2.1	
C 203	PT 319	Pharmaceutical Theory Microbiology	Internal	0.9	2.96
			external	2.06	
C204	PT 317	Pharmaceutical Engineering Theory	Internal	0.9	2.7
			external	1.8	
C 205	PT 394	Pharmaceutical Organic Chemistry II – Practical	Internal	0.9	3
			external	2.1	
C206	PT 396	Physical Pharmaceutics I – Practical	Internal	0.9	3
			external	2.1	
C207	PT 399	Pharmaceutical microbiology Practical	Internal	0.9	3
			external	2.1	
C208	PT 317	Pharmaceutical Engineering Theory	Internal	0.9	3
			external	2.1	
C209	PT 412	Pharmaceutical Organic Chemistry III– Theory	Internal	0.9	3
			external	2.1	
C210	PT 413	Industrial Pharmacy I – Theory	Internal	0.9	3
			external	2.1	
C211	PT 416	Physical Pharmaceutics II – Theory	Internal	0.9	3
			external	2.1	
C212	PT 418	Pharmacology I – Theory	Internal	0.9	3
			external	2.1	
C213	PT 412	Pharmacognosy and Phytochemistry I– Theory	Internal	0.9	3
			external	2.1	
C214	PT 493	Industrial Pharmacy I – Practical	Internal	0.9	3
			external	2.1	
C 215	PT 496	Physical Pharmaceutics II – Practical	Internal	0.9	3
			external	2.1	
C216	PT 498	Pharmacology I – Practical	Internal	0.9	2.51
			external	1.61	
C217	PT 492	Pharmacognosy and Phytochemistry I – Practical	Internal	0.9	3
			external	2.1	

C 301	PT 513A	Medicinal Chemistry I – Theory	Internal	0.9	3
			external	2.1	
C302	PT 513B	Medicinal Chemistry II – Theory	Internal	0.9	3
			external	2.1	
C303	PT 518	Pharmacology II – Theory	Internal	0.9	2.76
			external	1.86	
C304	PT 512	Pharmacognosy and Phytochemistry II– Theory	Internal	0.9	2.96
			external	2.06	
C305	PT 516	Pharmaceutical Jurisprudence – Theory	Internal	0.9	2.8
			external	1.9	
C306	PT 593	Medicinal Chemistry I – Practical	Internal	0.9	3
			external	2.1	
C 307	PT 598	Pharmacology II – Practical	Internal	0.9	3
			external	2.1	
C308	PT 592	Pharmacognosy and Phytochemistry II – Practical	Internal	0.9	3
			external	2.1	
C 309	PT 613	Medicinal Chemistry III – Theory	Internal	0.9	3
			external	2.1	
C310	PT 618	Pharmacology III – Theory	Internal	0.9	3
			external	2.1	
C311	PT 612	Herbal Drug Technology – Theory	Internal	0.9	3
			external	2.1	
C312	PT 616	Biopharmaceutics and Pharmacokinetics – Theory	Internal	0.9	3
			external	2.1	
C 313	PT 619	Pharmaceutical Biotechnology – Theory	Internal	0.9	3
			external	2.1	
C 314	PT 611	Quality Assurance – Theory	Internal	0.6	2.52
			external	1.92	
C 315	PT 693	Medicinal chemistry III – Practical	Internal	0.9	3
			external	2.1	
C 316	PT 698	Pharmacology III – Practical	Internal	0.9	3
			external	2.1	
C 317	PT 692	Herbal Drug Technology – Practical	Internal	0.9	3
			external	2.1	
C 401	PT 711	Instrumental Methods of Analysis – Theory	Internal	_	_
			external	_	_
C 402	PT 716A	Industrial Pharmacy II – Theory	Internal	_	_
			external	_	_
C 403	PT 718	Pharmacy Practice – Theory	Internal	_	_
			external	_	
C 404	PT 716B	Novel Drug Delivery System – Theory	Internal	_	_
			external	_	_
C 405	PT 791	Instrumental Methods of Analysis – Practical	Internal	_	_
			external	_	_

C 406	PT 781	Practise school	Internal	_	_
			external	_	_
C 407	PT 817	Biostatistics and Research Methodology	Internal	_	_
			external	_	_
C 408	PT818	Social and Preventive Pharmacy	Internal	_	_
			external	_	_
C 409	PT 810A	Pharma Marketing Management(Elective)*	internal	_	_
			external	_	_
C 410	PT 810B	Computer Aided Drug Design(Elective)*	internal	_	_
			external	_	_
C 411	PT 810C		Internal	_	_
		Advanced Instrumentation Techniques(Elective	external	_	_
C 412	PT 883	Project Work	Internal	_	_
			external	_	_

NOTE : CO attainment for 4th year courses could not be calculated as 4th year batch students were under OLD syllabus (wef 2008) and course mismatch was there compared to the NEW(2017-18) syllbus.

CO ATTAINMENT FOR CAYm2 2019-20 (OLD MAKAUT SYLLABUS wef 2008-2009)				
PAPER CODE	COURSE NAME		CO average	CO attainment level
PT706	Pharmaceutics	Internal	0.9	3
		external	2.1	
PT 703	Pharm(medicinal chemistry)	Internal	0.6	2.7
		external	2.1	
PT 702	Pharmacognosy	Internal	0.6	2.7
		external	2.1	
PT 708	Pharmacology	Internal	0.9	3
		external	2.1	
PT 709C	Pharmaceutical marketing management	Internal	0.9	3
		external	2.1	
PT 796	Pharmaceutics Lab	Internal	0.9	3
		external	2.1	
PT 793	Pharmaceutical Chemistry–Practical	Internal	0.9	3
		external	2.1	
PT 783	Project	Internal	0.9	3
		external	2.1	
PT 812	Pharmaceutical industrial management	Internal	0.9	3
		external	2.1	
PT 813	Pharmaceutical jurisprudence & ethics	Internal	0.9	3
		external	2.1	
PT 818	Hospital & Clinical	Internal	0.6	2.7

	Pharmacy	external	2.1	
PT 801	Pharmaceutical Analysis	Internal	0.6	2.7
		external	2.1	
PT 891	Pharmaceutical Analysis PRACTICAL	Internal	0.9	3
		external	2.1	
PT 884	VIVA VOCE	Internal	0.9	3
		external	2.1	

CO ATTAINMENT FOR CAYm3 2018-19 (NEW SYLLABUS wef 2017-18)					
COURSE CODE	PAPER CODE	COURSE NAME		CO average	CO attainment level
C101	PT 105	Human Anatomy and Physiology I-Theory	Internal	0.6	1.58
			external	0.98	
C102	PT101	Pharmaceutical Analysis I-Theory	Internal	0.3	1.42
			external	1.12	
C103	PT106	Pharmaceutics I-Theory	Internal	0.6	1.86
			external	1.26	
C104	PT 103	Pharmaceutical Inorganic chemistry Theory	Internal	0.6	2.7
			external	2.1	
C105	PT 195	Human Anatomy and Physiology Practical	Internal	0.9	1.77
			external	0.87	
C106	PT 191	Pharmaceutical Analysis I – Practical	Internal	0.9	2.1
			external	1.2	
C107	PT 196	Pharmaceutics I – Practical	Internal	0.9	2.72
			external	1.82	
C108	PT193	Pharmaceutical Inorganic Chemistry – Practical	Internal	0.6	1.76
			external	1.16	
C109	HU 181	Communication skills – Theory	Internal	0.6	2.7
			external	2.1	
C110	PTB184	Remedial Biology	Internal	0.9	2.02
			external	1.12	
C111	M183	Remedial Mathematics – Theory	Internal	0.9	1.95
			external	1.05	
C112	HU182	Communication skills – Practical	Internal	0.6	2.7
			external	2.1	
C113	PTB 185	Remedial Biology – Practical	Internal	0.9	2.16
			external	1.26	
C114	PT 215	Human Anatomy and Physiology II Theory	Internal	0.6	1.3
			external	0.7	
C115	PT 213	Pharmaceutica I Organic Chemistry I – Theory	Internal	0.6	1.47
			external	0.87	
C116	PT 214	Biochemistry Theory	Internal	0.6	1.41
			external	0.81	

C117	PT 216	Pathophysiolo gy – Theory	Internal	0.9	1.6
			external	0.7	
C18	PTC203	Computer Applications in Pharmacy Theory	internal	0.6	1.5
			external	0.9	
C119	PTC 293	Computer Applications In Pharmacy Practical	Internal	0.9	2.3
			external	1.4	
C120	PT 296	Pharmaceutica l Organic Chemistry I– Practical Pharmaceutica l Organic Chemistry I– Practical	Internal	0.9	2.06
			external	1.16	
C121	PT 297	Biochemistry – Practical Biochemistry – Practical	Internal	0.9	1.92
			external	1.02	
C122	PT 298	Human Anatomy and Physiology II –Practical	Internal	0.9	1.83
			external	0.93	
C123	HU 282	Environmenta l sciences – Theory	Internal	0.9	3
			external	2.1	
C201	PT 314	Pharmaceutical Organic Chemistry II – Theory	Internal	0.6	1.65
			external	1.05	
C 202	PT 316	Physical Pharmaceutics I – Theory	Internal	0.9	2.1
			external	1.2	
C 203	PT 319	Pharmaceutical Theory Microbiology	Internal	0.9	2.2
			external	1.3	
C204	PT 317	Pharmaceutical Engineering Theory	Internal	0.6	2.1
			external	1.5	
C 205	PT 394	Pharmaceutical Organic Chemistry II – Practical	Internal	0.9	2.06
			external	1.16	
C206	PT 396	Physical Pharmaceutics I – Practical	Internal	0.9	2.3
			external	1.4	
C207	PT 399	Pharmaceutical microbiology Practical	Internal	0.9	2.1
			external	1.2	
C208	PT 317	Pharmaceutical Engineering Theory	Internal	0.9	2.3
			external	1.4	
C209	PT 412	Pharmaceutical Organic Chemistry III– Theory	Internal	0.9	1.6
			external	0.7	
C210	PT 413	Industrial Pharmacy I – Theory	Internal	0.9	1.6
			external	0.7	
C211	PT 416	Physical Pharmaceutics II – Theory	Internal	0.9	1.9
			external	1	
C212	PT 418	Pharmacology I – Theory	Internal	0.9	1.7
			external	0.8	
C213	PT 412	Pharmacognosy and Phytochemistry I– Theory	Internal	0.9	2.06
			external	1.16	
C214	PT 493	Industrial Pharmacy I –	Internal	0.9	2.06

		Practical	external	1.16	
C 215	PT 496	Physical Pharmaceutics II – Practical	Internal	0.9	2.06
			external	1.16	
C216	PT 498	Pharmacology I – Practical	Internal	0.9	2.47
			external	1.57	
C217	PT 492	Pharmacognosy and Phytochemistry I – Practical	Internal	0.9	2.06
			external	1.16	
C 301	PT 513A	Medicinal Chemistry I – Theory	Internal	_	_
			external	_	_
C302	PT 513B	Medicinal Chemistry II – Theory	Internal	_	_
			external	_	_
C303	PT 518	Pharmacology II – Theory	Internal	_	_
			external	_	_
C304	PT 512	Pharmacognosy and Phytochemistry II– Theory	Internal	_	_
			external	_	_
C305	PT 516	Pharmaceutical Jurisprudence – Theory	Internal	_	_
			external	_	_
C306	PT 593	Medicinal Chemistry I – Practical	Internal	_	_
			external	_	_
C 307	PT 598	Pharmacology II – Practical	Internal	_	_
			external	_	_
C308	PT 592	Pharmacognosy and Phytochemistry II – Practical	Internal	_	_
			external	_	_
C 309	PT 613	Medicinal Chemistry III – Theory	Internal	_	_
			external	_	_
C310	PT 618	Pharmacology III – Theory	Internal	_	_
			external	_	
C311	PT 612	Herbal Drug Technology – Theory	Internal	_	_
			external	_	_
C312	PT 616	Biopharmaceutics and Pharmacokinetics – Theory	Internal	_	_
			external	_	_
C 313	PT 619		Internal	_	_
		Pharmaceutical Biotechnology – Theory	external	_	_
C 314	PT 611	Quality Assurance –Theory	Internal	_	_
			external	_	_
C 315	PT 693	Medicinal chemistry III – Practical	Internal	_	
			external	_	_
C 316	PT 698	Pharmacology III – Practical	Internal	_	_
			external	_	
C 317	PT 692	Herbal Drug Technology – Practical	Internal	_	_
			external	_	_
C 401	PT 711	Instrumental Methods of Analysis – Theory	Internal	_	_
			external	_	_
C 402	PT 716A	Industrial Pharmacy II – Theory	Internal	_	_
			external	_	_
C 403	PT 718	Pharmacy Practice – Theory	Internal	_	_
			external	_	_
C 404	PT 716B	Novel Drug Delivery System – Theory	Internal	_	_
			external	_	_
C 405	PT 791	Instrumental Methods of	Internal	_	_

		Analysis – Practical	external	_	_
C 406	PT 781	Practise school	Internal	_	_
			external	_	_
C 407	PT 817	Biostatistics and Research Methodology	Internal	_	_
			external	_	_
C 408	PT818	Social and Preventive Pharmacy	Internal	_	_
			external	_	_
C 409	PT 810A	Pharma Marketing Management(Elective)*	internal	_	_
			external	_	_
C 410	PT 810B	Computer Aided Drug Design(Elective)*	internal	_	_
			external	_	_
C 411	PT 810C		Internal	_	_
		Advanced Instrumentation Techniques(Elective	external	_	_
C 412	PT 883	Project Work	Internal	_	_
			external	_	_

NOTE : CO attainment for 3rd and 4th year courses could not be calculated as 4th year batch students were under OLD syllabus (wef 2008) and course mismatch was there compared to the NEW(2017-18) syllbus.

CO ATTAINMENT FOR CAYm3 2018-19(OLD MAKAUT SYLLABUS wef 2008-2009)				
PAPER CODE	COURSE NAME		CO average	CO attainment level
PT 506	Pharmaceutical technology -II	Internal	0.6	2
		external	1.4	
PT 508	Pharmacology	Internal	0.6	2
		external	1.4	
PT 509	Pharmaceutical Microbiology	Internal	0.6	2
		external	1.4	
PT 503	Medicinal Chemistry	Internal	0.6	2
		external	1.4	
PT 507	Pharmaceutical engineering	Internal	0.9	2.3
		external	1.4	
PT 504	Pharmaceutical chemistry-Biochemistry	Internal	0.9	2.3
		external	1.4	
PT 596	Pharmaceutics II	Internal	0.9	3
		external	2.1	
PT 597	Pharmaceutical engineering Lab	Internal	0.6	2.7
		external	2.1	
PT 599	Pharmaceutical Microbiology Lab	Internal	0.6	2.7
		external	2.1	
PT 593	Pharmaceutical (Medicinal) chemistry lab	Internal	0.9	3
		external	2.1	
PT 603	Pharmaceutical (Medicinal) chemistry	Internal	0.9	2.3
		external	1.4	
PT 606	Pharmaceutics	Internal	0.6	2
		external	1.4	
PT 611	Pharmaceutics(Biophrmaceutics & Pharmacokinetics	Internal	0.9	2.3
		external	1.4	
PT 608	Pharmacology	Internal	0.6	2

		external	1.4	
PT 609	Pharmaceutical biotechnology& industrial microbiology	Internal	0.6	2
		external	1.4	
PT 610B	Advanced pharmaceutical Biotechnogy	Internal	0.6	2
		external	1.4	
PT 693	Pharmaceutical (medicinal chemistry lab)	Internal	0.9	3
		external	2.1	
PT 696	Pharmaceeutics Lab	internal	0.6	2.7
		external	2.1	
PT 697	Pharmaceutics(Biophrmaceutics & Pharmacokinetics lab)	Internal	0.9	3
		external	2.1	
PT 698	Pharmacology lab	Internal	0.9	3
		external	2.1	
PT 691B	Advanced pharmaceutical Biotechnogy Lab	Internal	0.9	3
		external	2.1	
PT706	Pharmaceutics	Internal	0.9	2.3
		external	1.4	
PT 703	Pharm(medicinal chemistry)	Internal	0.6	2
		external	1.4	
PT 702	Pharmacognosy	Internal	0.6	2
		external	1.4	
PT 708	Pharmacology	Internal	0.9	2.3
		external	1.4	
PT 709C	Pharmaceutical marketing management	Internal	0.9	3
		external	2.1	
PT 796	Pharmaceutics Lab	Internal	0.6	2.7
		external	2.1	
PT 793	Pharmaceutical Chemistry–Practical	Internal	0.9	3
		external	2.1	
PT 783	Project	Internal	0.9	3
		external	2.1	
PT 812	Pharmaceutical industrial management	Internal	0.9	2.3
		external	1.4	
PT 813	Pharmaceutical jurisprudence & ethics	Internal	0.9	3
		external	2.1	
PT 818	Hospital & Clinical Pharmacy	Internal	0.6	2.7
		external	2.1	
PT 801	Pharmaceutical Analysis	Internal	0.6	2.7
		external	2.1	
PT 891	Pharmaceutical Analysis PRACTICAL	Internal	0.9	3
		external	2.1	
PT 884	VIVA VOCE	Internal	0.6	2
		external	1.4	

3.3 Attainment of Program Outcomes (40) Total Marks 40.00

3.3.1 Describe assessment tools and processes used for assessing the attainment of each PO (10) Institute Marks : 10.00

Performance indicators	Assesment tools	3 : Completely attained	2 : Attained	1 : Partially attained
DIRECT ASSESMENT 80% WEIGHTAGE	COURSE PERFORMANCE	At least 75% of students Achieved High Competence level (>7 Grade Pt in 10 Pt scale) in Final Umiversity examination	At least 60% of students Achieved Moderate Competence level (< 7 & >6 Grade Pt in 10 Pt scale) in Final Umiversity examination	At least 50% of students Achieved Avg. Competence level (<6 Grade Pt in 10 Pt scale) in Final Umiversity
INDIRECT ASSESMENT (20% WEIGHTAGE)	PLACEMENT AND HIGHER STUDIES RECORD	At least 80% of the graduates are working in technical or professional carrers or got enrolled for higher studies	At least 70% of the graduates are working in technical or professional carrers or got enrolled for higher studies	At least 60% of the graduates are working in technical or professional carrers or got enrolled for higher studies
	GPAT/COMPEITIVE EXAMS	More than 20% of the students succeed in GPAT / Other compeititive exams	At least 10-20% of the students succeed in GPAT / Other compeititive exams	Less than 10% of the students succeed in GPAT / Other compeititive exams
	GRADUATE EXIT SURVEY	Average assessment score of survey report is > 4.0	Average assessment score of survey report is between 3.01-3.99	Average assessment score of survey report is < 3.0
	ALUMNI FEEDBACK	Average assessment score of survey report is > 4.0	Average assessment score of survey report is between 3.01-3.99	Average assessment score of survey report is < 3.0

3.3.2 Provide results of evaluation of each PO (30) Institute Marks : 30.00

PO Attainment

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
C 122	3	3	0	0	3	0	0	0	0	0	3
C 123	0	0	0	0	0	3	3	0	0	0	0
C 206	0	3	3	0	0	0	0	0	0	3	0
C 207	3	3	0	0	0	0	0	0	0	3	0
C 209	3	0	0	0	3	0	0	0	0	0	0
C 212	3	0	0	0	0	0	0	0	0	0	0

C 213	3	3	0	0	0	0	0	0	0	3	0
C 214	3	3	0	0	0	0	0	0	0	3	0
C 215	3	3	0	0	0	0	0	0	0	3	0
C 216	3	3	0	0	0	0	3	3	0	3	0
C 217	3	3	0	0	0	0	0	0	0	3	0
C 301	3	0	0	0	3	0	0	0	0	0	0
C 302	3	0	0	0	3	0	0	0	0	0	0
C 303	3	3	0	0	0	0	0	3	0	0	3
C 304	3	3	0	0	0	0	0	3	0	0	3
C 305	0	0	0	0	0	3	0	0	0	0	0
C 306	3	3	0	0	0	0	0	0	0	3	0
C 307	3	3	0	0	0	0	0	0	0	0	0
C 309	3	0	0	0	3	0	0	0	0	3	0
C 310	3	0	0	0	0	0	0	0	0	0	3
C 311	3	0	0	0	3	3	0	0	0	0	0
C 312	3	0	3	0	3	3	0	0	0	0	3
C 313	0	3	0	0	3	3	0	0	0	0	3
C 314	3	0	3	0	3	3	0	0	0	3	0
C 315	3	3	0	0	0	0	0	0	0	3	0
C 316	3	3	0	0	3	0	0	0	0	0	0
C 317	0	3	0	0	0	0	0	0	0	3	0
C 401	3	3	0	0	0	0	0	0	0	3	0
C 402	3	3	3	3	0	3	3	0	0	0	0
C 403	3	3	0	3	0	3	0	3	3	0	0
C 404	3	3	0	0	0	0	0	0	0	3	0
C 405	3	3	0	0	0	0	0	0	0	3	0
C 406	3	3	3	0	3	3	3	3	3	0	0
C 407	3	3	0	0	0	0	0	0	0	3	0
C 408	0	0	0	0	3	0	0	0	0	0	0
C 409	3	0	0	0	3	0	0	0	0	0	0
C 410	3	0	0	0	0	0	0	0	0	3	0
C 411	3	3	0	0	0	0	0	0	0	3	0

C 412	3	3	3	0	3	3	3	3	3	3	0
C101	3	3	0	0	3	0	0	0	0	0	0
C102	2	2	0	0	0	0	0	0	0	2	0
C103	3	3	0	0	3	3	0	0	0	3	0
C104	3	3	0	0	3	0	0	0	0	0	0
C105	3	3	0	0	3	0	0	0	0	3	3
C106	3	3	0	0	0	0	0	0	0	3	0
C107	0	3	0	0	0	3	0	3	3	0	0
C108	3	3	0	0	0	0	0	0	0	3	0
C109	0	0	0	3	0	0	0	3	3	0	0
C110	3	0	0	0	0	3	3	0	0	0	0
C111	3	3	0	0	0	0	0	0	0	0	0
C112	0	0	0	3	0	0	0	0	3	0	0
C113	3	0	0	0	0	3	3	0	0	3	0
C114	3	0	0	0	3	0	0	0	0	0	3
C115	3	3	0	0	0	0	0	0	0	0	0
C116	3	0	0	0	0	0	0	0	0	3	0
C117	3	0	0	0	3	0	0	0	0	0	3
C118	3	3	0	0	0	0	0	0	0	3	0
C119	0	3	0	0	0	0	0	0	0	3	0
C120	3	3	0	0	0	0	0	0	0	3	0
C121	3	3	0	0	3	0	0	0	0	0	0
C201	3	3	0	0	0	0	0	0	0	3	0
C202	3	3	0	0	0	0	0	0	0	3	0
C203	3	3	3	0	3	3	3	0	0	0	0
C204	3	3	3	3	0	0	3	0	0	3	0
C205	3	3	0	0	0	0	0	0	0	3	0
C208	0	3	3	0	0	3	0	0	0	3	0
C210	3	0	0	0	0	0	0	0	0	0	0
C211	3	3	0	0	3	0	0	0	0	0	0
C308	3	3	0	0	0	0	0	0	0	3	0

PO Attainment Level

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
Direct Attainment	2.98	2.98	3	3	3	3	3	3	3	2.97	3
InDirect Attainment	2.5	2.75	1.75	2	1.75	2.5	2.5	1.75	1.75	3	2.5
PO Attainment	2.88	2.93	2.75	2.8	2.75	2.9	2.9	2.75	2.75	2.98	2.9

4 STUDENTS' PERFORMANCE (180) Total Marks 159.37

Total Marks 20.00

Table 4.1

Item	2021-22 (CAY)	2020-21 (CAYm1)	2019-20 (CAYm2)	2018-19 (CAYm3)	2017-18 (CAYm4)	2016-17 (CAYm5)	2015-16 (CAYm6)
Sanctioned intake of the program(N)	100	100	100	100	120	120	120
Total number of students admitted in first year (N1)	98	96	94	95	124	110	119
Number of students admitted in 2nd year in the same batch via lateral entry (N2)	0	19	22	14	15	10	21
Total number of students admitted in the programme(N1 + N2)	98	115	116	109	139	120	140

4.1 Enrolment Ratio (20) Institute Marks : 20.00

	N (From Table 4.1)	N1 (From Table 4.1)	Enrollment Ratio [(N1/N)*100]
2021-22	100	98	98.00
2020-21	100	96	96.00
2019-20	100	94	94.00

Average [(ER1 + ER2 + ER3) / 3] : 96.00

Assessment : 20.00

4.2 Success Rate in the stipulated period of the program (50) Total Marks 39.90

Table 4.2

Year of entry	Number of students admitted in 1st year + admitted via lateral entry in 2nd year (N1 + N2)	Number of students who have successfully graduated without backlogs in any year of study (Without backlog means no compartment/failure in any semester/year of study)			
		I year	II year	III year	IV year
2021-22 (CAY)	98				
2020-21 (CAYm1)	115	96			
2019-20 (CAYm2)	116	94	114		
2018-19 (CAYm3)	109	90	104	104	
2017-18 (LYG)	139	96	110	110	110
2016-17 (LYGm1)	120	81	91	91	91
2015-16 (LYGm2)	140	69	90	90	90

Table 4.3

Year of entry	Number of students admitted in 1st year + admitted via lateral entry in 2nd year (N1 + N2)	Number of students who have successfully graduated in stipulated period of study) [Total of with Backlog + without Backlog]			
		I year	II year	III year	IV year
2021-22 (CAY)	98				
2020-21 (CAYm1)	115	96			
2019-20 (CAYm2)	116	94	116		
2018-19 (CAYm3)	109	95	109	109	
2017-18 (LYG)	139	106	129	129	129
2016-17 (LYGm1)	120	91	118	118	118
2015-16 (LYGm2)	140	76	109	109	109

4.2.1 Success rate without backlogs in any year of study (30)

Institute Marks : 21.90

Item	Latest Year of Graduation, LYG (2017-18)	Latest Year of Graduation minus 1, LYGm1 (2016-17)	Latest Year of Graduation minus 2 LYGm2 (2015-16)
X Number of students admitted in the corresponding First Year + admitted in 2nd year via lateral entry	139.00	120.00	140.00
Y Number of students who have graduated without backlogs in the stipulated period	110.00	91.00	90.00
Success Index [SI = Y / X]	0.79	0.76	0.64

Average SI [(SI1 + SI2 + SI3) / 3] : 0.73

Assessment = 30 * Average SI : 21.90

4.2.2 Success rate in stipulated period (20)

Institute Marks : 18.00

Item	Latest Year of Graduation, LYG (2017-18)	Latest Year of Graduation minus 1, LYGm1 (2016-17)	Latest Year of Graduation minus 2 LYGm2 (2015-16)
X Number of students admitted in the corresponding First Year + admitted in 2nd year via lateral entry	139.00	120.00	140.00
Y Number of students who have graduated in the stipulated period	129.00	118.00	109.00
Success Index [SI = Y / X]	0.93	0.98	0.78

Average SI[(SI1 + SI2 + SI3) / 3] : 0.90

Assessment = 20 * Average SI : 18.00

Note : If 100% students clear without any backlog then also total marks scored will be 40 as both 4.2.1 & 4.2.2 will be applicable simultaneously.

