

**DEPARTMENT OF PHARMACY
M.I.T., MUZAFFARPUR**



**AFFILIATED TO
ARYABHATTA KNOWLEDGE UNIVERSITY,
MITHAPUR, PATNA**

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**NAME OF COURSE: PHARMACEUTICS -I
COURSE CODE (T): 091101
COURSE CODE (P): 091101 P
SEMESTER: I
ACADEMIC YEAR : 2018-2019**

Academic Calendar (Odd Semesters): 2018-19

| S.No | Events | B.Pharm 1 st sem | B.Pharm 3 rd sem | B.Pharm 5 th sem | B.Pharm 7 th sem |
|-----------|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 1 | Class Start Date | | 16.7.2018 | 16.7.2018 | 16.7.2018 |
| 2 | First Sessional Exam start date | | | | |
| 3 | First Sessional Exam End date | | | | |
| 11 | Theory exam Date | | Dec -2018 | Dec-2018 | Dec- 2018 |
| 12 | Practical Exam Start Date/Final Presentation | | Jan-2019 | Jan-2019 | Jan-2019 |
| 13 | Practical Exam End Date/ Final Presentation | | Jan-2019 | Jan-2019 | Jan-2019 |

List of Holidays

| S.No | Holiday | Date | Day |
|------|-----------------------------------|------------------------|-------------------------|
| 1 | Independence Day | 15.08.2018 | Wednesday |
| 2 | Bakrid | 22.08.2018 | Wednesday |
| 3 | Sri Krishna Janmasthanmi | 03.09.2018 | Monday |
| 4 | Muharam | 21.09.2018 | Friday |
| 5 | Gandhi Jayanti | 02.10.2018 | Tuesday |
| 6 | Durga Puja | 13.10.2018-21.10.2018 | Saturday to Saturday |
| 7 | Chehallum | 30.10.2018 | Tuesday |
| 8 | Deepabali | 07-11,2018 -16.11.2018 | Wednesday to Friday |
| 9 | Hazarat Mohamad sahib Birthday | 21.11.2018 | Wednesday |
| 10 | Christmas | 25-12-2018 -31.12.2018 | Tuesday To Monday |

Time Tables (Odd Semesters): 2018-19

| MUZAFFARPUR INSTITUTE OF TECHNOLOGY | | | | | | | | |
|--|-------------|------------------------|-----------------------------------|-------------------------|---------------------------|---------|------------------|--------|
| ODD SEM (JULY- DEC 2018) TIME TABLE FOR 3 rd , 5 th & 7 th SEMESTER, B.PHARM, WITH EFFECT FROM 16/07.20 | | | | | | | | |
| DAY | SEMESTER | 9 AM TO 10 | 10 -11 AM | 11- 12 AM | 12 -1 PM | 2- 3 PM | 3 PM | |
| MON | THIRD SEM | APHE II SK | PHARM ANAL II GT | PHARMACEUTICS III AB | PHARMACOGNOSY II NRB | | CLAS | |
| | FIFTH SEM | PHARMACEUTICS V RKC | PHARMACEUTICS V LAB RKC | | | | | CLAS |
| | SEVENTH SEM | PHARMA. BIOTECH SNS | PHARM CHEM VII RP | PHARMA. INDUST. MANAG. | PHARMACOLOGY III RP | | CLAS | |
| TUES | THIRD SEM | PHARMACEUTICS III AB | PHARM CHEM IV SW | PHARMACEUTICS III AB(T) | PHARM ANAL II GT(T) | | PHARMA LAB | |
| | FIFTH SEM | PHARM CHEM V SNS | PHARMACEUTICS VI AB | PHARMA CEUTICS V RKC | PHARMACOLOGY I SK | | PHARM C S | |
| | SEVENTH SEM | PHARMACEUTICS VIII RKC | PHARM CHEM VII RP | PHARMACOLOGY III RP | PHARMACEUTICS VIII RKC(T) | | PHARMA LAB | |
| WED | THIRD SEM | | PHARMACOGNOSY II NRB(T) | PHARMACOGONOSY II NRB | PHAR ANAL II GT | | PHARMA II LAB | |
| | FIFTH SEM | PHARMACOLOGY I SK | PHARM CHEM V SNS | PHARMACEUTICS VI AB | PHARMACOLOGY I SK(T) | | PHARMA LAB | |
| | SEVENTH SEM | PHARM CHEM VII RP(T) | PHARMACEUTICS VIII RKC | PHARM CHEM VII RP | ELECTIVE OPT