4.3 Academic Performance in Final Year (10)

Total Marks 7.62

Institute Marks : 7.62

Academic Performance	2017-18 (LYG)	2016-17 (LYGm1)	2015-16 (LYGm2)
Mean of CGPA or mean percentage of all successful students(X)	7.73	7.61	7.53
Total number of successful students(Y)	129.00	118.00	109.00
Totalnumber of students appeared in the examination(Z)	129.00	118.00	109.00
API [X*(Y/Z)]:	7.73	7.61	7.53

Average API [(AP1 + AP2 + AP3)/3] : 7.62

Academic Performance = Average API = [(AP1 + AP2 + AP3)/3] : 7.62

4.4 Academic Performance in Third Year (10)

Total Marks 7.72

Institute Marks : 7.72

Academic Performance	CAYm3 (2018-19)	LYG (2017-18)	LYGm1 (2016-17)
Mean of CGPA or mean percentage of all successful students(X)	7.86	7.85	7.46
Total number of successful students (Y)	109.00	129.00	118.00
Total number of students appeared in the examination (Z)	109.00	129.00	118.00
API [X * (Y/Z)]	7.86	7.85	7.46

Average API [(AP1 + AP2 + AP3)/3] : 7.72

Academic Performance = Average API [(AP1 + AP2 + AP3)/3] : 7.72

4.5 Academic Performance in Second Year (10)

Total Marks 8.19

Institute Marks : 8.19

Academic Performance	2019-20 (CAYm2)	2018-19 (CAYm3)	2017-18 (LYG)
Mean of CGPA or mean percentage of all successful students(X)	8.72	7.81	7.55
Total number of successful students(Y)	116.00	109.00	129.00
Totalnumber of students appeared in the examination(Z)	116.00	109.00	121.00
API [X*(Y/Z)]:	8.72	7.81	8.05

Average API [(AP1 + AP2 + AP3)/3] : 8.19

Academic Performance = Average API = [(AP1 + AP2 + AP3)/3] : 8.19

4.6 Academic Performance in First Year (20)

Total Marks 16.87

Institute Marks : 16.87

Academic Performance	2020-21 (CAYm1)	2019-20 (CAYm2)	2018-19 (CAYm3)
Mean of CGPA or mean percentage of all successful students(X)	9.30	8.42	7.59
Total number of successful students(Y)	96.00	94.00	95.00
Totalnumber of students appeared in the examination(Z)	96.00	94.00	95.00
API [X*(Y/Z)]:	9.30	8.42	7.59

Average API [(AP1 + AP2 + AP3)/3] : 8.44

Academic Performance = Average API = [(AP1 + AP2 + AP3)/3] : 8.44

4.7 Placement and Higher Studies (40)

Total Marks 39.07

Institute Marks : 39.07

Item	2017-18 (LYG)	2016-17 (LYGm1)	2015-16 (LYGm2)
Total No of Final Year Students(N)	129.00	118.00	109.00
Number of students placed in Industries/ Hospitals/ Government sector through on/off campus recruitment or opted for Entrepreneurship(x)	45.00	51.00	42.00
No. of students admitted to higher studies with valid scores in various qualifying exams(y)	78.00	67.00	65.00
Placement Index [(X + Y)/N] :	0.95	1.00	0.98

Average Placement [(X + Y)/N] : 0.98

Assessment [40 * Average Placement] : 39.07

4.8 Professional Activities (20)

Total Marks 20.00

4.8.1 Professional societies / chapters and organizing pharmacy events (5)

Institute Marks : 5.00

The institute organises professional evets to enable the students identify their role as pharmaceutical technologist and health care professional and identify their social and legal respinsibility towards the profession.

EVENTS (2019-20)			
DATE	EVENT NAME	GUEST SPEAKERS	NUMBER OF PARTICIPANTS
15-22nd October	NSHM Innovation week	1.Mr. Kaustav Majumdar, Mentor and Head: NSHM Center for Innovation, Incubation and Entrepreneurship 2. Mr. Aaquib Hussain, Chief Dreamer and Director at I& We_WeC Minds	200

28th-29th February	NATCONPH (A platform for healthcare professionals across diverse disciplines to deliberate on the 'Emerging Trends in Modern Health Sciences')	1.Prof. Sumanta Chaterjee, National Center For Biological Sciences (NCBS), Bangalore 2. Dr. Jayanta Chattopadhyay, Professor, Department of Pharmaceutical Chemistry, Bengal School of Technology. 3. Mr. Kaushik Ghosh, Chief Operating Officer & Learning Head, Guide Guru 4. Dr. B Santosh Kumar, Scientist - National Institute of Nutrition (NIN), Hyderabad 5. Dr. Rima Mukherjee, Psychiatrist, Founder , Founder and Director, Crystal Mind	1200
	NATIONAL pHARMACY WEEK CELEBRATION		
	EVENTS 2020-21		
25th July	International masterclass webinar on advancement in pharmaceutical industry and technology	1. Mr M S Nath, Co founder and executive director of Azzka Pharmaceuticals Pvt. Ltd. Gujarat, India 2. Dr. Subrata Deb, Chair and associate professor, Department of pharmaceutical science, Lerkin Universitty, USA	400
	National Pharmacy week celebration		
	EVENTS 2021-22		

7th August	1st INTERACTIVE CONVERSATION (online), A NSHM Alumni-Connect initiative.	1.Mr. Soumyadip Sarkar (Area Manager | CRM India Medtronic Pvt. Ltd., KOLKATA) 2. Mr. Debodeep Roy (Deputy Manager, MS&T Department,Zydus Cadilla, Ahmedabad)	120
21st Septembar	National Pharmacovigilence Week celebration	1. Mr. Saikat Biswas, Global Head, Med Devices, Pharma, Energy, Utilities and Manufacturing, Wipro, DOP 2. Mr. Anirban Roychowdhury, Vice President, Clinical Research and Pharmacovigilence, Bharat serums and vaccines Ltd	
25th september	Worls Pharmacist day celebration	. Mr. Bedadyuti chakraborty, Director, Rxcella, Advisor, Dr. Reddys Institute of life sciences, Hydrabad 2. Mr. Vijay Kumar Mangla, DGM, Glenmark Pharmaceuticals Ltd, Sikkim	

26- 27th August	International online conference on "Research Advancement Resilience in the Pandemic Era- A Drive for Innovative Transformation	1. Prof. Dr. Svante Winberg, Professor of Neuroendocrinology, Department of Neuroscience, Uppsala University 2.Prof. (Dr.) CHAN Chun Yong, Eric, Professor, Department of Pharmacy, National University of Singapore 3.Prof. (Dr.) Gill Diamond, Professor, Department of Oral Immunology and Infectious Diseases,University of Louisville School of Dentistry 4. Prof. (Dr.) G. D.Gupta, Director-cum-Principal, ISF College Of Pharmacy, Moga, India.	500
23-27th Nov	National Pharmacy week celebration	1. Prof. Ranendra N. Saha, Ex Vice Chancellor, BITS Pilani (11.00 am) 2. Mr. Tapan Kanti Rudra, IAS, Secretary, Health & Family Welfare Department 3. Dr. Nirmalya Dasgupta, Syngene International Limited, Bangalore 4. Dr. Santanu Chakraborty, Mylan Laboratory, Hyderabad	300

4.8.2 Publication of technical magazines, newsletters, etc. (5)

Institute Marks : 5.00

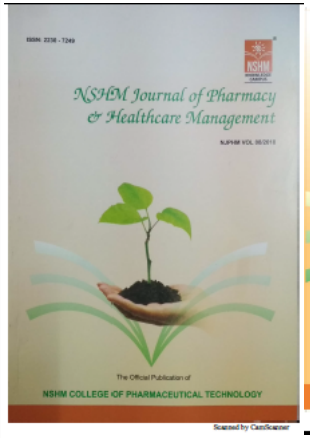
Publication of technical magazines, newsletters, etc is an integral part of any academic institution.

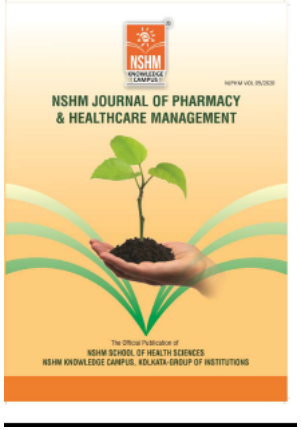
NSHM Knowledge Campus GOI,Kolkata,Department of pharmacy is actively involved in the publication of a national journal named “NSHM Journal of Pharmacy and Healthcare Management” since long back. This is an official, peer reviewed publication of the institution and the journal is published annually. ISSN number of the journal is 2230-7249.

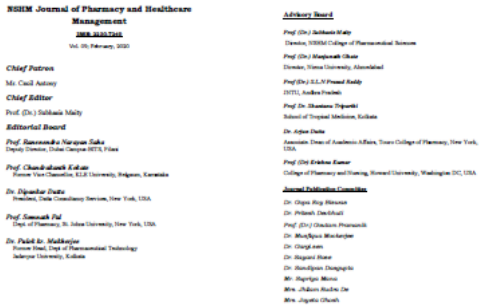
Eminent personalities from both academics as well as industries are there in the editorial board as well as the advisory board. This journal invites and publishes research and review papers from all across the country in different fields of pharmaceutical and other healthcare sciences.

Prof. Dr. Subhasis Maity, Director, NSHM Institute of Health Sciences is the Chief Editor of this journal and the publisher is NSHM Knowledge Campus, Kolkata.

Attached is a snapshot of journals published in 2018 and 2020.



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4.8.3 Participation in inter-institute events by students of the program of study (10)

Institute Marks : 10.00

Students are regularly participating in inter institute events in offline as well as online mode (during pendemic period).

Enlisted below is alist of student achievers in inter institute events.

YEAR	Seminars/conferences/workshop	Achievement	Name of students
2018	AGNITIO'' Spirit 18 National seminar on'Quality control &biotherapeutics',at IIT,BHU Dt: 3-4th feb,2018	1st prize (poster)Analyticalevent	Anwesha Paul,Lahanya guha,kushal Adikary IIyr BPHARM

2020	National quiz conducted as a part of their Industry-Academia Conclave event in India International Science Festival (IISF) 2020. Organized by Ministry of science and Technology in collaboration with CSIR	All India Top 30 from Pharmaceutical Sciences Category In preliminary round on 23rd Dec 8th position in Finals on 24th Dec. Prize money of Rs 500	Atreyee Bhattacharyya 3rd Sem Bpharm
	creative writing (Bengali) competition in **Xavotsav-2020** organised by St. Xaviers College	2nd Prize	Diptakshi majumdar 5th Sem BPharm
	Teegala Krishna ReddY College of pharmacy,QUIZ series on ''Pharmacy Practise''	96% score Certificate of appreciation	Arnab das 5th sem BPharm
	National Level E-Poster Compettition at RBVRR Womens College of Pharmacy **25th May, 2020**	1st Prize	Fahima Narzish 7th Sem BPharm
	Poster Presentation contest organized by Department of Microbiology and Biotechnology, Meerut Institute of Engineering and Technology, on World Environment Day **5th June, 2020**	1st Prize	Sohini Bera 7th Sem BPharm
	Poster making contest on World Intellectual Property Day, 2020 organized by College of Pharmacy, Bela (Ropar), Punjab **26th April, 2020**	1st Prize	Shankha Dey 7th Sem BPharm
	Poster compettition organized by Indian Pharmaceutical Association - Community Pharmacy Division and Indian Pharmaceutical Association Students Forum on World Pharmacists Day **25th September, 2020**	1st Prize	Dipayan Chakraborty 7th Sem BPharm

5 FACULTY INFORMATION AND CONTRIBUTIONS (175) Total Marks 153.35

Name	PAN No.	University Degree	Date of Receiving Degree	Area of Specialization	Research Paper Publications	Ph.D Guidance	Faculty receiving Ph.D during the assessment year	Current Designation	Date (Designated as Prof/Assoc. Prof.).	Initial Date of Joining	Association Type	At present working with the Institution(Yes/No)	In case of NO, Date of Leaving	IS HOD?
Subhasis Maity	AJXPM1061B	M.Pharm and Ph.D	24/12/1996	Pharmaceutics	4	3	2	Professor	01/01/2003	01/01/2003	Regular	Yes		Yes
AVIJIT GHOSH	ANYPG5904C	M.Pharm	29/05/2006	Pharmaceutical Chemistry	0	0	0	Assistant Professor		10/07/2017	Regular	Yes		No
Amrita chakraborty	AWQPC8169G	M.Pharm and Ph.D	23/12/2017	Pharmaceutics	0	0	0	Assistant Professor		02/05/2018	Regular	Yes		No
MAINAK MAL	AMNPM2888B	M.Pharm and Ph.D	31/12/2011	Pharmaceutical Chemistry	3	0	0	Assistant Professor		01/02/2021	Regular	Yes		No
Tania Chakraborty	AMWPC2037K	M.Pharm	23/08/2013	Pharmacology	7	0	0	Assistant Professor		08/02/2021	Regular	Yes		No
SOUVIK ROY	AMTPR0560M	M.Pharm and Ph.D	24/12/2007	Pharmacology	7	3	1	Professor	01/01/2022	15/06/2011	Regular	Yes		No
Swarupananda Mukherjee	APNPM1474L	M.Pharm and Ph.D	02/09/2021	Pharmaceutics	20	0	0	Assistant Professor		05/04/2007	Regular	Yes		No
SUTAPA BISWAS MAJEE	AHFPB6451N	M.Pharm and Ph.D	19/10/2001	Pharmaceutics	18	0	0	Professor	01/01/2022	01/09/2005	Regular	Yes		Yes
Nilanjan Sarkar	BPCPS8398B	M.Pharm	27/07/2009	Pharmacology	0	0	0	Assistant Professor		02/09/2013	Regular	Yes		No
BIJAYA GHOSH	AELPG0709D	M.Pharm and Ph.D	14/12/1994	Pharmaceutics	14	1	1	Professor	24/09/2010	24/09/2010	Regular	Yes		No
Debalina Das	APEPD3620E	M.Pharm and Ph.D	13/10/2017	Pharmacognosy	0	0	0	Assistant Professor		22/03/2021	Regular	Yes		No
PRITESH DEVBHUTI	AHWPD0887F	M.Pharm and Ph.D	24/12/2012	Pharmaceutical Chemistry	6	1	1	Professor	01/01/2022	01/08/2016	Regular	Yes		No
KUNAL GUPTA	ALTPG8892N	M.Pharm and Ph.D	03/03/2016	Pharmacology	1	0	0	Assistant Professor		03/03/2021	Regular	Yes		No
Sekhar Kumar Bose	AKDPB1922F	M.Pharm and Ph.D	16/09/2008	Pharmacognosy	3	1	0	Professor	19/10/2019	01/08/2008	Regular	Yes		No
Aparna Datta	BHDPD8342P	M.Pharm and Ph.D	25/07/2020	Pharmaceutics	4	0	0	Assistant Professor		15/02/2021	Regular	Yes		No
Mainak Chakraborty	ATAPC7013L	M.Pharm and Ph.D	02/04/2019	Pharmacology	13	0	0	Assistant Professor		01/02/2021	Regular	Yes		No
MILTU KUMAR GHOSH	AQSPG3160F	M.Pharm and Ph.D	24/12/2014	Pharmaceutics	2	1	0	Assistant Professor		12/01/2015	Regular	Yes		No
Sanhati Dutta Roy	DXMPS5752K	M.Pharm	08/11/2014	Pharmaceutics	0	0	0	Assistant Professor		08/02/2021	Regular	Yes		No
Apala Chakraborty	AOJPC6749P	M.Pharm	21/11/2012	Pharmaceutics	0	0	0	Assistant Professor		25/01/2021	Regular	Yes		No

Suchandra Sen	AXPPS5646G	M.Pharm and Ph.D	11/05/1994	Pharmacology	2	0	0	Professor	01/01/2022	02/05/2018	Regular	Yes		No
Satarupa Acharjee	AKGPA0160P	M.Pharm and Ph.D	24/12/2018	Pharmaceutical Chemistry	3	0	1	Associate Professor	17/01/2022	01/08/2007	Regular	Yes		No
Musfiqua Mookerjee	AQHPM3506C	M.Pharm and Ph.D	19/07/1991	MIcrobiology,Biotechnology	0	1	1	Professor	01/01/2022	01/11/2007	Regular	Yes		No
Samit Bera	ASWPB9921B	M.Pharm and Ph.D	01/03/2019	Pharmacology	0	0	0	Assistant Professor		02/07/2012	Regular	Yes		No
ANGSHUMAN LAHIRI	AEHPL1911L	M.Pharm and Ph.D	17/05/2017	Pharmaceutical Biochemistry	0	0	0	Assistant Professor		15/06/2010	Regular	Yes		No
Ashutosh Kar	AOEPK0849M	M.Sc and Ph.D	22/02/2022	Maths	2	0	1	Assistant Professor		01/08/2015	Regular	Yes		No
Dhrubojyoti Sarkar	BMZPS0659D	M.Pharm and Ph.D	14/09/2021	Pharmacognosy	2	0	0	Assistant Professor		08/07/2010	Regular	No	25/01/2022	No
Goutam Pramanik	AJBPP7669L	M.Pharm and Ph.D	03/09/2003	Pharmaceutical Chemistry	0	0	0	Professor	01/02/2011	01/02/2011	Regular	Yes		No
Tapas kumar pal	AFCPP6299K	M.Pharm and Ph.D	16/05/2017	Pharmaceutics	0	0	0	Professor	01/10/2010	27/08/2007	Regular	No	12/03/2020	No
TAPAN KUMAR GIRI	AKYPG4008N	M.Pharm and Ph.D	24/12/2011	Pharmaceutics	12	0	0	Assistant Professor		16/09/2013	Regular	No	02/07/2020	No
SANKHADIP BOSE	ALBPB4351P	M.Pharm and Ph.D	21/03/2014	Pharmacognosy	2	0	0	Assistant Professor		16/08/2016	Regular	No	31/01/2020	No
RITU KHANRA	CFPPK9395N	M.Pharm and Ph.D	24/12/2018	Pharmaceutical Chemistry	0	0	1	Assistant Professor		30/01/2018	Regular	No	15/05/2020	No
TAPAN KUMAR SHAW	DBBPS7637Q	M.Pharm and Ph.D	25/12/2017	Pharmaceutics	0	0	1	Assistant Professor		10/07/2017	Regular	No	03/03/2020	No
GOPA ROY BISWAS	ADUPR8618N	M.Pharm and Ph.D	24/12/2010	Pharmaceutics	15	0	0	Assistant Professor		01/07/2010	Regular	No	02/05/2020	No
ARIJIT MONDAL	AMWPM5751A	M.Pharm and Ph.D	24/12/2012	Pharmaceutical Chemistry	2	0	0	Assistant Professor		24/07/2017	Regular	No	21/01/2020	No
JAYANTA DAS	AHDPD5104E	M.Sc	16/02/2010	Information Technology	0	0	0	Assistant Professor		21/02/2019	Regular	Yes		No
KUMARASWAMY DHANABAL	BGXPK5295D	M.Pharm and Ph.D	03/08/2018	Pharmaceutical Chemistry	1	0	1	Assistant Professor		01/08/2007	Regular	Yes		No
SAIBAL CHATTERJEE	AJTPC0969Q	M.Sc	24/04/2008	ENGLISH	0	0	0	Assistant Professor		01/08/2015	Regular	Yes		No
SWAPAN DAS	AATPD2630E	M.Sc and Ph.D	12/05/2004	PHYSICS	7	0	0	Assistant Professor		09/07/2015	Regular	Yes		No
Debasis dutta	ADIPD8180F	M.Pharm	24/09/1980	Pharmaceutics	0	0	0	Professor	01/10/2010	16/06/2008	Regular	Yes		No
Debasish Bhattacharjee	AIJPB6421B	M.Pharm and Ph.D	13/02/2017	Pharmaceutics	0	0	0	Assistant Professor		01/08/2015	Contractual	Yes		No

MOUSUMI SHYAM	CXYPS1209N	M.Pharm	22/06/2016	Pharmaceutical Chemistry	0	0	0	Assistant Professor		31/03/2021	Regular	Yes		No
Pravangsu Sekhar Das	ADWPD0584B	M.Sc and Ph.D	04/02/2016	Maths	0	0	0	Professor	01/01/2018	26/07/2017	Regular	Yes		No
Supriya mana	AWLPM6062F	M.Pharm	26/03/2009	Pharmacology	0	0	0	Assistant Professor		17/05/2010	Regular	Yes		No
SANDIPAN DASGUPTA	AITPD8626N	M.Pharm and Ph.D	10/03/2017	Pharmacology	3	0	0	Assistant Professor		02/09/2013	Regular	No	23/12/2020	No
FALGUNI PATRA	BJWPP9616F	M.Pharm and Ph.D	24/12/2015	Pharmaceutics	0	0	0	Assistant Professor		01/08/2016	Regular	No	21/05/2019	No
NILANJANA SINHA	BAOPS6043L	M.Sc and Ph.D	07/03/2022	MBA	0	0	0	Assistant Professor		05/04/2007	Regular	Yes		No
RAJ KUMAR DASGUPTA	AGMPD2783P	M.Sc	19/09/2019	MBA	0	0	1	Assistant Professor		01/03/2007	Regular	Yes		No
MOUTUSI NATH	AJVPN5796N	M.Sc	07/04/2010	optometry	0	0	0	Assistant Professor		24/09/2018	Regular	Yes		No
JOYETA GHOSH	ATUPG9052D	M.Sc and Ph.D	08/04/2021	BIOCHEMISTRY	11	0	0	Assistant Professor		01/08/2019	Regular	Yes		No
Anwesha Roy Choudhury	AVPPR2849J	M.Sc	14/02/2003	English	0	0	0	Assistant Professor		09/07/2010	Regular	Yes		No
SOMDUTTA MAITRA	CCUPM8981L	M.Sc	19/05/2012	optometry	0	0	0	Assistant Professor		02/05/2018	Regular	Yes		No
SOUJANYA PUDI	APBPP7552E	M.Sc and Ph.D	07/03/2008	ENGLISH	0	0	0	Professor	03/06/2021	16/06/2007	Regular	Yes		No
RAJA CHAKREVERTY	AWHPC9379H	M.Pharm	09/01/2014	Pharmacology	0	0	0	Assistant Professor		05/01/2022	Regular	Yes		No
ATRI SANYAL	BREPS6192P	M.Sc	06/02/2006	computer science	0	0	0	Assistant Professor		01/08/2015	Regular	Yes		No

5.1 Student-Faculty Ratio (SFR) (20)

Total Marks 20.00

Institute Marks : 0

UG

No. of UG Programs in the Department 1

BPharm						
Year of Study	CAY (2021-22)		CAYm1 (2020-21)		CAYm2 (2019-20)	
	Sanction Intake	Actual admitted through lateral entry students	Sanction Intake	Actual admitted through lateral entry students	Sanction Intake	Actual admitted through lateral entry students
1st Year	100	0	100	0	100	0
2nd Year	100	19	100	22	100	14
3rd Year	100	22	100	14	120	15
4th Year	100	14	120	15	120	22
Sub-Total	**400**	**55**	**420**	**51**	**440**	**51**
Total	**455**		**471**		**491**	

Grand Total	455	471	491

PG

No. of PG Programs in the Department 2

PG pharmaceutics			
Year of Study	CAY(2021-22)	CAYm1(2020-21)	CAYm2 (2019-20)
	Sanction Intake	Sanction Intake	Sanction Intake
1st Year	15	15	24
2nd Year	15	24	24
Total	**30**	**39**	**48**

PG Pharmacology			
Year of Study	CAY(2021-22)	CAYm1(2020-21)	CAYm2 (2019-20)
	Sanction Intake	Sanction Intake	Sanction Intake
1st Year	15	15	24
2nd Year	15	24	24
Total	**30**	**39**	**48**

Grand Total	60	78	96

SFR

No. of UG Programs in the Department 1

No. of PG Programs in the Department 2

Description	CAY(2021-22)		CAYm1 (2020-21)		CAYm2 (2019-20)	
Total No. of Students in the Department(S)	515	**Sum total of all (UG+PG) students**	549	**Sum total of all (UG+PG) students**	587	**Sum total of all (UG+PG) students**
No. of Faculty in the Department(F)	43	**F1**	35	**F2**	39	**F3**
Student Faculty Ratio(SFR)	11.98	**SFR1=S1/F1**	15.05	**SFR2=S2/F2**	15.69	**SFR3=S3/F3**
Average SFR	14.24	**SFR=(SFR1+SFR2+SFR3)/3**				
F=Total Number of Faculty Members in the Department (excluding first year faculty)						

Note: 75% should be Regular/full time faculty and the remaining shall be Contractual Faculty/Adjust Faculty/Resource persons from industry as per AICTE norms and standards. The contractual faculty will be considered for assessment only if a faculty is drawing a salary as prescribed by the concerened State Government for the contractual faculty in the respective cadre.

5.1.1. Provide the information about the regular and contractual faculty as per the format mentioned below:

	Total number of regular faculty in the department	Total number of contractual faculty in the department
CAY(2021-22)	42	1
CAYm1(2020-21)	34	1
CAYm2(2019-20)	38	1

Average SFR for three assessment years : 14.24

Assessment SFR : 0

5.2 Faculty Cadre Proportion (20)

Total Marks 20.00

Institute Marks : 20.00

Year	Professors		Associate Professors		Assistant Professors	
	Required F1	Available	Required F2	Available	Required F3	Available
CAY(2021-22)	3.00	6.00	7.00	5.00	22.00	31.00
CAYm1(2020-21)	4.00	5.00	8.00	6.00	24.00	23.00
CAYm2(2019-20)	4.00	5.00	8.00	6.00	26.00	27.00
Average Numbers	3.67	5.33	7.67	5.67	24.00	27.00

Cadre Ratio Marks [(AF1 / RF1) + [(AF2 / RF2) * 0.6] + [(AF3 / RF3) * 0.4]] * 10 : 20.00

5.3 Faculty Qualification (20)

Total Marks 16.66

Institute Marks : 16.66

	X	Y	F	FQ = 2.0 x [(10X + 6Y) / F)]
2021-22(CAY)	26	15	34.00	20.59
2020-21(CAYm1)	19	11	36.00	14.22
2019-20(CAYm2)	23	11	39.00	15.18

Average Assessment : 16.66

5.4 Faculty Retention (20)

Total Marks 16.00

Institute Marks : 16.00

Description	2020-21	2021-22
No of Faculty Retained	34	33
Total No of Faculty	38	38
% of Faculty Retained	89	87

Average : 88.00

Assessment Marks : 16.00

5.5 Innovations by the Faculty in Teaching and Learning (15)

Total Marks 15.00

Institute Marks : 15.00

Experimentation with newer techniques of teaching is almost a regular aspect of NSHM. In the last 3 years too, we had ample opportunities to exercise the same.

Learning Management System was implemented for all courses of BPharm program in TCS ion platform to the bring it at par with the international level.

- The course outline was provided for all the courses by concerned faculty in charge which included introduction to course,learning materials,lesson plan,evaluation tools. this was made accesible to students online so that the students get an insight into the course at the inception period of joining the course.

- Apart from that, subjects prescribed in the syllabus, were divided by topics and teachers having expertise in those topics were allotted classes on it. For industry oriented subjects, experts were invited from the industry for conducting special classes and seminars. At the same time, institute entered into an agreement with Coursera Inc. a U.S.-based massive open online course provider to encourage the students to pursue a course of their own interest.
- Faculties mandatorily enrolled for NSHM sponsored Professional Development Program (a three month certification program offered by Harappa Education) to enrich their delivery and presentation skills.

- During the lockdown period (March 2020 to June 2021), technicians of NCPT made sanitizers which met the need of entire institute.
-
- In this period, the teaching learning process of the institute was switched to the online mode. Conducting classes in the online mode was challenging for both students and teachers. IT Department of NSHM arranged workshops for both faculty and students to educate them in the techniques of online communication.

- Classes were initially conducted in zoom.com (http://zoom.com/). following the institute implemented MS team for conducting theory classes.
- Teachings were mostly PowerPoint assisted. Teachers well versed with computers used blackboard option in the MS teams platform.
- MS Team's chat feature was used for communicating with students during the class hours. The option of direct download of attendance was a big time saver.

- Drawing structures and writing reactions are integral part of chemistry teaching. To facilitate this part, the chemistry faculty were provided with creative PEN Tablet (wacom).
- For evaluation, most of the faculty used Google form (quiz /multiple choice questions). It helped the students too, because the university used this mode of evaluation for final examination.

One of the shortcomings of the MS team is that, it had neither the material not the strategy to conduct practical classes. The challenge was met by innovating.

Pharmacy department in collaboration with department of media made demonstration videos on practical subjects. Faculty responsible for conducting practical classes, performed the experiments with assistance with the lab-technicians. The department of media and communication made videos of these experiments and the same was shared with the students. Online demonstration was also conducted on B Pharm level pharmacology practical's using the EXPHARM software.

5.6 Faculty as participants in Faculty Development/Training Activities (15)

Total Marks 8.69

Institute Marks : 8.69

Name of the faculty	Max 5 Per Faculty		
	2021-22	2020-21	2019-20
Dr.SUCHANDRA SEN	5.00	5.00	5.00
Dr. APARNA DUTTA	5.00	5.00	0.00
Mr AVIJIT GHOSH	5.00	5.00	0.00
DR. BIJAYA GHOSH	5.00	5.00	0.00
DR. MILTU KUMAR GHOSH	5.00	5.00	0.00
Dr. SWARUPANANDA MUKHERJEE	5.00	5.00	5.00
Dr. MAINAK MAL	5.00	0.00	0.00
DR. NILANJAN SARKAR	5.00	5.00	0.00
Dr SATARUPA ACHARJEE	3.00	5.00	5.00
Dr. PRITESH DEVBHUTI	3.00	5.00	0.00
Dr ANGSHUMAN LAHIRI	0.00	5.00	0.00
Dr. SUTAPA BISWAS MAJI	0.00	5.00	0.00
Dr. SOUVIK ROY	0.00	5.00	0.00
Ms. TANIA CHAKROBORTY	5.00	5.00	0.00
Dr MUSFIQUA MOOKERJEE	0.00	5.00	0.00
Dr SANDIPAN DASGUPTA	0.00	5.00	0.00
Mr SUPRIYA MANA	0.00	5.00	0.00
Ms APALA CHAKROBORTY	5.00	0.00	0.00
MS SANHATI DUTTA ROY	5.00	0.00	0.00
Sum	61.00	80.00	15.00
RF = Number of Faculty required to comply with 15:1 Student Faculty Ratioas per 5.1	34.33	36.60	39.13
Assessment [3*(Sum / 0.5RF)]	10.66	13.11	2.30

Average assessment over 3 years: 8.69

5.7 Research and Development (40)

5.7.1 Academic Research (10)

Number of quality publications in refereed/ SCI Journals, citations, Books/ Book Chapters

Master File of publications for the period of 2018-19

Name of the Faculty	Title of the paper	Name of the journal	year	volume	pages	indexed by Wos/ scopus or non indexed	Impact factor	cita
DR Subhasis Maity	Preparation and Characterization of Nanoemulsome Entrapped in Enteric Coated Hydrogel Beads for the Controlled Delivery of Capsaicin to the Colon	Current Drug Therapy	2018	13	98-105	Scopus	0.8	
Dr. Souvik Roy	Vanadium quercetin complex attenuates mammary cancer by regulating the P53, Akt/mTOR pathway and downregulates cellular proliferation correlated with increased apoptotic events	Biometals	2018	31	647-671	Scopus	2.949	10
Dr. Souvik Roy	Deciphering the biochemical and molecular mechanism underlying the in-vitro and in-vivo chemotherapeutic efficacy of Ruthenium Quercetin complex in colon cancer	Molecular Carcinogenesis	2018	57	700-721		4.784	8
Dr. Souvik Roy	Deciphering the molecular mechanism and apoptosis underlying the in-vitro and in-vivo chemotherapeutic efficacy of vanadium luteolin complex in colon cancer	Cell Biochemistry and Function	2018	36	116-128		3.685	1
Dr. Swarupananda Mukherjee	Cytosponge: A breakthrough in detection of barrett's esophagus. In: CANCER THERAPY	Vol 2, Meddocs Publishers, USA	2019	9	1-7			
Tania Chakraborty	Vanadium quercetin complex attenuates mammary cancer by regulating the P53, Akt/mTOR pathway and downregulates cellular proliferation correlated with increased apoptotic events	Biometals	2018	31	647-671	Scopus	2.949	10
Tania Chakraborty	Potentiating apoptosis and modulation of p53, Bcl2, and Bax by a novel chrysin ruthenium complex for effective chemotherapeutic efficacy against breast cancer	Journal of Cellular Physiology	2018	234			6.384	28
Tania Chakraborty	Polysaccharide-Based Nanocarriers Loaded with Drugs for the Management of Obesity	In book: Polysaccharide based Nano-Biocarrier in Drug Delivery	2018					
Tania Chakraborty	Antihyperglycemic activity of chalcone based novel 1-{3-[3-(substituted phenyl) prop-2-enoyl] phenyl} thioureas	Synthetic Communications	2018	48			1.796	8
satarupa acharjee	Antihyperglycemic activity of chalcone based novel 1-{3-[3-(substituted phenyl) prop-2-enoyl] phenyl} thioureas	Synthetic Communications	2018	48			1.796	
Bijaya Ghosh	Non-invasive extraction of gabapentin for therapeutic drug monitoring by reverse iontophoresis: effect of pH, ionic strength, and polyethylene glycol 400 in the receiving medium	Current pharmaceutical analysis	2019	15	632-639	Scopus	0.715	2
Bijaya Ghosh	Recent advances of chitosan nanoparticles as a carrier for delivery of antimicrobial drugs delivery	CRC press(Taylor Francis Goup)	2019					
Pritesh Devbhuti	An in vitro study on effect of lactic acid on levofloxacin induced peroxidation of lipids	Journal of PharmaSciTech	2018	8	2-4			
Pritesh Devbhuti	Modification of gums by periodate oxidation: a natural cross-linker	International Journal of Pharmacy and Pharmaceutical Sciences	2019	11	1-6			9

Bijaya Ghosh	Recent Advances of Chitosan Nanoparticles as a Carrier for Delivery of Antimicrobial Drugs	Taylor francis (Book chapter)	2018	1st Edition	17 pages			
Bijaya Ghosh	Chitosan-Based Nanoparticulate System for Pulmonary Drug Delivery	Taylor francis (Book chapter)	2018	Ist Edition	17 pages			
Bijaya Ghosh	Reverse iontophoretic extraction of gabapentin: a mechanistic study.	current drug delivery	2018	15	965-971	scopus	2.5	1
Tapan Kumar Giri	Reverse iontophoretic extraction of gabapentin: a mechanistic study.	current drug delivery	2018	15	965-971	scopus	2.5	1
Tapan Kumar Giri	Non-Invasive Extraction of Gabapentin for Therapeutic Drug Monitoring by Reverse Iontophoresis: Effect of pH, Ionic Strength, and Polyethylene Glycol 400 in the Receiving Medium	Current Pharmaceutical Analysis	2019	15	632-639	Scopus	0.715	2
Tapan Kumar Giri	Breaking the barricade of oral chemotherapy through polysaccharide nanocarrier	International Journal of Biological Macromolecule	2019	130	34-49	Scopus	6.95	24
Tapan Kumar Giri	Development of capsaicin loaded hydrogel beads for in vivo lipid lowering activities of hyperlipidemic rats	Drug Delivery Letters	2019	9	108-115	Wos	0.61	2
Tapan Kumar Giri	Breaking the Barrier of Cancer Through Liposome Loaded with Phytochemicals	current drug delivery	2019	16	01-17	scopus/wos	2.5	1
Tapan Kumar Giri	Breaking the barrier of cancer through papaya extract and their formulation	Anti-Cancer Agents in Medicinal Chemistry	2019	19	1577-87	Wos	2.5	6
Tapan Kumar Giri	Development and Characterization of a Phospholipid Complex for Effective Delivery of Capsaicin	Indian Journal of Pharmaceutical Science	2019	81	1011-19	WOS	0.97	6
SUTAPA BISWAS MAJEE	Exploring properties of sweet basil seed mucilage in development of pharmaceutical suspensions and surfactant-free stable emulsions	Int J Appl Pharm	2019	11	124-29			
SUTAPA BISWAS MAJEE	Physicochemical and pharmaceutical characterisation of mucilage from sweet basil seed	Int J Appl Pharm	2019	11	12-17			
SUTAPA BISWAS MAJEE	Hibiscus leaf mucilage as stabiliser for pharmaceutical disperse systems		2019	11	6-11			
GOPA BISWAS	Exploring properties of sweet basil seed mucilage in development of pharmaceutical suspensions and surfactant-free stable emulsions	Int J Appl Pharm	2019	11	124-29			
	Physicochemical and pharmaceutical characterisation of mucilage from sweet basil seed	Int J Appl Pharm	2019	11	12-17			
	Hibiscus leaf mucilage as stabiliser for pharmaceutical disperse systems		2019	11	6-11			

	Master File of publications for the period of 2019-20	
Name of the Faculty	Title of the paper	Name of the journal
DR Subhasis Maity	Development and characterization of solid dispersion system for enhancing the solubility and cytotoxicity of dietary capsaicin.	Current Drug Therapy
Dr.Subhasis Maity	Assessment of the antidiabetic potentiality of glyburide loaded glyceryl monostearate solid lipid nanoparticles	Journal of Drug Delivery Science and Technology
Dr. Souvik Roy	Bavachinin mitigates DMH induced colon cancer in rats by altering p53/Bcl2/BAX signaling associated with apoptosis	Biotechnic and Histochemistry
Dr. Souvik Roy	Decrypting the molecular mechanistic pathways delineating the chemotherapeutic potential of ruthenium-phloretin complex in colon carcinoma correlated with the oxidative status and increased apoptotic events	Oxidative Medicine and Cellular Longev
Dr. Souvik Roy	Construing the biochemical and molecular mechanism underlying the In vivo and in vitro chemotherapeutic efficacy of ruthenium-baicalein complex in colon cancer	International Journal of Biological Scier
Dr. Souvik Roy	Potentiating apoptosis and modulation of p53, Bcl2, and Bax by a novel chrysin ruthenium complex for effective chemotherapeutic efficacy against breast cancer	Journal of Cellular Physiology
Miltu Kumar Ghosh	Polymer-Based Responsive Hydrogel for Drug Delivery (BOOK CHAPTER)	Springer Nature

Dr. Swarupananda Mukherjee	Microsphere: A Modern Approach to Novel Drug Delivery System	World J Pharm Sci
Dr. Swarupananda Mukherjee	Brief Review on Therapeutic Potential of Nanocarrier Systems against Breast Cancer	Journal of Biomolecular Research & Therapeutics
Dr. Swarupananda Mukherjee	Role of Nutraceuticals as an Alternative Pharmaceutical for Medicinal & Health Benefits	Pharmaceut Reg Affairs
Dr. Swarupananda Mukherjee	Assessment of the antidiabetic potentiality of glyburide loaded glyceryl monostearate solid lipid nanoparticles	Journal of Drug Delivery Science and Technology
Dr. Swarupananda Mukherjee	Application of Nanosponges Drug Delivery System for the benefit of Pharmaceutical Area: A Mini Review	Adv Cli Med Res
Dr. Swarupananda Mukherjee	COVID-19 Diagnosis: A Short Review	Pharmatutor
Tania Chakraborty	Construing the biochemical and molecular mechanism underlying the In vivo and in vitro chemotherapeutic efficacy of ruthenium-baicalein complex in colon cancer	International Journal of Biological Scier
Tania Chakraborty	Assessment of the antidiabetic potentiality of glyburide loaded glyceryl monostearate solid lipid nanoparticles	
Tania Chakraborty	Decrypting the molecular mechanistic pathways delineating the chemotherapeutic potential of ruthenium-phloretin complex in colon carcinoma correlated with the oxidative status and increased apoptotic events	Oxidative Medicine and Cellular Longev
Dr. Sekhar Kumar Bose	Theaflavin Enriched Black Tea Extract Alleviates Diabetic Nephropathy by Suppressing Hyperglycaemia-Mediated Oxidative Stress and Inflammation in Streptozotocin-Induced Rats.	The Natural Products Journal
Bijaya Ghosh	Extraction of levetiracetam for therapeutic drug monitoring by transdermal reverse iontophoresis:	European Journal of pharmaceutical Sciences
Bijaya Ghosh	Development, evaluation and optimization of osmotic controlled tablets of aceclofenac for rheumatoid arthritis management	Drug Delivery letters
Bijaya Ghosh	Non-invasive extraction of gabapentin for therapeutic drug monitoring by reverse iontophoresis: effect of pH, ionic strength, and polyethylene glycol 400 in the receiving medium	Current pharmaceutical analysis
Bijaya Ghosh	Assessment of the antidiabetic potentiality of glyburide loaded glyceryl monostearate solid lipid nanoparticles	Journal of Drug Delivery Science and Technology
Bijaya Ghosh	Chitosan based nanoparticulate system for pulmonary drug delivery	
Pritesh Devbhuti	Development and evaluation of sustain release microparticles of metoproproprolol succinate	International J Appl Pharmaceutics
Pritesh Devbhuti	Nutrigenomics and prevention of cancer	NSHM J Pharm Healthcare Manageme
Pritesh Devbhuti	Utility of immune serum globulin in the treatment of carcinogenicity, a review	NSHM J Pharm Healthcare Manageme
Pritesh Devbhuti	Engineering of bispecific-DNA antibody hybrids	NSHM J Pharm Healthcare Manageme
Dr. Tapan Kumar Giri	Enhanced intestinal stability and pH sensitive release of quercetin in GIT through gellan gum hydrogels	Colloids and Surfaces B: Biointerfaces
Dr. Tapan Kumar Giri	Polysaccharide as renewable responsive biopolymer for in situ gel in the delivery of drug through ocular route	International Journal of Biological Macromolecule
Dr. Tapan Kumar Giri	Hydrogels based on gellan gum in cell delivery and drug delivery (https://www.sciencedirect.com/science/article/pii/S1773224719320155)	Journal of Drug Delivery Science and Technology
SUTAPA BISWAS MAJEE	Span 40/Tween 80-based soybean oleogels: Modeling of gelation kinetics and drug release	Int J Pharm Sci Res
SUTAPA BISWAS MAJEE	Comparative study of Span 40 and Span 60 based soy-gels for topical drug delivery	Asian J Pharm Clin Res
SUTAPA BISWAS MAJEE	Soybean oil-HPMCK15M based oleohydrogel hybrid: Novel approach to improve drug release.	J Pharm Sci Res
SUTAPA BISWAS MAJEE	Formulation and in vitro characterisation of soybean oil-HPMCK4M based bigel matrix for topical drug delivery	Int J Appl Pharm
	Oleogels of olive oil and soybean oil for topical drug delivery: A comparative analysis	Int J Pharm Pharm Sci
GOPA ROY BISWAS	Span 40/Tween 80-based soybean oleogels: Modeling of gelation kinetics and drug release	Int J Pharm Sci Res
	Comparative study of Span 40 and Span 60 based soy-gels for topical drug delivery	Asian J Pharm Clin Res
	Soybean oil-HPMCK15M based oleohydrogel hybrid: Novel approach to improve drug release.	J Pharm Sci Res
	Formulation and in vitro characterisation of soybean oil-HPMCK4M based bigel matrix for topical drug delivery	Int J Appl Pharm
	Oleogels of olive oil and soybean oil for topical drug delivery: A comparative analysis	Int J Pharm Pharm Sci

Master File of publications for the period of 2020-21

Name of the Faculty	Title of the paper	Name of the journal	year	volume	pages	inc Wc or inc
Dr. Souvik Roy	Decrypting a path based approach for identifying the interplay between PI3K and GSK3 signaling cascade from the perspective of cancer	Genes and Diseases	2021	Article in press		sc inc
Dr. Souvik Roy	Pharmacological basis and new insights of taxifolin: A comprehensive review	Biomedicine and Pharmacotherapy	2021	142	112004	sc inc
Miltu K. Ghosh	Multi-class multi-level classification algorithm for skin lesions classification using machine learning techniques	Expert systems with applications	2020	141	112961	sc inc
Suchandra Sen	In-Silico Modelling of 1- 3- [3-(Substituted Phenyl) Prop-2-Enoyl) Phenyl Thiourea Against Anti-Inflammatory Drug Targets	Biosci Biotech Res Asia	2021	18		we sci
Suchandra Sen	A Cross-Sectional Community based Study to Analyse Drinking Water Quality in an Urban Area of Kolkata Municipal Corporation.	Research & Reviews: A Journal of Health Professions	2021	11	10-19	Gc Sc
Dr. Swarupananda Mukherjee	Editorial Note for Journal of Pharmaceutical Regulatory Affairs	Pharmaceut Reg Affairs	2021	9	5	Gc Sc
Dr. Swarupananda Mukherjee	Accelerated stability study of preformulated glyburide loaded lyophilized lipid nanoparticles	Research Journal of Pharmacy and Technology	2021	7(13)	115-132	sc inc
Dr. Swarupananda Mukherjee	Lipid nanoparticulate drug delivery system for the treatment of hepatic fibrosis	Arch Hepat Res	2021	7(1)	001-003	Gc Sc
Dr. Swarupananda Mukherjee	A Systematic Review on the Role of Several Drugs and Nutrients in Enhancing Immunity in the Pandemic Situation of COVID-19	J Corona Virus. 2021	2021	1(1)	1	Gc Sc
Dr. Swarupananda Mukherjee	Environmental Control of Plant Primary Metabolism: Exploitation of Plant Plasticity in Perennial and Tree Crops	Asian Journal of Research in Crop Science	2021	6(4)	40-50	Gc Sc
Tania Chakraborty	Theaflavin Enriched Black Tea Extract Alleviates Diabetic Nephropathy by Suppressing Hyperglycaemia-Mediated Oxidative Stress and Inflammation in Streptozotocin-Induced Rats	The Natural Products journal	2021	4		SC
Tania Chakraborty	Bavachinin mitigates DMH induced colon cancer in rats by altering p53/Bcl2/BAX signaling associated with apoptosis	Biotechnic & Histochemistry	2021	96		
Tania Chakraborty	Pharmacological basis and new insights of taxifolin: A comprehensive review	Biomedicine and Pharmacotherapy	2021	142	112004	sc inc
Dr. Aparna Datta	Immensity of Self Treatment And Its Impact – A Questionnaire Based Study	World Journal of Pharmaceutical Research	2021	10	1343-13644	
Dr. Aparna Datta	Potential of Curcumin Loaded Nanoparticles in Antimicrobial Photodyanamic Therapy	International Journal of of Pharmacy Research & Technology	2021	11	44-49	
Dr. Sekhar Kumar Bose	Phytochemical analysis and assessment of Antioxidant properties of black tea extract obtained from Camellia sinensis	Research J. Pharm. and Tech	2021	13(10)	4539-4544	Gc Sc
Dr. Sekhar Kumar Bose	Synergistic immunomodulatory activity of aqueous root extract of asparagus racemosus willd and ethanol whole plant extract of boerhavia diffusa linn	Asian Journal of Pharmaceutical and Clinical Research	2021	14(11)	120-123	Gc Sc
Satarupa acharjee	A recent review on etiology and management of covid -19 pendamic	International research journal of modernization in engineering ,Technology and science	2021	3	1-11	Gc Sc
Satarupa acharjee	In silico modelling of 1-3-[3-substituted phenyl)prop-2-enoyl) phenyl thiourea against anti-inflammatory drug targets	Biosciences Biotechnology research Asia	2021	18	413-421	Gc Sc
Bijaya Ghosh	Development of Cinnarizine Microballoons by Sequential Optimization and In Vivo Imaging by Gamma Scintigraphy	Current Drug Therapy	2020	15	369-380	Wc
Bijaya Ghosh	Assessment of the antidiabetic potentiality of the glyburide loaded glyceryl monostearate solid lipid nanoparticles	Journal of Drug Delivery Science and Technology (https://www.sciencedirect.com/journal/journal-of-drug-delivery-science-and-technology)	2020	55	101451	Sc

Dr. Tapan Kumar Giri	Development and characterization of solid dispersion system for enhancing the solubility and cytotoxicity of dietary capsaicin	Current Drug Therapy	2020	15	143 - 151	Wo
Dr. Tapan Kumar Giri	Formulation and characterization of solid dispersion containing capsaicin for the treatment of diabetes	Current Drug Therapy	2020	15	219-225	Wo
Dr. Tapan Kumar Giri	Xyloglucan as green renewable biopolymer used in drug delivery and tissue engineering	International Journal of Biological Macromolecule	2020	160	55–68	Wo

Ph.D. guided / Ph.D. awarded during the assessment period while working in the institute

PHD GUIDED BY THE FACULTIES				
S NO	FACULTY	2018-19	2019-20	2020-21
1	DR SOUVIK ROY	3	3	3
2	DR PRITESH DEVBHUTHI	1	1	1
3	DR SEKHAR BOSE	1	1	1
4	DR SUBHASIS MAITY	2	1	1
5	DR BIJAYA GHOSH	1	1	1
6	DR MUSFIQUA MOOKERJEE	1		
PHD AWARDED TO FACULTIES				
1	DR TAPAN SHAW	1		
2	DR RITU KHANRA	1		
3	DR SATARUPA ACHARJEE	1		
4	DR KUMARASWAMY DHANABAL	1		

5.7.2 Sponsored Research (10)

2021-22

Project Title	Duration	Funding Agency
NA	NA	NA

2020-21

Project Title	Duration	Funding Agency

2019-20

Project Title
Deciphering the molecular mechanism of ruthenium-oxicam anti-P-glycoprotein loaded nanoparticles on multidrug resistance colitis associated inflammatory tumor microenvironment and colon cancer progression

Cumulative Amount(X + Y + Z) = 650000.00

5.7.3 Consultancy (from Industry) (10)

2021-22

Project Title	Duration	Funding Agency
ACUTE TOXICITY AND SUB ACUTE TOXICITY STUDY OF SUPPLIED SAMPLE	1 YEAR	HERITAGE INSTITUTE OF TECHNOLOGY 994 MADURDAHA, CHOWBAGA ROAD, ANANDAPUR, K
Pre-clinical in-vivo & in-vitro study of the supplied samples	1 YEAR	EMAMI LIMITED 13, B.T ROAD, BELGHARIA, 24 PARGANAS, NORTH WEST BENGAL KOLKATA- 70

2020-21

Project Title	Duration	Funding Agency
Preclinical in-vivo and in-vitro study of some herbal formulations	12 months	Emami Limited, Emami Tower,687 AnandaPur, EM Bypass, Kolkata-700107

2019-20

Project Title	Duration	Funding Agency
Preclinical in-vivo, in-vitro and ex vivo studies of different productsor formulationsof herbs for efficacy and safety profile	12 monthes	Emami Limited, Emami Tower,687 Anar

Cumulative Amount(X + Y + Z) = 2400000.00

5.7.4 Honorary Consultancy from Central/State/Local Government Organizations (5)

S.No	Name	honorary consultancy
1	Dr Subhasis Maity	Convener,Board of studies, MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY,KOLKATA

5.7.5 Development activities (5)

institute always emphasizes on the continuous development of the students and the faculty members.

RESEARCH

- The faculty members are engaged in research activities supported by various funding agencies and industry.
- College research activities are well supported by the state of the art central instrument room. Laboratories are continuously upgraded to support academic research.
- One research laboratory is funded and equipped by Science and Engineering Research Board (Department of Science and Technology, DST, India).This laboratory is well equipped with advanced analytical facilities which are available for studen
- This research lab mainly focuses on pharmaceutical research subject to the cancer biology and cancer chemotherapeutics, specifically the use of metal-based drugs. Designing of various metal based co-ordination compounds with different liganc area of research correlated with toxicological and genotoxicological aspects. Moreover, our research delineate the molecular mechanistic pathways involved in the chemotherapeutic potential of aforementioned compounds

Along with this ,two industry consultancy projects are being run by faculties of concerned department along with post graduate students.

This provides an exposure to faculties to the recent trends of pharma industry and faculties in turn can percolate the same to their students.

FACULTY DEVELOPMENT

- Institution also sponsers advanced level on site industrial training for faculties . They are temporarily relieved from academic duty during that period. Those faculties after upgradation , share their experience theough seminar presentatior

1. Dr Swarupananda Mukherjee,Assistant Professor,Pharmaceutics undertook industrial training at Torrent Pharma,Sikkim from 25th Nov-24th Dec 2021.
2. Dr Miltu Ghosh ,Dr Tapan Giri Assistant Professor ,Pharmaceutics underwent industrial training at Mcleods Pharma ,sarigaon,Mumbai from 31st July-20Aug 2019.

- Institution encourages faculty members to enroll for for post doctoral programs by providing them leave during that period.

1. Dr Miltu Kr ghosh served as a visiting resarch fellow at Anglia Ruskin University,Cambridge from September December 2017-Oct 2018.
2. Dr Souvik Roy was awarded post doctoctoral fellowship by Matsuame International Foundation, Japan,wherin he conducted research at

Hamamatsu University School of Medicine, Hamamatsu, Japan from 1 st August 2019- 1 st February 2020

- Institution has memorandum of understanding with ISF COLLEGE OF PHARMACY MOGA,PUNJAB -DATED 04.03.2021 to facilitate technology transfer and knowledge upgradation of faculties as well as students

5.8
Faculty Performance Appraisal and Development System (FPADS)

Total Marks 20.00

(20)

Institute Marks : 20.00

The Performance Appraisal System for Faculty at NSHM is structured to ensure optimum contribution of individual faculty members towards Institutional performance. Therefore our appraisal system caters to three specific focus areas:

1. INDIVIDUAL FOCUS: which deals with individual growth and has following elements

a. Professional Focus: this records achievements against committed targets on:

i. Research (which includes Papers; Publications; Projects/Consultancy; Research guidelines and awards/invited lectures)

ii. Academic (which includes syllabus completion; Innovative content delivery; Class attendance; Assessments; Interactive LMS content; Innovative projects with students and Student mentorship)

b. Self Focus: which records achievements on:

i. Developmental (which includes qualification upgrade and Attending training courses)

ii. Discipline (which includes self attendance and latecoming/early going)

2. INSTITUTIONAL FOCUS which records achievements pertaining to Self initiating activities involving students; organising training programmes/workshops etc; Involvement in student club activities; organising industry/field visits and active participation in institutional activities.
3. COMPETENCY FOCUS which records competency level in both core competencies and leadership competencies.

The appraisal is modelled on interactive worksheets which are vetted by reporting superior.

5.9 Visiting/Adjunct Faculty (5)

Total Marks 5.00

Institute Marks : 5.00

There is a provision of visiting faculty from industry to bridge the gap between academics and industry to enable the students identify their role as pharmaceutical technologist & health care professional.

Furthermore these deliberations from industry experts encourage the practise of innovation and research aptitude among students that can help them shape their carears as competent pharmaceutical technologist and/ budding entrepreneurs.

Session	Visiting faculty,designation	Topics	hrs/wk	Student participants
July 2018-Dec 2019	**Dr Debasis Bhattacharryya, Manager, East India Pharmaceuticals Ltd ,kolkata**	**Floating microspheres**	**4hr**	**Bpharm 4th yr**
		cGMP regulations	4hrs	Bpharm 4th and 3rd yr
		QA,QC documentation	4rs	Bpharm 4th and 3rd year yr
		3D Printing	4hrs	Bpharm 3rd and 4th year yr
		Liposomes	4 hrs	Bpharm 3rd yr
		Microemulsions	4 hrs	Bpharm 4th yr

		Lipid nanoparticles	4 hrs	Bpharm 4th yr
Feb 2019-June 2019		Mucoadhesive drug delivery	4 hrs	Bpharm 3rd yr
		Targeted drug delivery system	4 hrs	Bpharm 4th yr
		Gastroretentve drug delivery system	4 hrs	Bpharm 4th yr
		preformulation parameters	4 hrrs	Bpharm 4th yr
		Concept of 6 sigma in pharma industry	4 hrs	Bpharm 4th yr
		Validation in pharma industry	4 hrs	Bpharm 4th yr
		TOTAL	**52 hrs**	
July 2019-Dec 20	Dr Debasis Bhattacharryya, Manager, East India Pharmaceuticals Ltd ,kolkata	same as above	4 hrs/wk	Bpharm 4th and 3rd yr
Jan 20-June 20		same as above	4 hrs/wk	Bpharm 4th and 3rd yr
		TOTAL	**52 hrs**	
July 2020-DEC 20	Dr Debasis Bhattacharryya, Manager, East India Pharmaceuticals Ltd ,kolkata		4 hrs/wk	Bpharm 4th and 3rd yr
		TOTAL	28 hrs HRS	
Feb 2021-June 2021	Mr Saaptarishi Ghosh, Head,TAG e-cell ,NSHM centre for innovation and Incubation	Start ups,Innovation in work place ,incubation cell	4 Hrs.wk	Bpharm 4th and 3rd yr
			24hrs	
		TOTAL	**52 hrs**	

6 FACILITIES (120)

Total Marks 120.00

6.1 Availability of adequate, well-equipped classrooms to meet the curriculum requirements (20)

Total Marks 20.00

Institute Marks : 20.00

Room Description	No. of Rooms	Shared/ Exclusive	Capacity	Dimensions with area	Rooms/Labs Equipped with
Class Room with WIFI facility	6	Exclusive	75	505.4 Sq.M	Teaching aids: White board / Green board, LCD Projector & screen, Chair with writing table / desk, tube light, ceiling fan, soft notice board and provision for sound system.
Tutorial Room	2	Exclusive	20	109.68 Sq.M	Teaching aids: White board / Green board, LCD Projector & screen, Chair with writing table / desk, tube light, ceiling fan, soft notice board and provision for sound system.

6.2 Faculty rooms (10)

Total Marks 10.00

Institute Marks : 10.00

Faculty Rooms	2	Exclusive	40	178.02 Sq.M	PC & laptop with internet, telephone, wall mounted file cabinets, soft notice board, chairs and tables cabinets mounted below the tables & fans along with air conditioner

6.3 Laboratories including preparation room (wherever applicable), instrument/machine room and computer labs along with equipment and relevant facilities (60)

Total Marks 60.00

Institute Marks : 60.00

- **Laboratories & Stores**

Room Description	No. Of Rooms	Shared/ Exclusive	Capacity	Dimensions with area	Rooms/Labs Equipped with

Pharmaceutics	4	Exclusive	25	327.01 Sq.M	Layout design is as per industries setup including cubicular section with anti room, aseptic room. Equipped with required equipments, instruments and glass wares to conduct experiments related to programme curriculum and provided with working table, water and gas connection where ever need.

Microbiology/Biotechnology	1	Shared	25	77.81 Sq.M	Equipped with required equipments, instruments and glass wares to conduct experiments related to programme curriculum and provided with working table, water and gas connection where ever need along with sterile room and laminar airflow hood.
Pharmaceutical Chemistry	3	Exclusive	25	234.01 Sq.M	Equipped with required equipments, instruments and glass wares to conduct experiments related to programme curriculum and provided with working table, water and gas connection where ever need

Anatomy and Physiology	1	Shared	25	82.26 Sq.M	Equipped with required equipments, instruments and glass wares to conduct experiments related to programme curriculum and provided with working table, water and gas connection where ever need. human skeleton, Charts & models.
Pharmacology	1	Shared	25	82.26 Sq.M	Equipped with required equipments, instruments and glass wares to conduct experiments related to programme curriculum and provided with working table, water and gas connection where ever need. human skeleton, Charts & models.

Pharmacognosy	1	Exclusive	25	82.28 Sq.M	Equipped with required equipments, instruments and glasswares to conduct experiments related to programme curriculum and provided with working table, water and gas cannection where ever need.

Machine room	1	Exclusive	25	80.69 Sq.M	Equipped with required equipments, instruments to conduct experiments related to programme curriculum and provided with working table and water where ever need.
Instrument room	1	Exclusive	25	75.47 Sq.M	Equipped with required equipments, instruments to conduct experiments related to programme curriculum and provided with working table and water where ever need.
Computer Lab	1	Shared	75	374.28 Sq.M	Equipped with 268 (PC and laptops) for use of students and faculty members in an air conditioned hall along with internet connection with UPS.

CENTRAL INSTRUMENT ROOM

AVAILABLE INSTRUMENTS & EQUIPMENTS

SL. NO.	NAME	AVAILABLE NO.	MAKE/MODEL	SOPs	LOG BOOK
1	**UV-VIS Spectrophotometer (Shimadzu) Model no -1900i**	1	(Shimadzu) Model no -1900i	YES	YES
2	**H P L C (Waters) with Accessories**	**1**	waters Model No-2489	YES	YES
3	**Spectrophotometer (systronics)**	**1**	systronics	YES	YES
4	**Precision Digital Balance (Mettler)**	**1**	METTLER Model N-ML/204	YES	YES
5	**Flamephotometer**	**1**	systronics-130	YES	YES
6	**pH Meter**	**2**	TARSON CL 46	YES	YES
7	**Conductivity meter**	**1**	systronics ModEL NO-5953	YES	YES

8	**Potentiometer**	**1**	Equtonoice, Model no-602	YES	YES
9	**Karl Fischer Titrator**	**1**	Testing Instrument MFG pvt -modle no- 761	YES	YES
10	**Nephalo Turbiditimeter**	**1**	Elico make Modle CLSD-iins /no -184/1668	YES	YES
11	**Colorimeter**	**1**	Digital Photo electric , Model No -113	YES	YES
14	**Vacuum Pump**	**1**	Testing Instrument MFG pvt -	YES	YES
15	**Fluorescence Microscope with Photo Micrograph attachment**	**1**	Olympus Modle No-cx2liTR & LC30	YES	YES
16	**Hand Held Harmonizer**	**1**	Make-D-Lab(USA) Modle No-D-160	YES	YES
17	**Semi Auto Analyzer**	**1**	Make Tulip Doiagnosis,Modle no-GRBLab1.0	YES	YES
18	**Western Blotting With Power Pack**	**1**	Make Scientific Modle no DCx- HC	YES	YES
19	**Hand Top Deep Freezer**	**1**	Make- Blue Star Modle No-CHF100C	YES	YES
20	**Lyophilizer**	**1**	Lyophilizer,Model No-LILYFO-55	YES	YES
21	**Micro centrifuge With Speed Regulator**	**1**	RIMI, Modle No-RM-12C	YES	YES
22	**Horizontal Gel Apparatus Terson**	**1**	Terson, Modle no-ATI-222	YES	YES
23	**Elisa Plate reader meril Eia Quant**	**1**	Merilyser EIAQUANT microplate reader	YES	YES
24	**Elisa plate washer Meril- EIA Wash**	**1**	Merilyser EIAQUANT microplate washer	YES	YES
25	FTIR Spectrophotometer with ATR attachment and accessories	1	BRUKER ALPHA-T	YES	YES

MACHINE ROOM				
SL. NO.	NAME	AVAILABLE No	SOP	LOG BOOK
1	LIQUID FILLING MACHINE	1	YES	YES
2	AMPOULE FILLING/SEALING MACHINE	1	YES	YES
3	AUTOCLAVE	1	YES	YES
4	BOD INCUBATOR	1	YES	YES
5	RENAULTS APPARATUS	1	YES	YES

Lab Description	BatchSize	Availability of manuals	Quality of Instrument	Safty Measures	Remarks
PHARM ANALYSIS LAB C02	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
INORGANIC CHEMISTRY LAB C01	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
PHARMACOGNOSY LAB C13	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
INSTRUMENT LAB C11	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG,PG
DISPENSING LAB C24	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
MEDICINAL CHEMISTRY LAB C23	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
MICROBIOLOGY LAB C22	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
PHARMACEUTICS I LAB C32	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
PHARMACEUTICS II LAB C33	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
PHARMACOLOGY LAB C31	25	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	UG
PHARMACEUTICS LAB C41	15	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	PG
PHARMACOLOGY LAB D41	15	YES	STANDARD	MSDS,LAB SAFETY CHART,FIRST AID	PG

6.4 Drug Museum (5) Total Marks 5.00

Institute Marks : 5.00

The Museum of NSHM college of Pharmaceutical Technology is a spacious above 50 sq m, well maintained room on 2nd floor that holds various Informative and Educative specimens, packaging materials & models related to the profession of Pharmacy.

The museum presently has the following items displayed

1. Drug samples used to cure various diseases---- tablets, capsules, liquid preparations, ointments, eye drops are properly kept on shelves
2. Natural products that have medicinal properties are kept with labels.
3. Herbarium sheets labelled are exhibited.
4. Charts showing the transverse sections of various part of plants are displayed from walls.
5. Charts with illustrations of the different systems of the human anatomy
6. Human organ models which are immersed in formalin that is regularly changed
7. Samples of various types of cosmetics eg shampoo, creams, lotions, toothpaste
8. Various types of Surgical dressings used eg, Gauze, cotton, bandage

6.5 Medicinal Plant Garden (5)

Total Marks 5.00

(Area, demarcation, temporary/permanent arrangement, planting of plants under the shade in demarcated areas, adequacy of the plants)

(5)

Institute has a well planned and maintained medicinal plant garden .the total area of the garden is 224 sq feet and properly demarcated. It contains a variety of herbs ,shrubs and trees.Overall look of the medicinal plant garden is green and ambient. The parts of the plant provide source of different herbal medicinal formulation which are utilized as basis ingredient for different laboratory experiments and project in pharmacognosy, formulation development and other purpose.

Types of plant available is 18. Total number of plants is 22.

Few important plants are listed below:

Sl. No.	Common name	Scientific name
01	Nayantara(Vinca)	*Catharanthus roseus*
02	Vasaka(Bakas)	*Adhatoda vasica*
03	Ghritakumari (Aloe)	*Aloe barbadensis*
04	Datura	*Datura stramonium*
05	Amla	*Emblica officinalis*
06	Ashwagandha	*Withania somnifera*
07	Bael	*Aegle marmelos*
08	Neem	*Azadirachta indica*
09	Jaba	*Hibiscus rosa-sinensis*
10	Curry	*Murraya koenigii*
11	Ashoka	*Adhatoda vasica*
12	Gandal	*Paederia scandens*
13	Arjun	*Terminalia arjuna*
14	Satamuli,Shatavari	*Asparagus* racemosus
15	Nishinda	(*Vitex negundo* /
16	Ulatkambal	*Abroma augusta*
17	Papaya	*Caria papaya*
18	Cardamom	*Elettaria cardamomum*
19	Tulsi	*Ocimum sanctum*

6.6 Non Teaching Support (20) Total Marks 20.00

Name of the Technical Staff	Designation	Date Of Joining	Qualification		Other Technical Skill Gained	Responsibility
			AT joining	Now		
Prasun Kanti Adhikari	Sr.Technical Assitant	15/01/2014	B PHARM	NA	NA	Arrangements & guiding Lab Expt.
Amarendra Kishore Das	Technical Assitant	08/06/2018	B PHARM	NA	NA	Arrangements & guiding Lab Expt.
Chinmoy Adhikari	Sr.Technical Assitant	17/05/2010	B PHARM	NA	NA	Arrangements & guiding Lab Expt. & responsibility of Store
Soumya Ghosh	technical assistant	10/01/2018	BSc,DPHARM	NA	NA	rrangements & guiding Lab Expt.
Lalmohon Masanta	Sr.Technical Assitant	08/09/2010	BPHARM	NA	NA	Arrangements & guiding Lab Expt. & responsibility of Store
Subhankar Dash	Lab Coordinator	16/07/2008	BSC,DPHARM	NA	NA	rrangements & guiding Lab Expt.
Pravanjan Bhakta	Sr Lab Coordinator	01/09/2009	DPHARM,BPHARM	NA	DMLT	Arrangements & guiding Lab Expt. & responsibility of Store

6.6.1 Availability of adequate and qualified technical supporting staff for program specific laboratories (10)

Institute Marks : 10.00

TECHNICAL ASSISTANTS FOR PROGRAM SPECIFIC LABORATORIES			
SL NO	NAME OF THE LABORATORY	ROOM NO	NAME OF THE TECHNICIAN
1	Pharm analysis Lab	C02	Prasun Kanti Adhikari
2	Inorganic Lab	C01	Amarendra Kishor Das
3	pharmacognosy Lab	C13	Chinmoy Adhikari
4	Instrument Lab	C11	Pravanjan Bhakta
5	Dispensing Lab	C24	Soumya Ghosh
6	Medicinal chemistry Lab	C23	Subhankar Dash
7	Microbiology Lab	C22	Soumya Ghosh
8	Pharmaceutics (I&II) Lab	C32&33	Pravanjan Bhakta
9	Pharmacology Lab	C31	Lalmohan Masanta
10	PG Ceutics Lab	C42	Chinmoy Adhikari
11	PG Cology Lab	D41	Lalmohan Masanta

6.6.2 Incentives, skill upgrade, and professional advancement (10)

Institute Marks : 10.00

SESSION	DATE	EVENT	RESOURCE PERSON
18-19	22ND SEP 2018	HANDS ON TRAINING ON HPLC AND UV VISIBLE SPECTROPHOTOMETER	DR TAPAN GIRI
19-20	3 AUG 2019	WORKSHOP ON LABORATORY SAFETY	DR MILTU GHOSH
20-21	13TH FEB 2021	HANDS ON TRAINING ON HPLC AND FTIR SPECTROPHOTOMETER	DR SWARUPANADA MUKHERJEE
21-22	18TH DFEB 2022	TRAINING FOR LABORATORY REAGENT PREPARATION	DR PRITESH DEVBHUTHI

7 CONTINUOUS IMPROVEMENT (75)

Total Marks 72.62

7.1 Improvement in Success Index of Students without the backlog (15)

Total Marks 15.00

Institute Marks : 15.00

Items	2017-18 (LYG)	2016-17 (LYGm1)	2015-16 (LYGm2)
Success Index (from 4.2.1)	0.79	0.76	0.64

7.2 Improvement in Placement and Higher Studies (15)

Total Marks 15.00

Institute Marks : 15.00

Items	2017-18 (LYG)	2016-17 (LYGm1)	2015-16 (LYGm2)
Placement Index (from 4.7)	0.95	1.00	0.98

7.3 Improvement in the API of the Final Year Students (10)

Total Marks 7.62

Institute Marks : 7.62

Academic Performance	2017-18 (LYG)	2016-17 (LYGm1)	2015-16 (LYGm2)
Mean of CGPA or mean percentage of all successful students(X)	7.73	7.61	7.53
Total number of successful students(Y)	129.00	118.00	109.00
Totalnumber of students appeared in the examination(Z)	129.00	118.00	109.00
API [X*(Y/Z)]:	7.73	7.61	7.53

Average API [(AP1 + AP2 + AP3)/3] : 7.62

Academic Performance = Average API = [(AP1 + AP2 + AP3)/3] : 7.62

7.4 Improvement in the quality of students admitted to the program (15)

Total Marks 15.00

Institute Marks : 15.00

Item		2020-21(CAYm1)	2019-20(CAYm2)	2018-19 (CAYm3)
National Level Entrance Examination	No of students admitted	6	10	10
NEET	Opening Score/Rank	103711	107123	76499
	Closing Score/Rank	963994	1027310	292361
State/ University/ Level Entrance Examination/ Others	No of students admitted	96	94	95
WBJEE	Opening Score/Rank	4528	3737	1767
	Closing Score/Rank	19644	20813	20863
Name of the Entrance Examination for Lateral Entry or lateral entry details	No of students admitted	22	14	13
	Opening Score/Rank	15	7	22
JELET	Closing Score/Rank	336	145	179
Average CBSE/Any other board result of admitted students(Physics, Chemistry&Maths)		70	66.2	63.4

7.5 Actions taken based on the results of evaluation of each of the POs (20)

Total Marks 20.00

Institute Marks : 20.00

POs Attainment Levels and Actions for Improvement- (2020-21)

POs	Target Level	Attainment Level	Observations
PO 1 : Pharmacy Knowledge			
PO 1	3	2.88	High

targetsto be set higher in next academic session

PO 2 : Planning abilities

PO 2	3	2.93	high
targetsto be set higher in next academic session			

PO 3 : Problem Analysis

PO 3	3	2.75	high
targetsto be set higher in next academic session			

PO 4 : Modern tool usage

PO 4	3	2.8	high
targetsto be set higher in next academic session			

PO 5 : Leadership skills

PO 5	3	2.75	high
targetsto be set higher in next academic session			

PO 6 : Professional identity

PO 6	3	2.9	high

targetsto be set higher in next academic session

PO 7 : Pharmaceutical Ethics

PO 7	3	2.9	high
targetsto be set higher in next academic session			

PO 8 : Communication

PO 8	3	2.75	high
Action: More Impetus to be given on grooming communication skills of students.			

PO 9 : The pharmacist and society

PO 9	3	2.75	high
Action: continous improvements needs to be done in terms of setting higher targets			

PO 10 : Environment and Sustainability

PO 10	3	2.98	high
Action: continous improvements needs to be done in terms of setting higher targets			

PO 11 : Life-long Learning

PO 11	3	2.9	high

Action:continous improvements needs to be done in terms of setting higher targets

POs Attainment Levels and Actions for Improvement- (2019-20)

POs	Target Level	Attainment Level	Observations
PO 1 : Pharmacy Knowledge			
PO 1	3	2.5	medium
C 107 : Pharmaceutics I practical Students were found to not understand the concepts hence fared low . Tutorial classes for weak students to be given Apart from this, due to introduction of new syllabus in 2017-18 , 4th yr B pharm subjects could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible			
PO 2 : Planning abilities			
PO 2	3	2.4	medium
Due to introduction of new syllabus in 2017-18 , 4th yr B pharm subjects could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible			
PO 3 : Problem Analysis			
PO 3	3	2.26	low
Though there has been an improvement in CO attainment in the follwing subjects compared to last session, still continous improvement via different assesment tools needs to be done C204: Phrmaceutical Engineering theory. Students failed to reproduce their knowledge in written communication and lacked clarityin concepts. Action: Weaker students to be identified and more emphasis should be given on continuous assesments C 203 pharmaceutical Microbiology theory , some Students fared low due to low understanding and language issues. They couldnot express in written tests.			
PO 4 : Modern tool usage			
PO 4	3	1.2	low
C109: Englisg communication theory Students lacked in written communication and grammer due to language and cultural issues.Thry dont attend CLC classes C112 English communication practical ;Students lacked in verbal communication and grammer due to language and cultural issues. Action:Attendance in CLC classes should be mandatory for students			
PO 5 : Leadership skills			

PO 5	3	2.26	low

due to introduction of new syllabus in 2017-18 , 4th yr B pharm subjects(old syllabus) could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible

PO 6 : Professional identity

PO 6	3	2.42	medium

Due to introduction of new syllabus in 2017-18 , 4th yr B pharm subjects (old syllabus)could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible

PO 7 : Pharmaceutical Ethics

PO 7	3	2	low

Although overall CO attainment for subjects mapped to PO 7 was attaining the target,
due to introduction of new syllabus in 2017-18 , 4th yr B pharm subjects (old syllabus)could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible

PO 8 : Communication

PO 8	3	1.8	low

C109: English communication theory Students lacked in written communication and grammer due to language and cultural issues.Thry dont attend CLC classes
Action: more assignments should be given to them to improve their written compentency.
C112 English communication practical ;Students lacked in verbal communication and grammer due to language and cultural issues.
Action:Attendance in CLC classes should be mandatory for students

PO 9 : The pharmacist and society

PO 9	3	1.58	low

C109: English communication theory Students lacked in written communication and grammer due to language and cultural issues.Thry dont attend CLC classes
Action: more assignments should be given to them to improve their written compentency.
C112 English communication practical ;Students lacked in verbal communication and grammer due to language and cultural issues.
Action:Attendance in CLC classes should be mandatory for students

PO 10 : Environment and Sustainability

PO 10	3	2.7	medium
Although overall CO attainment for subjects mapped to PO 10 was attaining the target, due to introduction of new syllabus in 2017-18 , 4th yr B pharm subjects (old syllabus)could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible			
PO 11 : Life-long Learning			
PO 11	3	2.3	low
C303: Pharmacology II theory; Studets were found to forget their basic physiology and chemistry concepts,hence attainment of CO was not as per the target. Action: Stress to be given on more continuous assesment and application based MCQs. Apart from this, due to introduction of new syllabus in 2017-18 , 4th yr B pharm subjects could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible			

POs Attainment Levels and Actions for Improvement- (2018-19)

POs	Target Level	Attainment Level	Observations
PO 1 : Pharmacy Knowledge			
PO 1	3	2.16	low
C 101 In the course Human anatomy and physiology I theory,student performance has been low with respect to attainment of COs as analysis of answers revealed that this could be due to variability in linguistic ability and written communication. Action: weaker students will be given extra classes and tests to improve on it C 102: Pharmaceutical analysis-1 theory student performance has been weak in respect of attainment of COs and analysis revealed that the students concept need to be stronger. Action: Tutorial classes need to be given for weaker students			
PO 2 : Planning abilities			
PO 2	3	2.33	low
C 105 Human anatomy and physiology practical, many students fared low due to improper time management Action: They should be guided properly and more emphasis should be given on practice . C101: human anatomy physiology 1 ,student performance has been low with respect to attainment of COs as analysis of answers revealed that this could be due to lack of understanding of certain topics. Action: Understanding will be enhanced by improving pedagogy and diagrammatic explanation			
PO 3 : Problem Analysis			
PO 3	3	1.95	low

C 203 pharmaceutical Microbiology theory , some Students fared low due to low understanding and language issues. They couldnot express in written tests.
Action: Weaker students to be marked and given extra theory and communication classes.
C 206: physical Pharmaceutics I practical ,students could not apply their theoritical concept in practicals.
Action: Stdents should be given more time to practise and extensive viva voce to be done to inprove them

PO 4 : Modern tool usage

PO 4	3	2.2	low

C204 Pharmaceutical Engineering Theory, Analysis revealed students students could not apply their theoritical concept in practicals.
Action: Students should be given more time to practise and extensive viva voce to be done to improve them
C109:Communication skills theory;Students fared low in written communication. exams
Action: More practise would be given in this aspect to the studenst

PO 5 : Leadership skills

PO 5	3	1.58	low

C 103: Pharmaceutics -1 theory; Analysis revealed students didnt learn the subject properly.
Action: Weaker students too be identified and given tutorial classes and tests
C 117: pathophysiology theorystudents didnt get anough practise and hence fared low.
Action: Weaker students too be identified and given tutorial classes and tests

PO 6 : Professional identity

PO 6	3	2.32	low

C103: Pharmaceutics 1 Theory; Students could not grasp certain topics .
Action: Assignments would be given on those topics for their inprovement
C110: Remedial biology theory;Students could not grasp certain topics .
Action: Assignments would be given on those topics for their inprovement.

PO 7 : Pharmaceutical Ethics

PO 7	3	2.22	low

C110: Rembio Theory; Students could not understand and grasp some topics and hence couldn't write properly
Action: Turial classes would be provided for slow learners
C123: Environment Ecology-Theory Students didnt understand the relavance of some topics in broader aspect and didnt study properly.
Action: Impetus would be given on making them understand the relavance

PO 8 : Communication

PO 8	3	2.75	low

C109:Communication Skills Theory;Students fared low in written communication. exams
Action: More practise would be given in this aspect to the studenst
C112: communication skill practical: Students could not communicate verbally due to linguistic and cultural variability.
Action: Impetus to be given on this aspect and they should be forced to attend CLC classes

PO 9 : The pharmacist and society

PO 9	3	2.75	high

C109: communication skills theoryStudents fared low in written communication. exams
Action: More practise would be given in this aspect to the studenst
C112: communication skill practical: Students could not communicate verbally due to linguistic and cultural variability.
Due to introduction of new syllabus in 2017-18 ,3rd year and 4th yr B pharm subjects could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible

PO 10 : Environment and Sustainability

PO 10	3	2.4	medium

C205: Pharmaceutical Organic chemistry II practical, Students fared low in result writing and viva voce which is required for their sustainence as competent pharmacist
Action: More emphasis should be given on regular viva on every practical that can boost their confidence

Apart from this, due to introduction of new syllabus in 2017-18 ,3rd year and 4th yr B pharm subjects could not be mapped with POs as they were of old syllabus.Hence CO related to all those subjects attainment was not possible

PO 11 : Life-long Learning

PO 11	3	2.1	low

C102: Pharm analysis I theory; Students could not apply the concepts of analytical methods effectively and independently which is required for their growth as pharmacy professional.
Action: Assigning students to collect information with the application of analytical methods and give presentations.
C116: Biochem Theory; It was found that basic concepts were weak and contributted to low COs.
Action: Oral presentations will be conducted on those topics

8 STUDENT SUPPORT SYSTEMS (50)

Total Marks 50.00

8.1 Mentoring system to help at individual levels (5)

Total Marks 5.00

Institute Marks : 5.00

STUDENT MENTORING POLICY

Mentoring may be defined as a strategy required by the students to achieve learning goals with academic and non-academic support. Thus, the student mentorship policy shall incorporate the support of faculty members as well as senior students as “Faculty Mentors” and “Student Mentors” respectively. Mentoring will be available to all the students in the institution.

Faculty mentors play a crucial role in mentoring students. Students and their mentors share responsibility for ensuring productive and rewarding mentoring relationships. Both the stakeholders have a role to play in the success of mentoring. For students, a mentor is someone who serves as a guide throughout their institutional training. They provide both professional and personal advice in transitioning into, and out of, the institution. They give constructive feedback on teaching & learning and other elements of career design. They can serve to help students balance professional goals with their personal lives or give emotional encouragement during challenging times.

The assigned “Mentors” will help the students to overcome their hurdles to achieve the goals desired by them in their professional career.

The aim of this Mentoring policy is to identify the fundamental mechanisms that will enable constructive interaction, guidance and mentorship of junior students by senior students, under the supervision of Faculty Mentors and providing a reliable and comprehensive support system to motivate students to excel in both academic and non-academic fields and to make the most of their life at the Institute.

OBJECTIVES OF STUDENT MENTORING POLICY

·Provide students with career and non-academic counselling.

·Provide students with information on preparatory courses such as skill courses, bridge courses etc. for their academic prosperity.

·Focus and motivate students to achieve learning goals and thereby improve their academic performance.

·Guide, encourage, and advice the students about their upcoming student life, student health, mental and emotional well-being and listen to their issues with patience and help them solve their concerns with appropriate resources, support and referral available.

·Generate curiosity and interest in academics and other institutional activities amongst the students.

·Ensuring regularity and punctuality of students through counseling sessions.

·Help undergraduate fresh students understand the challenges and opportunities present in the Institute and develop a smooth transition to campus life.

·Counsel academically weak undergraduate students and to play an important role in helping troubled students cope with academic, extra-academic and personal problems.

- **Provide positive role models to first year undergraduate students in the institute.**
- **Proactively try to identify problems of the general student populace and to bring them to the notice of the concerned authorities.**

The SMP attempts to track these objectives by carefully identifying those who can act as an anchor and guide for a junior student or an academically weak student to bank upon.

SCHEDULE OF MEETINGS

Faculty Mentors will meet with the respective mentees, according to a pre-arranged calendar, as well as per need of the student or the moment. They will be introduced to each other in the first few weeks after admission. Mentors and mentees should meet initially at least once a month. They are encouraged to meet periodically to build rapport within the team. Mentees should be encouraged to initiate meetings with mentors.

ROLE AND RESPONSIBILITES OF THE MENTOR

For effective mentoring, the mentor should embrace the ability and willingness to:

1.Coach to advise the mentees on how to accomplish their goals

2.Provide guidance and help to increase the mentee's exposure to new experiences.

3.Teach to provide learning opportunities.

4.Counsel to enhance the mentees self-esteem through supportive, non-judgmental discussions.

5.Communicate through active listening. Focus fully on the mentee and show active verbal and non-verbal signs of listening.

6.Share experiences and be open to sharing mistakes, failures and lessons learned.

7.Maintain strict confidentiality of the information shared by the mentee.

8.Be a role model to walk the talk and exhibit the behaviors essential for success

9.If at any time, the mentor feel that the mentees need special counselling, the mentor may encourage the students to seek counselling with professional experts.

10.If any student needs special academic tutoring, the mentor may direct the mentees to an appropriate faculty and may even ask the faculty to help their mentees in a particular area.

ROLES AND RESPONSIBILITIES OF THE MENTEES

1.Mentee is responsible for initiating all contact with the mentor and should be prepared and punctual for the mentoring sessions.

2.Mentee is responsible for establishing the agenda for the conversation. The student might even email topics to the mentor ahead of time. At the beginning of each session, the mentee should provide a brief update on progress since the last conversation.

3.Mentee should share his/her ideas, concerns, and professional goals so that the mentor is able to place the situation in perspective.

4.Mentee should establish a mutually agreeable plan for mentoring sessions. He/she should schedule the sessions on his/her calendar and build in enough time around the sessions to prepare. By ensuring that conversations start and end on time, the mentee will demonstrate respect and responsibility.

5.Mentee should ask direct questions about what he/she most want to know and shouldn't be shy about asking. Mentee is responsible for ensuring, the conversation meets, his/her needs .

Program implementation will include the following steps:

1. Allotment of mentees to the mentors.
2. Mentor – Mentee interaction to identify the strengths and weaknesses of the mentees. Forming WhatsApp group, if possible, to ensure smooth flow of communication among the group.
3. Periodic meeting of the mentees with the mentors and remedial training of the learners, training students to take up higher skills.

Details of Student Mentoring System

- An effective Student Mentoring System is in practiced in the college. Students of all departments are brought under this system from the date of joining the college.
- Each Mentor is allotted with 25- 30 students under the mentoring system.
- Student activities like Academic, Curricular, Co-curricular, Extra Curricular achievements, Social activities and the details of Parent Meetings are registered in the Student Mentoring System.
- Any discrepancies such as disciplinary issues, health issues, sense of insecurity, lack of attendance etc. are discussed and counselled with care.
- Mentoring Meeting is conducted every month. during which Mentors submit the register and the mentoring forms to the high level Mentoring /Counselling committee comprising of HODs and the Head of the institution.
- The committee scrutinizes case by case and suggests corrective measures.
- If necessary, the committee holds discussions with the parents and Medical Counsellor.

Efficacy of the Mentoring System

The prevailing mentoring system helps us in the following ways:

- Enhances the teaching-learning process making it more student-centric
- Provides impartial advice and encouragement to students
- Assists in problem solving and improves self-confidence of students
- Provides individual and personal care to the students
- Improves students" performance in internal assessment test and end semester exam
- Reduces the risk of failures and drop-outs and improves academic performance.
- Promotes improvement in attendance percentage of students
- Helps to Identify student's interests and create opportunities of growth in relevant areas.

- Motivates students to participate in various co-curricular and extracurricular activities

- Promotes decision making abilities that support students" goals, abilities and aspirations and helps students to take better control of their career
- Develops a supportive relationship between students and staff
- Creates a positive work environment
- Facilitates information gathering and dissemination
- Promotes effective utilization of college infrastructure and resources.
- Facilitates better placement.

Here are some of the strategies to help faculty members stay in tune with the needs of students:

- Identify strengths and weaknesses in all fields of the student mentees by using SWOC analysis

- Identify hobbies and fields of their interests.
- Guide and motivate to improve their results.
- Knowing their academic and psychological needs and guiding them accordingly
- Conducting regular counseling sessions for building discipline.
- Encouragement and Orientation provided in developing enthusiasm to participate in multi- skilled activities such as curricular, co-curricular and extra-curricular
- Collect feedback to strengthen the feedback system and achieve desired results on different aspects.
- Taking feedback at the end on this Student Mentor system.

Tenthings a mentor shouldd definitelyknowabout his/hermenteesbythe end of the

1. Name and contact number and residential address.
2. Whether he/she is at ease in interacting with others? Is he/she too reserved?
3. If he/she faces any Language problems.
4. If he/she suffers from any medical issues.
5. If he/she hails from a remote village/town/metropolis.
6. Whether he/she is enthusiastic for academics.
7. His/her hobbies?
8. Whether he/she is able to cope up with the academics or has he/she given up?
9. Attendance.
10. How well he/she has settled in (to the institute)?

Following is the hierarchical structure of this system:

CHIEF MENTOR			
PORTAL HEAD			
FACULTY MENTOR			
STUDENT MENTEES (UG 1ST YEAR)	STUDENT MENTEES (UG 2ND YEAR)	STUDENT MENTEES (UG 3RD YEAR)	STUDENT MENTEES (4TH YEAR)

Mentor Details

Academic Year	Number of Faculty Mentors	Number of students per mentor	Frequency of meeting
2019-2020	25	25-30	2 MEETING / SEMESTER
2020-2021	21	25-30	2 MEETING / SEMESTER
2021-2022	31	25-30	2 MEETING / SEMESTER

Type of Mentoring:

The student mentoring system focuses on the following four progresses:

i. Academic progress (Professional guidance)

ii. Co-curricular progress (all-round development)

iii. Extra-curricular progress

iv. Career progress (career advancement)

i. Academic progress: (Professional guidance)

- All students will be mentored by the respective mentors after every Internal Assessment Tests and after every end semester examination results. This enables the mentors to monitor the progress of each student.
- During this regular mentoring, the students are mentored based on their performance. Students who have scored good marks are encouraged to perform better.
- Good performers are advised to help the slow learners whenever possible, which enables peer learning among the students.
- Toppers are motivated to score good GPAs in all the semester and secure university ranks.

- Slow learners are advised to attend special tutorial classes for better understanding of the subjects.
- Scholarships and certificates are given to Class Toppers/Meritorious Students
- College Toppers are awarded based on the academic performance.
- Best Outgoing Student Award is also presented to motivate the students.

Efficacy:

Through this effective mentoring system

- The performance of the students in the internal assessment tests has improved and the students who perform better are motivated to do well in the upcoming tests.
- Slow learners have also shown improvement in their test performance because of peer learning. They are motivated to perform better in the ensuing tests.
- Slow learners who attend coaching classes perform better in internal tests and have shown great improvement.

ii. Co-curricular progress:

- Students" participation in co-curricular activities is periodically monitored.
- Suitable events are identified by the mentors and intimated to the students.
- Students are motivated to participate in multiple activities to enhance their technical and life skills.
- Students are encouraged to do inter-departmental projects.
- Students are involved in various Value Added Courses based on their interest, various state and national level symposiums, seminars, conferences & competitions, training programmes, workshops etc.
- Students of our institute participate in various co-curricular activities across India**.**

Efficacy

- Students have actively participated in several co-curricular events inside and outside the college.
- Students have participated in a wide range of best events suggested by the faculty.
- Students have improved their technical and life skills

- Many inter-departmental projects, value added courses, symposiums, conferences & competitions, training programmes, workshops have made them industry-ready.

- Students have travelled to many institutions in West Bengal and across the country to participate in events/competitions and have also won prizes.

iii. Extra-curricular progress (all-round development)

- With the support of Extracurricular Clubs, different kind of programme, fest, mentors identify the potential talents among the students and encourage them to participate in various extra-curricular activities like sports, dancing, singing, photography and social activities.
- Participation in extra-curricular activities moulds their character and personality. Students emerge physically and mentally strong. Such participations increase the confidence of the students too.

Efficacy

- Students have participated in various won college, inter college, inter university, and state level events and have also won prizes.
- Students have started their own NGOs and are involved in several social service activities. Senior students have addressed and encouraged juniors to be part of their NGOs and start their own NGOs
- Students have involved in many village welfare activities, cleanliness drives, health & hygiene programmes in.
- Multiple Tree plantation programmes have been conducted.
- Students have exhibited their skills in photography, acting, elocution, aptitude etc. in several in-house & external events and have also won prizes.

iv. Career progress (career advancement)

Mentors through the Career Guidance Cell, Higher Education Cell and Entrepreneurship Development Cell, guide the students to achieve their career aim by following the practices like:

- GPAT coaching
- Motivational programme
- Foreign and additional languages coaching
- Entrepreneurial skill development programme

- Value Added Courses / Placement training programmes / Skill development programmes

Efficacy

- Students have qalified GPAT Exam.
- Students have cleared different language certificate Exams
- Several students have enrolled for Business English Certificate Exam and the classes are underway.
- Students have started their own ventures and start-ups

NOTE: SEPARATE LISTS OF MENTOR-MENTEES FOR 2019-20,2020-21,2021-22 IS AVAILABLE IN THE DEPARTMENT OFFICE

8.2 Feedback analysis and reward /corrective measures taken, if any (10)

Total Marks 10.00

Institute Marks : 10.00

MECHANISM

Feedback is collected centrally in an online format in TCSION platform , one week before the end of each semester in the questionnaire format focussing on majorly academics and faculty performance.

Questions were based on course engagement, assessment and labs,LMS and online classes(during pendemic) and faculty performance

· The feedback is analysed and a report is generated for each faculty department wise.

· The feedback is shared with the faculties on one to one basis by the Director of the program

· As a corrective measure against possible prejudices, 10% of worst opinions are not considered while analysing the feedback.

Method followed for collection of feedback

· Students' feedback format was devised after a number of discussions with the faculty and undergoes modifications as and when required.

· All students of each class are given an opportunity to express their opinion with regards to effectiveness in teaching by a teacher, which are detailed in the feedback format..

· There are always possibilities of certain students developing prejudices against a teacher if he/ she is a strict disciplinarian. This may lead to a negative impression about the teacher concerned. This factor is taken into consideration while analysing the final students' feedback.

· This system has been functioning well and has improved the teaching and mentoring skills of faculties teaching excellence

·Students are also encouraged to share their views and suggestion with the mentor to whom they are assigned. If all else fails, students have an easy access to the Director, wherein they can directly go and complain/ share their views with him. However this is not taken as a criterion for judging the faculty and is only utilised by the teacher/s as guidance for improvement..

· B Pharm Program has a designated program coordinator who monitors the day to day academic activity and regular meetings of students from each class with PC and director are held to get an update on syllabus completion, teaching methodology, and conduct of teaching, non-teaching and administrative staff, facilities and infrastructure. Prompt action is taken in case of any issues brought to notice by students.

Actions taken:

The following actions are taken on basis of the feedback collected.

Commendatory actions

Rewarding of High performing faculty
Corrective actions

1.Intervention Plan for bottom ranked Faculty are chalked out
2. Teachers receiving lesser than 80% in their feedback are counselled.

2. Faculties with less than 50% in their feedback are closely monitored for consecutive three semesters and necessary action is taken from management level..

3. Faculties receiving poor feedback on usage of LMS / on less technology friendly are counselled to upgrade on that aspect.

a sample of questionnare is provided below

* Program
BPHARM

* Course & Faculty
Choose

Section 1 –General

Section 2- Subject

Sec tion 3- professor Evaluation

Section 4-Overall

*1.1 Overall evaluation of the Professor(s)

○ Excellent ○ Very Good ○ Satisfactory
○ Fair ○ Poor

*1.2 Overall evaluation of the course.

○ Excellent ○ Very Good ○ Satisfactory
○ Fair ○ Poor

*1.3 The course encouraged my participation in the class.

○ Excellent ○ Very Good ○ Satisfactory
○ Fair ○ Poor

*1.4 The instructor(s) provided helpful feedback on assessed class components (e.g., exams, papers, quizzes).

○ Excellent ○ Very Good ○ Satisfactory
○ Fair ○ Poor

*1.5 Assessments (quiz, exams etc.) were interesting and challenging.

○ Excellent ○ Very Good ○ Satisfactory
○ Fair ○ Poor

*1.6 The course was interesting

○ Excellent ○ Very Good ○ Satisfactory
○ Fair ○ Poor

*2.1 After this course, my interest in this subject has increased.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

*2.2The course increased my knowledge of the subject.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

*2.3 Course Materials (PDFs, PPTs, Notes) were more useful than YouTube/Notes found online.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

*2.4 Course Syllabus was sufficient to give a thorough understanding of the topic.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

*2.5 Online Classes for this course were held regularly and as per schedule.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

*2.6 The Course Syllabus was completed.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

*2.7 The LMS platform (TCS iON) is user friendly and useful for this subject

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

*2.8 MS Teams is easy to use and user friendly

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.1 The professor was prepared for class with appropriate material.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.2 The instructor encouraged student participation.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.3 the professor was knowledgeable about the course content.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.4 The instructor was open to students' questions and multiple points of view.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.5 The instructor helped clear doubts and other questions.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.6 The instructor presented the content in an interesting manner.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.7 The instructor communicated well.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.8 The professor held online classes regularly.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 3.9 TCS iON LMS was regularly used for this subject

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 4.1 Overall, I am satisfied with the Professor(s).

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 4.2 Overall, I am satisfied with the Course.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

* 4.3 Overall, I am satisfied with the learning environment.

○ Strongly Agree ○ Agree ○ Neutral
○ Disagree ○ Strongly Disagree

4.4 Additional Comments 1:

(1000 Characters remaining)

8.3 Feedback on facilities (5)

Total Marks 5.00

Institute Marks : 5.00

Online feedback about all the facilities(Canteen,IT lab,Sports)is taken by the department and collected collected once every semester.

The feedback is taken in online form.The feedback is kept anonymous and the concerned department, committee or individuals are counselled and steps are taken to implement changes.

A periodic review is conducted by the management to check the changes made and if they are continued.

8.4 Self Learning (5)

Total Marks 5.00

Institute Marks : 5.00

Lifelong learning, also known as **LLL**, is the "lifelong, voluntary, and self-motivated" pursuit of knowledge for either personal or professional reasons.

The term recognises that learning is not confined to childhood or the classroom, but takes place throughout life and in a range of situations.OVER THE YEARS constant scientific and technological innovation and change has had a profound effect on learning needs and styles.

Learning can no longer be divided into a place and time to acquire knowledge (school) and a place and time to apply the knowledge acquired (the workplace). Instead, learning can be seen as something that takes place on an on-going basis from our daily interactions with others and with the world around us.

Benefits of self learning:

- Effective utilization of intellectual resources, minimizing wastage of time in scouting for opportunities or desired items of knowledge appropriate to the requirement,
- Certification of attainments of any kind at any level acquired through formal or non formal means in conventional or non conventional fields.
- Any-time availability of desired knowledge at appropriate levels of comprehension to all for self paced learning.
- Platform for sharing of ideas and techniques and pooling of knowledge resources
- Making Students employable in the Industry or pursue a suitable higher education programm.

SCOPE:

In this direction,Massive Open Online Courses (MOOCs) creates an excellent opportunity for students to acquire the necessary additional skill for employability , where the rare expertise of world famous experts from academics and industry are available.

MAKAUT (affiliating university)has introduced AICTE model curriculum for all its B.PHARM program and allow students to choose courses from any established online platform (NPTEL /SWAYAM / EDX / UDEMY /COURSERA etc)

MOOCs for B.Pharm Program

For B.Pharm Honours degree, **8 credits** will have to be obtained by students in addition to the credits specified for B.Pharm degree curriculum during entire period of 4 years. These credits have to be obtained through MOOCs platforms.

MOOCs platform	Course duration	Credits

Coursera edX Udemy Simpilearn	4---7 weeks	1
	8----11 weeks	2
	12---15 weeks	3
	16 weeks or more	4
NPTEL	Course specific	Specified in course
SWAYAM	Course specific	Specified in course

MOOCs for Mandatory Additional Requirements (MAR)

MOOCS in MAR is provided for encouraging every student to enter in Digital content form of education from well -known universities or organizations.

Students are encouraged to choose any MOOCs course as per their interest area. There is no credit system for MOOCS in MAR as points could be earned as specified in the scheme and the MOOCs courses which are taken for earning credits for honours degree will not be considered in MAR purpose.

Materials for self learning:

(1) video lectures,

(2) specially prepared reading material that can be downloaded/printed

(3) self-assessment tests through tests and quizzes

(4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multimedia and state of the art pedagogy/ technology.

Facilities for Self learning:.

For the students to engage in MOOCs, there are facilities for availing computers on campus

NSHM computer lab……100

NSHM library ……10

All are provided with LAN connection and have free internet from 10.00am to 6.00pm Monday to Saturday.

ONLINE COURSES TAKEN BY 3YR (CURRENT) BPHARM STUDENTS

S.NO	1. Name	2. Roll No.	4. Platform chosen for the course	5. Session in which course is undertaken	6. Duration of the course	7. Status of the course
1	ARUP PRAMANICK	2.77019E+11	NPTEL	2021--2022	12 weeks	completed
2	Bittu Das	27701919001	Coursera	2021--2022	12 weeks	in progress

3	Trishagni Baidy	27701919006	Coursera	2020--2021	4 weeks	enrolled
4	SAHIM MONDAL	27701920116	others	2021--2022	4 weeks	completed
5	Debjyoti Adak	27701919045	Coursera	2021--2022	4 weeks	completed
6	Samik Das	27701919096	Edx	2021--2022	8 weeks	in progress
7	Aritra Pan	27701919077	others	2021--2022	4 weeks	completed
8	ARNAB ROY	27701919070	Coursera	2020--2021	6 weeks	completed
9	Swikriti Paul	27701919036	Coursera	2019--2020	8 weeks	completed
10	Aneek Mondal	27701919050	others	2021--2022	12 weeks	completed
11	Ankita Maiti	27701919061	Edx	2021--2022	others	completed
12	Souvik Nandi	27701919048	Coursera	2020--2021	others	completed
13	Aritra Pan	27701919077	others	2021--2022	4 weeks	completed
14	Sayanee halder	27701919057	Coursera	2020--2021	4 weeks	completed
15	Debjyoti Adak	27701919045	Coursera	2021--2022	8 weeks	completed
16	Debjyoti Adak	27701919045	Coursera	2021--2022	6 weeks	completed

ONLINE COURSES TAKEN BY 4TH YEAR (CURRENT)BPHARM STUDENTS

S.NO	1. Name	2. Roll No.	4. Platform chosen for the course	5. Session in which course is undertaken	6. Duration of the course	7. Status of the course
1	ARUP PRAMANICK	2.77019E+11	NPTEL	2021--2022	12 weeks	completed
2	Bittu Das	27701919001	Coursera	2021--2022	12 weeks	in progress
3	Trishagni Baidy	27701919006	Coursera	2020--2021	4 weeks	enrolled
4	SAHIM MONDAL	27701920116	others	2021--2022	4 weeks	completed
5	Debjyoti Adak	27701919045	Coursera	2021--2022	4 weeks	completed
6	Samik Das	27701919096	Edx	2021--2022	8 weeks	in progress
7	Aritra Pan	27701919077	others	2021--2022	4 weeks	completed
8	ARNAB ROY	27701919070	Coursera	2020--2021	6 weeks	completed
9	Swikriti Paul	27701919036	Coursera	2019--2020	8 weeks	completed
10	Aneek Mondal	27701919050	others	2021--2022	12 weeks	completed
11	Ankita Maiti	27701919061	Edx	2021--2022	others	completed
12	Souvik Nandi	27701919048	Coursera	2020--2021	others	completed
13	Aritra Pan	27701919077	others	2021--2022	4 weeks	completed
14	Sayanee halder	27701919057	Coursera	2020--2021	4 weeks	completed
15	Debjyoti Adak	27701919045	Coursera	2021--2022	8 weeks	completed
15	Debjyoti Adak	27701919045	Coursera	2021--2022	6 weeks	completed

ONLINE COURSES TAKEN BY PASSOUT BATCH (2022)

S.NO	Name	Roll number	List of the courses that you have completed	Session	Choose the platform of the courses

1	JUHI MAHATA	27701919105	1.Marketing innovative products and services (edx) 2.SAS Programming (INTERNSHALA)	2020-21	edx, Others
2	Soumalya Mondal	27701918036	NPTEL	2020-21	NPTEL
3	SUCHANA DAS	27701917031	1.Write Professional Emails in English 2.Speak English Professionally: In Person, Online & On the Phone 3.Build Your Professional ePortfolio in English 4.Career planning: resume/CV,cover letter,interview 5.Drug Discovery 6.Drug Development 7.Drug Commercialization 8.The Science of Well-Being 9.Positive Psychology	2020-21	Coursera
4	Sk Ekbal	27701918041	1	2020-21	NPTEL
5	Sayan Bose	27701918048	1. COVID-19: What You Need to Know (CME Eligible) 2..Applied Machine Learning in Python 3. Fundamentals of Scalable Data Science 4.Introduction to Artificial Intelligence (AI)	2020-21	Coursera
6	Sunit Mukhopadhyay	27701919109	1. Python and Statistics for Financial Analysis. 2. Introduction to Artificial Intelligence (by IBM). 3. Prescription Drug Regulation, Cost, and Access: Current Controversies in Context. 4. Fundamentals of Scalable Data Science(by IBM). 5. Data Science: Statistics and Machine Learning Specialization.	2020-21	Coursera, edx

7	Arijit Mandal	27701919099	1) Applied Machine Learning in Python, 2) Introduction to Artificial Intelligence (AI), 3)Python and Statistics for Financial Analysis.	2020-21	Coursera
8	ANIMA MAITY	27701919103	1) Applied Machine Learning in Python, 2) Introduction to Artificial Intelligence (AI), 3)Python and Statistics for Financial Analysis	2020-21	Coursera
9	Arindam Mukherjee	27701918094	Marketing Innovative Product and services		edx
10	Anubhav Mandal	27701918099	Biochemistry		NPTEL
11	Subhranil Manna	27701918029	1- NPTEL Online Certification on Biochemistry	2020-21	NPTEL
12	KRISHNENDU HALDER	27701918077	Marketing innovative products and services	2020-21	edx
13	SHUBHAM DAS	27701919106	MARKETING INNOVATIVE PRODUCTS AND SERVICES		edx
14	PRIYA MONDAL	27701919106	MARKETING INNOVATIVE PRODUCTS AND SERVICES	2020-21	edx
15	Abesh Barman	27701918112	Biochemistry, Marketing Innovative Products and Services	2020-21	NPTEL, edx
16	SHUBHRA GHOSH	27701918113	1. Google Digital Unlocked 2. Introduction to Artificial Intelligence (AI) 3. Python and Statistics for Financial Analysis	2020-21	Coursera, Others
17	Sumaita Anwar	27701918023	Biochemistry Biomedical engineering Impact of Covid 19 on telehealth Digital marketing Web development	2020-21 2021-22	NPTEL, Others
18	Avijit Bera	27701918092	1	2020-21	edx
19	Amartya Ghosh	27701918102	NPTEL Biochemistry	2020-21	NPTEL
20	Souvik Sikder	27701918032	Biochemistry nptel	2020-21	NPTEL
21	ADRIJA DEY	27701918108	NPTEL biochemistry	2020-21	NPTEL
22	Kuhealika Mandal	27701918076	1	2020-21	NPTEL
23	Atiya khatoon	27701918093	Coursera - Dna decoded Coursera - introduction of psychology Cursa - pharmacology Cursa - biology	2020-21	Coursera, Others

24	HEERAK NAG	27701918083	1)EDX Prescription Drug Regulation, Cost, and Access: Current Controversies in Context (8 weeks) 2 POINTS 2)COURSERA Introduction to Artificial Intelligence (AI) (8 weeks) 2 POINTS 3)COURSERA Applied Machine Learning in Python (12 weeks) 4 POINTS	2020-21	Coursera, edx
25	Sougata Dey	27701919107	(1)Prescription Drug Regulation ,Cost and access : Current Controversies in this Context.(2) Covid -19 training for health care workers, (3) 10 Principles of GMP in Pharma. (4) Basic Principles of Freeze Dryer .	2020-21	Coursera, edx, Others
26	Rupsa Saha	27701918053	Introduction to Artificial intelligence (AI), Python and Statistics for Financial Analysis, Statistical Inference.	2020-21	Coursera
27	Tanbir Alam	2770918019	INDUSTRIAL BIOTECHNOLOGY	2020-21	Coursera
28	SUDIP GHOSH	27701918025	1. Immunology (12 weeks & 4 credit point course completed from Swayam) 2. Python and Statistics for Financial Analysis (4 weeks course completed from Coursera) 3. Applied Machine Learning in Python (4 weeks course completed from Coursera) 4. Six Sigma: Define and Measure (10 weeks course pursuing from EDX) 5. AI for Everyone: Master the Basics (4 weeks course pursuing from EDX) 6. Leaders of Learning (4 weeks course pursuing from EDX)	2020-21	Swayam, Coursera, edx

29	SUBHRANIL MUKHERJEE	27701918028	1.Applied Machine learning in Phython 2. Introduction to AI 3.Introduction to Data Analysis Using Microsoft Excel 4 .Python and Statistics for financial Analysis 5. Immunology from Swayam NPTEL 6. AI for Everyone: Master the Basic(Pursuing) 7.Six Sigma: Define and Measures(Pursing) 8.Leaders of Learning(Pursuing)	2021-22	NPTEL, Swayam, Coursera, edx
30	Pritam Kuili	27701918059	Biochemistry, Immunology,AI FOR EVERYONE, NUTRITION AND HEALTH, PRESCRIPTION DRUG REGULATION	2021-22	NPTEL, Swayam, edx
31	Nikita sharma	27701918064	Human anatomy and physiology Machine learning Introduction to biostatics Artifical intellegence Python	2021-22	Others
32	Firoj Mia	27701918084	1. Introduction to Artificial Intelligence (AI) in IBM through COURSERA 2. 1962USRx:Prescription Drug Regulation, Cost, and Access in " Harvard University" through EDX 3. Applied machine learning in Python in "University of Michigan" through COURSERA	2021-22	Coursera, edx
33	Saptarshi Mondal	27701918050	7	2021-22	Swayam, edx

34	KINGSHUK RAY	1.8277E+12	(1) Python and Statistics for Financial Analysis=1 point,from Coursera (2) Introduction to Artificial Intelligence (by IBM) = 2 point,from Coursera (3) Prescription Drug Regulation, Cost, and Access: Current Controversies in Contex =2 point .from EDX (4) Applied Machine Learning in Python =4 point (in process),from Coursera (5)Biochemistry from NPTEL	2020-21	NPTEL, Coursera, edx
35	SUBHRA SARKAR	27701918030	9	2020-21	Swayam, edx
36	Krishna Prasad Pal	27701918078	2	2021-22	NPTEL, edx
37	Animesh Paul	27701918100	Nutrition and Health: Food safety	2020-21	edx

NUMBER OF STUDENTS OF BPHARM PROGRAM WHO SUCCESFULLY COMPLETED NPTEL COURSES

SESSION	NUMBER OF STUDENTS
2019-20	70
2020-21	11

NOTE:Detailed list of students and courses completed is availbe in the department office.

8.5 Career Guidance, Training, Placement (10)

Total Marks 10.00

Institute Marks : 10.00

Training and Placement Cell at NSHM Knowledge Campus Kolkata, Group of Institutions, Kolkata is an integral part of the institute. The Cell makes consistent and constant efforts to provide students with numerous opportunities to participate in the Campus Recruitment process in order to enhance the employability of the students. Various training programs are conducted rigorously throughout the year to make sure that the students are industry ready and meet the set standards of the company. Many reputed industries visit our college on regular basis for campus recruitment process and we feel proud to share that our students are recruited by most of the leading MNC's. The cell is equipped with the State of the Art infrastructure for conducting the Campus Recruitment Process. With the use of latest technology, the cell has adopted an effective communication system to keep the students informed and updated about the various activities conducted. Career Guidance Sessions are conducted to guide and educate students with various Career opportunities in different areas such as Public Sector, Private Sector and MNC's. The main objective of the Cell is to act as a strong interface between various companies and talented young graduates and post graduates. The cell also guides the students about career after higher studies in different streams. The Industry Institute Interaction Cell actively helps the students by providing them necessary guidance from experts to help the budding Entrepreneurs of the institute. The cell makes the students aware about the various entrepreneurship encouragement schemes declared by the state and central government.

AIM:

To prepare and train aspiring learners to face campus recruitment by providing them exhaustive training with relevance to Communication Skills, Aptitude test and overall development for personal & professional grooming required in Industry.

· To arrange guest lecture of industrial experts to update and upgrade learners with hands on experience in the wake of ever changing dimensions of professionalism.

· To arrange guest lecture of Alumni who are placed in reputed industries to inspire and motivate the aspiring learners.

· To arrange guest lecture on diverse career paths such as Public Sector and Private Sector etc.

· To arrange Sessions for students with regard to opportunities in Higher education and importance of GPAT, TOEFL, GRE, IELTS, etc.

· To provide basic insights of Entrepreneurship.

· To make concerted and consistent efforts to enhance employability through Campus placements.

Professional trainers are hired for training students in Aptitude, Group Discussion, Personal Interview Techniques and Resume Writing.

· Company Specific workshops (Mock Placement Sessions) for Final Year Students before the commencement of Campus Recruitment.

· Assistance by Alumni turned Entrepreneurs in Campus Recruitments, In plant training and Expert Talks. · Strong Industry – Institute – Interaction.

· Guidance sessions by Placed Students to junior batches on various aspects of selection procedure and dos and don'ts of campus interview process.

· 100 % Placement assistance to eligible students.

Dedicated and active involvement of all faculty members to enhance the employability of student in conjunction with Training & Placement Cell.

· Workshops are conducted on regular basis to enhance the Soft Skills of students.

· Well-developed Language Laboratories to improve the Communication Skills of students.

· Interaction of students with Dean Placements and TPO from First Year of Pharmacy to provide necessary roadmap to be industry ready.

ELIGIBILITY & REGISTRATION

1. All the Final year students who are passing out from the Institute and are seeking employment should register for campus placements with their respective Training and Placement Officer (TPO). Placement Registration is for ONE ACADEMIC YEAR ONLY.

2. Registration of students interested to seek job opportunities in industry is done during the month of August.

3. An active team comprising of Faculty and Student placement coordinators is formed during the beginning of the session.

4. Students are advised to read the Announcements made through notices put up on Notice boards, WhatsApp Group and Emails about the Campus Recruitment process. They should go through the company website and must inform TPO if they are not interested to appear for the same.

5. Students shall prepare their Resume under the supervision of the TPO, highlighting their achievements, Inplant training, Extra Curricular and Co-curricular activities besides their academic laurels.

6. Students should positively attend various Training Programs / Placement Readiness Enhancement Programmes that would be organized by the Institute from time to time, as all these sessions are designed and tailored to improve the performance of students in the Recruitment Processes. Undergoing these Training Programs seriously and sincerely and following the various tips and guide lines given by experts, will undoubtedly improve the performance in the highly competitive selection process.

PRE-PLACEMENT TALKS

1. Students are informed about the Pre-Placement Talks (PPT) by the respective company visiting for Campus Recruitment through Notices displayed on Notice Boards, WhatsApp groups and Emails.

2. Students registered for seeking employment through Training and Placement Cell attends the Pre-Placement Talks (PPT) without fail.

3. Attendance is taken and only those students who have attended PPT are allowed to sit for the rest of recruitment process of the said company.

4. Students clarify queries/doubts if any related to package, job profile, place of work, bond details etc with the HR officials of the Company during Pre-Placement Talks (PPT).

DISCIPLINE & PUNCTUALITY:

1. Students shall maintain utmost discipline and decorum through-out all the Recruitment Process. 2. Students will not be permitted to appear for the Campus Recruitment Process if they are found to be reporting late.

3. Students should maintain discipline and show ethical & decent behaviour in every action they make during the placement process. Any student found violating the protocol set by the company or defaming the Institute's name would be debarred from the placements for the rest of the academic year and it could lead to strict disciplinary action by the Institute.

4. Students found cheating or misbehaving in the selection process (PPT/Test/GD/Interview) will be disqualified from the placements for the rest of the academic year.

JOB OFFERS:

We follow the policy of "ONE STUDENT ONE OFFER" i.e once the student is placed in a company, he / she is not permitted to appear for the next placement drives scheduled.

OFFER LETTERS:

Offers received from companies is submitted & collected from T & P Cell. The responsibility of going through the offer letter and taking further actions such as signing and accepting and sending it back to the Company lies entirely on the student. In case offers are received directly by the student from the company, the same is intimated to the TPO.

8.6 Entrepreneurship Cell (5)

Total Marks 5.00

Institute Marks : 5.00

NSHM KNOLWLEDGE CAMPUS GOI has an entrepreneurship cell named "NSHM Center of Innovation and Incubation (NCI&I) which plays a key role in the entrepreneurship ecosystem with its 4 prolonged approach :

1. Academic delivery of MAKAUT curriculum through unique teaching learning pedagogy.

2. Conducting various impact lecture series, conferences and hackathons in alignment to IIC (MoE) requirements.

3. Engage with and mentor internal students, interested in starting their own entrepreneural venture and provide them guidance, lab support and fund support for the same.

4. Building relationships with various MSME and StartUp companies and collaborate so as to provide student internships and placements in an early stage, mid sized venture.

With all of above endeavors , NSHM strives to bring about a 360 degree perspective on the subject of Innovation and Entrepreneurship thinking and execution."

8.7 Co-curricular and Extra-curricular Activities (10)

Total Marks 10.00

Institute Marks : 10.00

- Students partcipate in extracurricular and cocurricular activities in the institute as well as interinstitute events.

CO-CURRICULAR ACTIVITIES ASSOCIATED WITH THE FOLLWING EVENTS IN THE INSTITUTION

S.NO	EVENTS	DATE
1	National conference on Collaborative heath sciences-visions for future	14-15 feb 2019
2	57th NPW celebration on theme,“Pharmacists for Healthy India”	20-11-2018
3	NATCONPH 2020	28th-29th February 2020
4	National Pharmacy week	23rd - 27th nov 2021
5	ACCEPTUS 2021	29th September - 7th October, 2021
6	Orientation 2020	Oct 13, 2020

CO -CURRICULAR ACTIVITIES OF STUDENTS OF B PHARM PROGRAM IN INTER INSTITUTE EVENTS

S..No	Name	currently in	event name	event	institute	DD,YY
1	Jyoti Mollick	2nd Yr Bpharm	Surya Namaskar	Webinar	Ministry of Ayush	14 January 2022
2	Animesh Paul	2022 pass out		Merit Mentor	Aakash	13 July 1905

3	Animesh Paul	2022 pass out	Badminton Competition 2014-2015	Badminton Competition	Kendriya Vidyalaya Sangathan, New Delhi	2014-2015
4	Kainat Perween	2nd Yr Bpharm	Basics of Digital Integrated Circuits	Certificate of Appreciation	Young Researchers Forum	30 January 2022
5	Kainat Perween	2nd Yr Bpharm		Online Business quiz	SENGUNTHAR ARTS AND SCIENCE COLLEGE	03 July 2020
6	Kainat Perween	2nd Yr Bpharm		Quiz	Ministry of Education	02 February 2022
7	Sourav maji	2021 pass out	Online training Program on HPLC, LCMS and NMR Basic and Practical Problem	Certification of Participation	NIPER	20 October 2020
8	SAMSUJJAMAN SARDER	2nd Yr Bpharm	“The Magic of Bosons: Photons to Gravitional Waves	Certification of Participation	ADAMAS University	05 January 2022
9	Anish Banik	2nd Yr Bpharm		Webinar	MAKAUT	10 January 2022
10	ARINDAM MUKHARJEE	2022 pass out	Entreprenuership	Certificate of Completion	YOUNITY	25 August 2020
11	Arnab Saha	2nd Yr Bpharm		Quiz	Bharat Institute of Engineering and Technology	15 January 2022
12	Prateep Sengupta	2021 pass out		Quiz	Brainware University	22 November 2018
13	Rohan sahoo	3rd yr B Pharm		Certificate of Appreciation	Vinayaka Missons Kirupananda Variyar Engineering College	30 April 2020
14	Rohan sahoo	3rd yr B Pharm		Quiz	MNR College of Pharmacy	23 September 2021
15	Sayan mondal	3rd yr B Pharm		Certificate of Appreciation	JKKN College of Pharmacy	25 November 2021
16	Sayan mondal	3rd yr B Pharm	“The Magic of Bosons: Photons to Gravitional Waves	Certification of Participation	ADAMAS University	05 January 2022
17	Sayan mondal	3rd yr B Pharm		Awarded	Museum of Sardar Patel University	06 February 2022
18	Somnath Basak	3rd yr B Pharm		Certification of Participation	Ministry of Education	year 2021
19	Tanbir Alam Mallick	2nd Yr Bpharm		Certificate	CURSA	27 February 2022
20	Tanbir Alam Mallick	2nd Yr Bpharm		ONLINE G.K. QUIZ COMPETITION	COLLEGE OF EDUCATION [B.Ed & D.Ed]	15 February 2022
21	Sandeepan Halder	3rd yr B Pharm		Quiz	IDS	
22	Sreemoyee Halder	3rd yr B Pharm		Certification of Participation	Ministry of Ayush	year 2021
23	Debjit Sen	3rd yr B Pharm		Certification of Participation	Ministry of Ayush	year 2021
24	Bappa Nandi	4th yr B Pharm		Certificate of Appreciation	Vinayaka Missons Kirupananda Variyar Engineering College	30 April 2020
25	Abhiroop Sengupta	2nd Yr Bpharm		Certification of Participation	Kakatiya Institute of Technology and Science	29 January 2022
26	ANUSHNA BHATTACHARYA	2022 pass out	“COVID 19 Perception”,	Online Quiz	BCDA College of Pharmacy	25 June 2020
27	Rupam Patra	2nd Yr Bpharm		Online Business quiz	SENGUNTHAR ARTS AND SCIENCE COLLEGE	03 July 2020
28	Dipasa Das	3rd yr B Pharm		Quiz	Indic Inspirations India Pvt Ltd	01 June 2021
29	Ibne ul Soif	2nd Yr Bpharm		Quiz	Teegala Krishna Reddy College of Pharmacy	24 February 2022
30	Kaustabh Barman	2nd Yr Bpharm		Online Business quiz	SENGUNTHAR ARTS AND SCIENCE COLLEGE	03 July 2020

31	Kaustabh Barman	2nd Yr Bpharm	Basics of Digital Integrated Circuits	Certificate of Appreciation	Young Researchers Forum	30 January 2022
32	Mamta Soni	2nd Yr Bpharm	Basics of Digital Integrated Circuits	Certificate of Appreciation	Young Researchers Forum	30 January 2022
33	Rahul Datta	2nd Yr Bpharm		Quiz	Ministry of Education	02 February 2022
34	Rahul Datta	2nd Yr Bpharm		Quiz	ITS Engineering College	20 February 2021
35	MD MINHAJUDDIN SIRAJ	2nd Yr Bpharm		ONLINE G.K. QUIZ COMPETITION	COLLEGE OF EDUCATION [B.Ed & D.Ed]	25 February 2022
36	Mehefuj Alam	3rd yr B Pharm		Quiz	Indic Inspirations India Pvt Ltd	01 June 2021
37	MOJAFFAR HOSSAIN	2nd Yr Bpharm		Quiz	Teegala Krishna Reddy College of Pharmacy	25 February 2022
38	MOJAFFAR HOSSAIN	2nd Yr Bpharm		Donation	Give India	01 March 2022
39	Parthiv Ghosh	2nd Yr Bpharm		ONLINE G.K. QUIZ COMPETITION	COLLEGE OF EDUCATION [B.Ed & D.Ed]	01 March 2022
40	Parthiv Ghosh	2nd Yr Bpharm		Webinar	MAKAUT	02 November 2021
41	Parthiv Ghosh	2nd Yr Bpharm	Surya Namaskar	Webinar	Ministry of Ayush	14 January 2022
42	Sibsankar Manna	4th yr B Pharm		Quiz	IPGA	Year 2020
43	Romit Banerjee	2nd Yr Bpharm		Quiz	ITS Engineering College	20 February 2021
44	Sakina Afrin	2nd Yr Bpharm		Online Quiz	Jayaraj Annapackiam College For Women	29 November 2021
45	Saptarshi Maity	2nd Yr Bpharm		Online Quiz	Jayaraj Annapackiam College For Women	29 November 2021
46	Saptarshi Maity	2nd Yr Bpharm	“The Magic of Bosons: Photons to Gravitional Waves	Certification of Participation	ADAMAS University	05 January 2022
47	Saptarshi Maity	2nd Yr Bpharm		Certificate of Appreciation	JKKN College of Pharmacy	25 November 2021
48	Soumik halder	2nd Yr Bpharm		Quiz	Bharat Institute of Engineering and Technology	05 January 2022
49	SUBHRAJYOTI PAUL	2nd Yr Bpharm		Certification of Participation	Kakatiya Institute of Technology and Science	29 January 2022
50	SUBHRAJYOTI PAUL	2nd Yr Bpharm	Basics of Digital Integrated Circuits	Certificate of Appreciation	Young Researchers Forum	30 January 2022
51	SUBID DUTTA	2nd Yr Bpharm		Certification of Participation	Kakatiya Institute of Technology and Science	29 January 2022
52	WASHIM AKRAM MONDAL	3rd yr B Pharm		Quiz	Sigma Group of Institutes	
53	Shahnawaz Hussain	2nd Yr Bpharm		Certificate	CURSA	NOV, 2021
54	Arup Pramanick	4th yr B Pharm		Conference	JIS University	13 June 2020
55	Srijan Bhattacharya	2nd Yr Bpharm	Improving Global Health: Focusing on Quality and Safety	online learning	Global Health Institute, Harvard	
56	MD MOHTAJ ALAM	2022 pass out	Basics of Digital Integrated Circuits	Certificate of Appreciation	Young Researchers Forum	30 January 2022
57	Sudip Maji	2nd Yr Bpharm		Internshala Training	Intershala	24 January 2022
58	HEERAK NAG	2022 pass out		Quiz	International Forensic Science	17 June 2021
59	Trisanu Das	4th yr B Pharm		Certificate of Appreciation	Vinayaka Missons Kirupananda Variyar Engineering College	30 April 2020
60	Moumoyee Chakraborty	2021 pass out		Online Quiz	JIS University	27 May 2020
61	Moumoyee Chakraborty	2021 pass out		Pharmacology Olympiad	Gpad Adda Academy	24 May 2020
62	Moumoyee Chakraborty	2021 pass out		Online Quiz	Malla Reddy College of Pharmacy	06 June 2020

63	Priyabrata Naskar	3rd yr B Pharm		Webinar	MAKAUT	17 January 2021
64	Shusovon Kundu	3rd yr B Pharm		Online Business quiz	SENGUNTHAR ARTS AND SCIENCE COLLEGE	03 July 2020
65	Sukriti kumar naskar	3rd yr B Pharm		Quiz	Ministry of Parliamentary Affairs	2020-2021
66	Bidisha Das	2021 passout		Dance competition	Akhil Natrajam Antar Sankrutik Sangh	Year 2022
67	Alyona Ankita Mahanta	3rd yr B Pharm		E-poster presentation	Ministry of Health & Family welfare	23 September 2021
68	Sreemoyee Mitra	3rd yr B Pharm		Online Quiz	COLLEGE OF EDUCATION [B.Ed & D.Ed]	28 January 2022
69	Krishnendu Halder	2022 passout batch		Quiz	Ministry of Tourism	
70	Parasmita saha	3rd yr B Pharm		Art Exhibition	Gallery Gold	24 February 2022
71	Parthiv Ghosh	2nd Yr Bpharm			National Sports & Physical Fitness Board	
72	Rahul Datta	2nd Yr Bpharm	Surya Namaskar	Webinar	Ministry of Ayush	14 January 2022
73	Sk Robiul Akram	3rd yr B Pharm		Quiz	Sports Authority Of India	
74	Adrish Boxi	2nd Yr Bpharm		Certificate of Appreciation	Young Researchers Forum	30 January 2022

EXTRA CURRICULAR ACTIVITIES

S. No.	Name of the Activity	Collaborting Organization	Year	No. of Studentss Participants
1	Blood donation camp	MR Bangur Hospital	Sep-19	70
2	Blood donation camp		April 2019	90
3	A Swach Bharat Summer Internship programme	AICTE	2018	100
4	Yoga ratri shivir	Bihar school of yoga	2018	60
5	COVID vaccination drive for students at subsidised rate	medica superspeciality hospital,kolkata	13 July2021	200

9 GOVERNANCE, INSTITUTIONAL SUPPORT AND FINANCIAL RESOURCES (100)

Total Marks 100.00

9.1 Organization, Governance and Transparency (50)

Total Marks 50.00

9.1.1 Governing body, administrative setup, functions of various bodies, service rules procedures, recruitment and promotional policies (10)

Institute Marks : 10.00

NSHM Knowledge Campus, Kolkata – Group of Institutions

Composition of Board of Governors(24.07.21)

Sl. No.	As per AICTE guidelines	GOB Members

a)	The Governing Body shall have at least eleven members including the Chairman and the Member-Secretary. The Registered Society/Trust shall nominee six members including the Chairman and the Member-Secretary, and the remaining five members shall be nominated as indicated below	
b)	Chairman to be nominated by the Registered Society/Trust The Chairman of the Governing Body shall preferably be a technical person either entrepreneur of an industrialist or an educationist of repute who is interested in development of technical education and as demonstrated an interest in promotion of quality education	Mr. Arnab Roy, Co-Founder & Director, NSHM Knowledge Campus, Kolkata
c)	Two to five members to be nominated by the Registered Society / Trust	Mr. Cecil Antony, Managing Trustee NSHM Knowledge Campus, Kolkata Prof.(Dr.) Krishnendu Sarkar, NSHM School Management Technology, Kolkata
d)	Nominee of the All India Council for Technical Education – Regional Officer (Ex-Officio)	AICTE, ERO, Kolkata
e)	An Industrialist / technologist / educationist from the Region to be nominated by the concerned Regional Committee as nominee of the Council, out of the panel approved by the Chairman of the Council.	***Management*** Mr. Sanjeev Sinha, President – IT & Digital Transformation India Power Corporation Ltd. Mr. Rahul Bose, Global Manager, Learning & Knowledge, IBM Global business Services. ***Pharmacy*** Dr. (Mrs.) Neena Sharma, Associate Vice President, Emami Limited, Kolkata Prof. Biswajit Mukherjee (Prof., Dept. of Pharmacy, Jadavpur University)

f)	Nominee of the Affiliating Body / University / State Board of Technical Education	Ms. Rupali Patua, Assistant Professor, Deptt. of Computer Science & Engg. Maulana Abul Kalam Azad University of Technology, West Bengal
g)	Nominee of the State Government – Director of Technical Education (ex-officio)	Prof. Pranabesh Das , Director, Directorate of Technical Education, Govt. of West Bengal
h)	An Industrialist / technologist / educationist from the Region nominated by the State Government	Dr. Srimanta Patra, Associate. Professor, Govt. College of Engineering & Ceramic Technology, Kolkata (State Govt. Nominee)
i)	Principal / Director of the concerned technical institution (as nominee of society / trust) – Member Secretary	Prof. (Dr.) Subhasis Maity, Director, NSHM Knowledge Campus, Kolkata - Group of Institutions
j)	Two Faculty members to be nominated from amongst the regular staff one at the level of Professor and one at the level of Assistant Professor	Dr. Supriya Biswas, Professor – NSHM Kolkata, Dept. of Management Dr. Sekhar Kumar Bose Professor – NSHM Kolkata, Dept. of Pharmacy
k)	The number of members can be increased equally by adding nominees of the registered Society and by adding an equal number of educationists from the Region keeping in view the interest of the Technical Institution. The total number of members of a Governing Body shall, however, not exceed 21	

Responsibilities of Governing Body

1. Governing Body members are nominated on the basis of AICTE regulation.
2. Conduct quarterly meetings for continuous upgradation of academic performance.
3. Analysis semester results of the students and advise on developmental issues.
4. Faculty selection process, Faculty achievement and training are assessed.
5. Analysis audited Balance Sheet and Budgetary allocation of regular practical and project work.
6. Admission status & expansion of UG & PG programmes.
7. Scope for placement and future developments and planning.
8. Resource verification & employees' welfare activities.
9. Measures for prevention of ragging.

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REF NO.: GBM/NKC-KOL/16/19-20

MINUTES OF THE MEETING OF GOVERNING BODY OF NSHM KNOWLEDGE CAMPUS, KOLKATA– GROUP OF INSTITUTIONS HELD AT 124 (60), B.L. SAHA ROAD, KOLKATA – 700053 ON 8TH FEBRUARY, 2020 AT 11:30 A.M.

Present :

Dr. Prof. Pranabesh Das (Director, Directorate of Technical Education, Member)
Dr. Srimanta Kr. Patra (Associate Professor, Govt. College of Engineering & Ceramic Technology, Member)
Ms. Rupali Patua (Assistant Professor, Deptt. of Computer Science & Engg., Maulana Abul Kalam Azad University of Technology
Mr. Sanjeev Sinha (President, IT & Digital Transformation India Power Corporation Ltd.)
Dr. Supriya Biswas (Professor, NSHM Business School, Kolkata, Member)
Mr. Tapas Kr. Pal (Professor, NSHM College of Pharmaceutical Technology, Kolkata, Member)
Dr. Naveen Das (Director, NSHM Business School, Kolkata, Member)
Mr. Arnab Roy (Co-Founder & Director NSHM Knowledge Campus, Kolkata – Group of Institutions, Chairman)

Absent :

Mr. Cecil Antony (Managing Trustee, Member)
Dr. (Mrs.) Neena Sharma, (Associate Vice President, Emami Ltd. Kolkata, Member)
Mr. Rahul Bose (Global Manager, Learning & Knowledge, IBM Global Business Services)
Prof. (Dr.) Subhasis Maity (Director, NSHM College of Pharmaceutical Technology, Kolkata, Member Secretary)

All the members mentioned above were absent due to their personal exigencies. The nominated member of AICTE (Regional) and an industrialist /technologist/educationist from the Region to be nominated by the Regional Committee were also absent in the meeting and it was noted by the members.

1. **Confirmation of Minutes of the 15th Governing Body Meeting held on 23rd February, 2019 at NSHM Knowledge Campus, Kolkata.**

   The minutes of last Governing Body meeting held on 23rd February, 2019 were already circulated to the members for their information and record and it was formally confirmed by all the members.

.....Cont P/2

REF NO. : GBM/NKC-KOL/15/18-19

MINUTES OF THE MEETING OF GOVERNING BODY OF NSHM KNOWLEDGE CAMPUS, KOLKATA– GROUP OF INSTITUTIONS HELD AT 124 (60), B.L.SAHA ROAD, KOLKATA – 700053 ON 23RD FEBRUARY, 2019 AT 11:30 A.M.

Present :

Dr. Amalendu Basu (Director, Directorate of Technical Education, Member)
Dr. Srimanta Kr. Patra (Associate Professor, Govt. College of Engineering & Ceramic Technology, Member)
Ms. Rupali Patua (Assistant Professor, Deptt. of Computer Science & Engg., Maulana Abul Kalam Azad University of Technology
Mr. Sanjeev Sinha (President, IT & Digital Transformation India Power Corporation Ltd.)
Dr. Supriya Biswas (Professor, NSHM Business School, Kolkata, Member)
Mr. Tapas Kr. Pal (Professor, NSHM College of Pharmaceutical Technology, Kolkata, Member)
Dr. Naveen Das (Director, NSHM Business School, Kolkata, Member)
Mr. Arnab Roy (Co-Founder & Director NSHM Knowledge Campus, Kolkata – Group of Institutions, Chairman)

Absent :

Mr. Cecil Antony (Managing Trustee, Member)
Ms. Rupali Patua (Assistant Professor, Deptt. of Computer Science & Engg., Maulana Abul Kalam Azad University of Technology)
Dr. (Mrs.) Neena Sharma, (Associate Vice President, Emami Ltd. Kolkata, Member)
Mr. Rahul Bose (Global Manager, Learning & Knowledge, IBM Global Business Services)
Prof. (Dr.) Subhasis Maity (Director, NSHM College of Pharmaceutical Technology, Kolkata, Member Secretary)

All the members mentioned above were absent due to their personal exigencies. The nominated member of AICTE (Regional) and an industrialist /technologist/educationist from the Region to be nominated by the Regional Committee were also absent in the meeting and it was noted by the members.

1. **Confirmation of Minutes of the last Governing Body Meeting held on 29TH September, 2018 at NSHM Knowledge Campus, Kolkata.**

   The minutes of last Governing Body meeting held on 29th September, 2018 were already circulated to the members for their information and record and it was formally confirmed by all the members.

.....Cont P/2

2. **Action Taken Report based on the 15th Governing Body Meeting**
   Action taken on the points which were discussed in last Governing body meeting held on 23rd February, 2019 and report was prepared vide Ref. No. GB/NKC-KOL/15(a)/18-19 dated 23.02.2019. The Report were circulated to all the members for their information and record

3. **Budget for next financial year**
   Budget for financial year 2019-20 was tabled and it was approved by all the members.

4. **Report on Financial Assistance provided to the student (Full Free/ Half Fee-ship) in the last Academic year**

   As per G.O. No. 69 Edn (T), dated 01.02.2018 by Govt. of West Bengal, Department of Higher Education, the following students have been awarded full freeship for the academic year 2017-18 as per their application.

2. **Action Taken Report based on the last Governing Body Meeting**
Action taken on the points which were discussed in last Governing body meeting held on 23RD February, 2018 and report was prepared vide Ref. No. GB/NKC-KOL/13(a)/17-18 dated 22.09.2018. The Report were circulated to all the members for their information and record

3. **Budget for next financial year**
Budget for financial year 2019-20 is under preparation.

4. **Report on Financial Assistance provided to the student (Full Free/ Half Fee-ship) in the last Academic year**

As per G.O. No. 69 Edn (T), dated 01.02.2018 by Govt. of West Bengal, Department of Higher Education, the following students have been awarded full freeship for the academic year 2017-18 as per their application.

Sl. No.	Name	Stream
1	Mr. Samsur Ali Dafadar	B.Pharm, 1st year, 2017
2	Mr. Mukaddam Hossain	B.Pharm, 1st year, 2017
3	Mr. Sarif Ahammed	B.Pharm, 1st year, 2017
4	Mr. Arif Kamal	B.Pharm, 1st year, 2017
5	Mr. Arsful Islam	B.Pharm, 1st year, 2017
6	Mr. Shuvankar Seth	B.Pharm, 1st year, 2017

REF NO. : GBM/NKC-KOL/15/18-19

MINUTES OF THE MEETING OF GOVERNING BODY OF NSHM KNOWLEDGE CAMPUS, KOLKATA– GROUP OF INSTITUTIONS HELD AT 124 (60), B.L.SAHA ROAD, KOLKATA – 700053 ON 23RD FEBRUARY, 2019 AT 11:30 A.M.

Present :

Dr. Amalendu Basu (Director, Directorate of Technical Education, Member)
Dr. Srimanta Kr. Patra (Associate Professor, Govt. College of Engineering & Ceramic Technology, Member)
Ms. Rupali Patra (Assistant Professor, Deptt. of Computer Science & Engg., Maulana Abul Kalam Azad University of Technology
Mr. Sanjeev Sinha (President, IT & Digital Transformation India Power Corporation Ltd.)
Dr. Supriya Biswas (Professor, NSHM Business School, Kolkata, Member)
Mr. Tapas Kr. Pal (Professor, NSHM College of Pharmaceutical Technology, Kolkata, Member)
Dr. Naveen Das (Director, NSHM Business School, Kolkata, Member)
Mr. Arnab Roy (Co-Founder & Director NSHM Knowledge Campus, Kolkata – Group of Institutions, Chairman)

Absent :

Mr. Cecil Antony (Managing Trustee, Member)
Ms. Rupali Patra (Assistant Professor, Deptt. of Computer Science & Engg., Maulana Abul Kalam Azad University of Technology)
Dr. (Mrs.) Neena Sharma, (Associate Vice President, Emami Ltd. Kolkata, Member)
Mr. Rahul Bose (Global Manager, Learning & Knowledge, IBM Global Business Services)
Prof. (Dr.) Subhasis Maity (Director, NSHM College of Pharmaceutical Technology, Kolkata, Member Secretary)

All the members mentioned above were absent due to their personal exigencies. The nominated member of AICTE (Regional) and an industrialist /technologist/educationist from the Region to be nominated by the Regional Committee were also absent in the meeting and it was noted by the members.

1. **Confirmation of Minutes of the last Governing Body Meeting held on 29TH September, 2018 at NSHM Knowledge Campus, Kolkata.**

The minutes of last Governing Body meeting held on 29th September, 2018 were already circulated to the members for their information and record and it was formally confirmed by all the members.

.....Cont P/2

REF NO. : GBM/NKC-KOL/17/20-21

MINUTES OF THE MEETING OF 17th GOVERNING BODY OF NSHM KNOWLEDGE CAMPUS, KOLKATA– GROUP OF INSTITUTIONS HELD AT 124 (60), B.L. SAHA ROAD, KOLKATA – 700053 ON 24th JULY, 2021 AT 1:00 A.M. THROUGH ONLINE ZOOM

Present :

Prof. Pranabesh Das (Director, Directorate of Technical Education, Member)
Prof.(Dr.) Biswajit Mukherjee (Professor & Ex HOD, Department of Pharmaceutical Technology, Jadavpur University, Member)
Ms. Rupali Patua (Assistant Professor, Deptt. of Computer Science & Engg., Maulana Abul Kalam Azad University of Technology, Member)
Dr. Supriya Biswas (Professor, NSHM Business School, Kolkata, Member)
Prof.(Dr.) Subhasis Maity: (Director, Department of Pharmaceutical Technology, NSHM Knowledge Campus, Kolkata – Group of Institutions, Member Secretary)
Mr. Arnab Roy (Co-Founder & Director NSHM Knowledge Campus, Kolkata – Group of Institutions, Chairman)

Absent :

Mr. Cecil Antony (Managing Trustee, Member)
Dr. Srimanta Kr. Patra (Associate Professor, Govt. College of Engineering & Ceramic Technology, Member)
Mr. Sanjeev Sinha (President, IT & Digital Transformation India Power Corporation Ltd.)
Mr. Rahul Bose (Global Manager, Learning & Knowledge, IBM Global Business Services)

All the members mentioned above were absent due to their personal exigencies. The nominated member of AICTE (Regional) and an industrialist /technologist/educationist from the Region to be nominated by the Regional Committee were also absent in the meeting and it was noted by the members.

1. **Confirmation of Minutes of the 16th Governing Body Meeting held on 8TH February, 2020 at NSHM Knowledge Campus, Kolkata.**

The minutes of the 16th Governing Body meeting held on 8th February 2020 were already circulated to the members for their information and record and it was formally confirmed by all the members.

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2. **Action Taken Report based on the 16th Governing Body Meeting**

Action taken on the points which were discussed in 16th Governing body meeting held on 8th February, 2020 and report was prepared vide Ref. No. GB/NKC-KOL/16(a)/19-20 dated 12.07.2021. The Report were circulated to all the members for their information and record

3. **Placing of AICTE's Extension of approval letter and steps taken by Institute to overcome AICTE indicated shortfall/deficiencies**

AICTE's Extension of approval letter for the academic year 2020-21 as follows : -

B.Pharm	: 100 seats
M.Pharm (Pharmacology)	: 15 seats
M.Pharm (Pharmaceutics)	: 15 seats
MBA	: 180 seats
MBA (Part time)	: 30 seats

4. **Report on extension of existing intake or introduction of new courses as approved by AICTE**

The intake capacity of MBA has been increased from 120 to 180 in the academic year 2021-22. No new courses have been approved by AICTE.

5. **Anti ragging measures taken for the coming session**

- Anti ragging committee has been re-constituted on 2nd July, 2021. Affidavit by the students and Affidavit by Parents/Guardian has been taken as per AICTE format at the time of admission for the on-going academic session 2021-22
- Posters of anti-ragging with effective slogans were displayed to prominent locations in the Campus.
- Anti Ragging Squad members Phone No. & E-mail I.D. were displayed at the Notice Boards in the Campus for any unwanted situation.
- The members of anti ragging committee are regularly visiting our hostels and making discussions in the class room and student groups to stop all possibilities of ragging.

6. **Assessment of academic performance based on Even Semester Results**

Pharmacy:

Periodic improvement of academic performance of the students of UG & PG has been noticed.

Management :

i) Continuous and consistent improvement in the grades of students semester-wise was noted.
ii) The Board appreciated the initiative of conducting remedial tutorial) sessions for the subjects traditionally difficult for students, like Economics, Quantitative Methods.

7. **Achievements in the current academic year and projection for the next academic year.**

One MOU with ISF College of Pharmacy, MOGA has been finalized on 4th March 2022.
Another MOU are in progress with Government Pharmacy College, Sajong, Sikkim.
We will organize an International Conference "eNATCONPH" in virtual mode on 26th & 27th August, 2022
We will apply for renewal of NBA at the beginning of the next calendar year
We will procure ELISA Plate reader to augment Research activities within a short period of time.

8. **Report on Financial Assistance provided to the student (Full Free/ Half Fee-ship) in the last Academic year**

As per G.O. No. 69 Edn (T), dated 01.02.2018 by Govt. of West Bengal, Department of Higher Education, the following students have been awarded half freeship for the academic year 2019-20 as per their application.

Sr.No	Applicant ID	Applicant Name	Course	Discipline	Freeship Status
1	WFS1916052676?3	HIRANMOY MITRA	B.PHARM	B.PHARM/ PHARMACEUTICAL TECHNOLOGY	HALF FREESHIP
2	WFS1916047529?4	SANGRAMJIT BASAK	B.PHARM	B.PHARM/ PHARMACEUTICAL TECHNOLOGY	HALF FREESHIP
3	WFS1916050?5686	SUBHAJIT MAJUMDER	B.PHARM	B.PHARM/ PHARMACEUTICAL TECHNOLOGY	HALF FREESHIP
4	WFS1916050804?7	SUDIPTA HALDER	B.PHARM	B.PHARM/ PHARMACEUTICAL TECHNOLOGY	HALF FREESHIP
5	WFS1916050661?7	TUHIN SUBHRA SEN	B.PHARM	B.PHARM/ PHARMACEUTICAL TECHNOLOGY	HALF FREESHIP

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9. **Last year's placement record**

Level of course	Name of the Course	Approved Intake	Number Of Companies Visited	Number Of Students Passed	Number Of Eligible Students	Number Of Students Placed in IT	Number Of Students Placed in Non IT	Total Student Placed (IT+ Non IT)	Lowest Package(In Lakhs)	Highest Package(In Lakhs)
UNDER GRADUATE	PHARMACY	100	18	131	51	9	35	44	1.44	3
POST GRADUATE	PHARMACEUTICS	15	10	24	23	9	6	15	2	3
POST GRADUATE	PHARMACOLOGY	15	10	24	23	3	6	9	2	3
POST GRADUATE	MBA	150	59	30					3	7.6

10. **Miscellaneous**

On the rising cases of Covid'19 pandemic situation, the institute has issued a notification dated 1st June. 2021 to waive Tuition Fees of the students for upcoming semester who lost their Earning Members (Mother or Father).

There being no other issue to transact, the meeting ended with vote of thanks to the Chair.

Place : Kolkata
Date : 24/07/2021

24/07/2021

Prof. (Dr.) Subhasis Maity
Member Secretary – NSHM Knowledge Campus
Kolkata - Group of Institutions

The published rules, policies and procedures; year of publication and its implementation

HR MANUAL (version 3)
Date of Issue: 1st September, 2014
Amended on: 1st February, 2015
Amendment No: 01

SECTION	TOPIC
1	Message from the Managing Trustee
2	NSHM – The Organization
3	NSHM – Brand Identity
4	NSHM – Vision, Mission & Organizational Objective
5	The "IV: model of Organization Building at NSHM
6	The NSHM Code of Conduct
7	NSHM – Quality Policy
8	NSHM – Social/New Media Guidelines
9	Probation Policy
10	Identification Card Policy
11	Policy on Working Hours, Attendance & Punctuality
12	Policy on Declared Holidays
13	Policy on Bandhs & Forced Closure
14	Leave Policy
15	Remuneration Policy
16	Domestic Travel Policy
17	Incentives for Ph.D./M.Phil & M.Tech
18	Policy on Consultancy/Project Assignments
19	Policy on Separation from the Organization
20	Policy to deal with Cases of Sexual Harassment at Work Place
21	Policy on Employee Grievance Procedure
22	Policy on Disciplinary action

The above polices are published in the form of HR manual which is circulated to all faculty members and staff members .Being a controlled document it is available for internal use only,however it is available for audit ,if required.

9.1.2 Decentralization in working and grievance redressal mechanism (15)

Institute Marks : 15.00

LIST OF PHARMACY FACULTIES ADMINISTRATORS/DECISION MAKERS FOR VARIOUS RESPONSIBILITIES

S.No	Appointment Reference	Date of Appointment	Member	Profession	Address	Associated with	Committee	e-mail

1	**NKC- GOI/SGRC/4**	**02/6/21**	Dr Subhasis Maity Dr Suchandra Sen Dr Souvik Roy Mr Raj Kumar dasgupta	**Professor** **Assistant Professor**	**124, B.L Saha Road, Kolkata 53**	**NSHM Knoledge Campus, Kolkata 53**	Students Grievience Redressal	**souvik.roy@nshm.com** **suchandra.sen@nshm.com** **rajkumardasgupta@nshm.com**
2	**NKC- GOI/ARC- 006**	2/7/21	Mr Nilanjan Sarkar(squad leader) Ms Nilanjana Sinha Dr Amrita Chakroborty	**Assistant Professor**			Anti ragging committee	pritesh.devbhuti@nshm.com
3	NKC/KOL/GRC/2	2/7/21	Dr Subhasis Maity Dr Bijaya ghosh Dr Goutam Pramanik	Professor	**124, B.L Saha Road, Kolkata 53**		Grevience Redressal cell for faculty staff	bijaya.ghosh@nshm.com goutam.pramanik@nshm.com
4	NKC/KOL/ICC/2021/003	2/7/21	Dr Soujanya Pudi (Presiding officer) Dr Satarupa Acharjee	Professor Associate professor			Internal complaints committee	satarupa.acharjee@nshm.com
5	NKC/KOL/IIC/3	2/7/21	Dr Shekhar bose Dr Swarupananda Mookerjee	Professor Assistant professor			Industry-Instute cell	sekhar.bose@nshm.com swarupananda.mukherjee@nshm.com
6	NKC/KOL/SC-ST/4	2/7/21	Dr Sutapa biswas majee Dr Souvik Roy Mr Nilanjan sarkar	Professor Professor Assistant Professor			Committee for SC-ST	sutapa.majee@nshm.com souvik.roy@nshm.com nilanjan.sarkar@nshm.com

- **Functions and duties of Anti Ragging Squad** :

1. The members of the squad will visit **at least once in a week** all potential areas of ragging in or outside of the college and hostel premises, including at night and may apprehend the culprits.
2. The members must be vigilant at all hours including at odd hours all round the campus and other places vulnerable to incidents of ragging and shall be empowered to inspect such places.

3. The members must conduct anonymous random surveys among freshers to ensure that the Campus is free from ragging.
4. The members must conduct anonymous random surveys among fresshers to ensure that the campus is free from ragging.
5. The members must conduct on-the-spot enquiry into any incident of ragging referred to it by the Head of the Institution or any member of the faculty, staff student, parent or guardian or employee of a service provider or by any other person, as the case may be; and the enquiry report along with the recommendation shall be submitted to the Anti Ragging Committee for action.
6. The members must ensure the display of posters on the institute notice boards and other prominent places.
7. Any one gets information about the ragging or any other untoward activities must inform immediately to the members and it should be reported to the Anti Ragging Committee

Students Grievance Redressal Committee (SGRC)

Functions and the responsibilities:

1. The committee shall contribute effectively to address the grievances at the earliest.
2. To register the complaint in the Complaint Register available in Administrative Dept.
3. The Chairman shall convene meeting with the members of the Committee and the Complainant(s) on receipt of the Complaint for expeditious resolution of the same following the principles of natural justice

Grievance Redressal Cell(GRC) for Faculty / Staff

Functions and the responsibilities

As per guidelines laid down by All India Institute of Technical Education, a Grievance Redressal Committee(GRC) for faculty/Staff members is re-constituted to address the Grievances of faculty /staff members including service matter at the Institute level.

Internal Complaint Committee

Functions and the responsibilities

NSHM Knowledge Campus, Kolkata Group of Institutions have zero tolerance policy against discrimination and sexual harassment. An act of sexual harassment is a punishable offence. In terms of the Sexual Harassment of Woman at Workplace (Prevention, Harassment and Redressal) Act 2013, with a view to provide protection against discrimination and sexual harassment of women at workplace and for the prevention and redressal of complaints of sexual harassments and for matters connected therewith or incidental thereto, the Internal Complaints Committee has been constituted in NSHM Knowledge Campus, Kolkata Group of Institutions. The Complaints Committee will be responsible for the redressal of complaints made by employees and ensure time-bound treatment of the complaints as provided in the Act. In case of any complaint, an employee of the institute may contact the following members :

Institute Industry Cell

Functions and the responsibilities

1. To explore and identify common avenues of interaction with industry.
2. To promote collaborative research catering to industry needs through consultancy projects and allied industry-related activities.

Committee for SC/ST

Functions and the responsibilities

1. Issues related to SC/ST
2. Affairs related to SC/ST reservation & its implementation in the Institute, according to Government of India Policies.
3. Registering the complaints in writing from Officers, Teachers, Employees and Students belonging to SC/ST category and addressing it to the concerned department/person section, for its peaceful resolution.

- Composition of grevience redressal committees are available in department office.

INTERDEPARTMENTAL COMMITTEES :

S.No	Committees	Chairpersons
I	Admission	Dr Mainak Mal
II	Examination	Dr Kunal Gupta
III	Training ,Placement &tour	Dr Swarupananda mukherjee

IV	Journal and Publication	Dr Bijaya Ghosh
V	Store	Mr Chinmay Adhikari
VI	Purchase	Dr Sekhar Bose
VII	Library	Dr Bijaya ghosh
VIII	Event, Seminar & Presentation	Dr Satarupa Acharjee
IX	Website Development & Upgradation	Dr Satarupa Acharjee
X	Infrastructure	Dr Souvik Roy
X	Statutory	Mr Nilanjan sarkar

9.1.3 Delegation of financial powers (15)

Institute Marks : 15.00

Managing Trustee has full financial powers to approve any transactions and banking transactions.

- **CFO & CEO** – has full power to approve all banking payments and cheques upto Rs.1 lakh with Managing Trustee and Rs.50000 individually. Power to approve purchases upto Rs.50000 and above that with Managing Trustee. All other transactions also accordingly.
- **Portal Heads/Principals** are authorised to approve all transaction pertaining to their portal/division as per approved budget. In case of any variance approval of Managing Trustee after verification of CFO is taken.
- They are to approve all expenses pertaining to their portal for payment.
- They are authorised to approve purchases upto Rs.25000 and over it with Managing Trustee.

9.1.4 Transparency and availability of correct/unambiguous information in public domain (10)

Institute Marks : 10.00

The college maintains transparency in all its operation and working. Information such as Internal marks scored by students, shortage of attendance, if any. Availability of scholarships, opportunities for students etc. are promptly displayed on Notice Boards as well through college email wherever required.

At the end of every semester, faculty has to give an individual Semester SELF-APPRAISAL report, which helps faculty to evaluate their own performance during the period. Criteria for student scholarships are informed well in advance so that equal opportunity is given to all individuals concerned.

At the beginning of every academic year the college brings out a Rule book which contain all the information, required by a student to carry out his/her studies in the college. Information about every activity in the college are sent to all staff and students through e-mail.

All the required information about the college are made available, as per directions of AICTE, in the college website: www.nshm.com (http://www.nshm.com/). Information sought under RTI act is promptly furnished by the Principal/Director.

9.2 Budget Allocation, Utilization, and Public Accounting at Institute level (30) Total Marks 30.00

Total Income at Institute level: For CFY,CFYm1,CFYm2 & CFYm3
CFY : (Current Financial Year),
CFYm1 : (Current Financial Year minus 1),
CFYm2 : (Current Financial Year minus 2) and
CFYm3 : (Current Financial Year minus 3)

Table 1 - CFY 2021-2022

Total Income 50941000				Actual expenditure(till…): 41947494			Total No. Of Students 438
Fee	Govt.	Grants	Other sources(specify)	Recurring including salaries	Non Recurring	Special Projects/Anyother, specify	Expenditure per student
50941000	0	0	0	40913000	1034494	0	95770.53

Table 2 - CFYm1 2020-2021

Total Income 54847000				Actual expenditure(till…): 42725882			Total No. Of Students 460
Fee	Govt.	Grants	Other sources(specify)	Recurring including salaries	Non Recurring	Special Projects/Anyother, specify	Expenditure per student
54847000	0	0	0	37648000	5077882	0	92882.35

Table 3 - CFYm2 2019-2020

Total Income 62761000				Actual expenditure(till…): 52641530			Total No. Of Students 474
Fee	Govt.	Grants	Other sources(specify)	Recurring including salaries	Non Recurring	Special Projects/Anyother, specify	Expenditure per student
62761000	0	0	0	50636000	2005530	0	111058.08

Table 4 - CFYm3 2018-2019

Total Income 52097000				Actual expenditure(till…): 52252793			Total No. Of Students 483
Fee	Govt.	Grants	Other sources(specify)	Recurring including salaries	Non Recurring	Special Projects/Anyother, specify	Expenditure per student
52097000	0	0	0	50011000	2241793	0	108183.84

Items	Budgeted in 2021-2022	Actual Expenses in 2021-2022 till	Budgeted in 2020-2021	Actual Expenses in 2020-2021 till	Budgeted in 2019-2020	Actual Expenses in 2019-2020 till	Budgeted in 2018-2019	Actual Expenses in 2018-2019 till
Infrastructure Built-Up	500000	350000	5000000	4116000	2100000	1832000	250000	145600
Library	200000	190494	100000	27882	120000	109530	755200	620793
Laboratory equipment	500000	495000	1000000	933000	200000	64000	250000	165000
Laboratory consumables	400000	368000	600000	461000	150000	68000	280000	216000
Teaching and non-teaching staff salary	26000000	24193000	25000000	21714000	30000000	26543000	28000000	25332000
Maintenance and spares	314000	217000	200000	193000	295000	205000	215550	181000
R&D	55500	41000	55000	53000	0	0	35000	24000
Training and Travel	350000	235000	100000	49000	229000	198000	210000	156000
Miscellaneous expenses*	15000000	14267000	6000000	5756000	21000000	2254000	15060000	13032000
Others, specify	6100000	5925000	4000000	3777000	5025000	4817000	5612000	5454000
Total	**49419500**	**46281494**	**42055000**	**37079882**	**59119000**	**36090530**	**50667750**	**45326393**

9.2.1 Adequacy of budget allocation (10)

Institute Marks : 10.00

The budget is progressively modified to meet the new facilities for equipment, maintenance of existing lab equipments as well as chemicals, animals & other consumables and new labs due to revision in syllabi. Budget requirements under recurring and non-recurring heads are collected from every departments and sections before the commencement of the financial year. Allocations are made as per availability of funds.

Expenditure is monitored by the accounts section. Supplementary allocations are made in special cases. The institutional head carefully monitors the expenses so that the necessities are met without affecting the smooth working of the institution. The management has been very efficiently doing this over the past several years that the institution never had any serious budget crunch that affected the functioning of the college.

9.2.2 Utilization of allocated funds (15)

Institute Marks : 15.00

Funds are allocated through the Budget proposals. Department Heads are intimated of the extent of funds allocated against their budget proposals. Actions for procurement of lab equipment, up-gradation of existing lab facilities, purchase of consumables, animals, furniture etc. are initiated from the department and the funds are released on a case by case basis from the accounts office of the college on approval by the Campus Director.

Items	Budgeted in CFY 2021-22	Actual expenses in CFY (till MARCH 22…)	%UTILISATION	Budgeted in CFYm1 2020-21	Actual Expenses in CFYm1	%UTILISATION	Budgeted in CFYm2 2019-20	Actual Expenses in CFYm2	%UTILISATION	Budgeted in CFYm3 2018-19	Actual Expenses in CFYm3	% UTILISATION
Infrastructure Built-Up	500000	3,50,000	70	5000000	41,16,000	82	2100000	18,32,000	87	250000	1,45,600	58.2
Library	200000	190494	95	100000	27882	28	120000	109530	91	755200	620793	82.2
Laboratory equipment	500000	4,95,000	99	1000000	9,33,000	93	200000	64000	32	250000	1,65,000	66.0
Laboratory consumables	400000	3,68,000	92	600000	4,61,000	77	150000	68000	45.3	280000	2,16,000	77.1
Teaching and non-teaching staff salary	26000000	2,41,93,000	93	25000000	2,17,14,000	87	30000000	2,65,43,000	88.5	28000000	2,53,32,000	90.5
Maintenance and spares	314000	2,17,000	69	200000	1,93,000	97	295000	2,05,000	69.5	215550	1,81,000	84.0
R&D	55500	41000	74	55000	53000	96.36363636				35000	24000	68.6
Training and Travel	350000	2,35,000	67.14	100000	49000	49	229000	1,98,000	86	210000	1,56,000	74.3
Miscellaneous expenses *	15000000	1,42,67,000	95.11	6000000	57,56,000	95.93	21000000	1,22,54,000	58	15060000	1,30,32,000	86.5
Others, (administrative,IT,branding)	6100000	59,25,000	97.13	4000000	37,77,000	94.43	5025000	48,17,000	96	5612000	54,54,000	97.2

9.2.3 Availability of the audited statements on the institute's website (5) Institute Marks : 5.00

As of now, the audited statements of accounts of the college are not made available on the college website. However, this can be done with the permission of the Governing body and the Board of Trustees of the INSTITUTE.

9.3 Library and Internet
It is assumed that zero deficiency report was received by the institution, Effective availability and utilization to be demonstrated. (20) Total Marks 20.00

9.3.1 Quality of learning resources (hard/soft) (10)

Institute Marks : 10.00

• Library Services	Yes
• Carpet area of library (in m2)	425.18
• Number of seats in reading space	150
• Number of users (issue book) per day	59(AVERAGE)
• Number of users (reading space) per day	63 (AVERAGE)
• Timings: During working day, weekend, and vacation	9.30 A.m. to 7.00 P.M.
• Number of library staff	3
• Number of library staff with degree in Library	3
• Management Computerisation for search, indexing, issue/return records Bar coding USED	TCS ion
• Library services on Internet/Intranet INDEST or other similar membership Archives	DELNET, NDL,BENTHAM
• Library networking	YES
• Reprographic facility	YES

Library resources (hard) are accesible to students during library hours .

Soft resources like e- copies of all syllabus books,question banks are available to the students 24x7 via library server or college mail id.

During pendemic scanned chapters were provided in case of to the point and exact search of information.

Year	Number Of New Titles Added	Number Of New Editions Added	Number Of New Volumes Added	new e books downloaded
2018-2019	100	23	467	25
2019-2020	48	2	56	27
2020-21	100	0	100	4148
2021-22	33	19	46	200

9.3.2 Internet (10)

Institute Marks : 10.00

Name of the Internet provider	TATA Teleservices Ltd.
Available band width	100 mbps (ILL) 1:1
WiFi availability	WIFI campus
Internet access in labs, classrooms, library and offices of all Departments	YES AVAILABLE
Security arrangements	CCTV installed in certain areas of the campus as per the approval of competent authority.

Annexure I

(A) PROGRAM OUTCOME (POs)

ANNEXURE I: PROGRAM OUTCOMES

1. Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

2. Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

3. Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

4. Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

5. Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.

6. Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

7. Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

8. Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

9. The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

10. Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

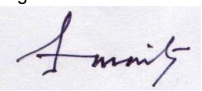
11. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Declaration

The head of the institution needs to make a declaration as per the format given -

- I undertake that, the institution is well aware about the provisions in the NBA's accreditation manual concerned for this application, rules, regulations, notifications and NBA expert visit guidelines inforce as on date and the institutes hall fully abide by them.
- It is submitted that information provided in this Self Assessment Report is factually correct.
- I understand and agree that an appropriate disciplinary action against the Institute willbe initiated by the NBA. In case, any false statement/information is observed during pre-visit, visit, postvisit and subsequent to grant of accreditation.

Head of the Institute
Name : Dr Subhasis Maity
Designation : Director,NSHM Knowledge campus,kolkata-Group of Institutions
Signature :



Seal of The Institution :

Place : Kolkata
Date : 08-08-2022 17:14:37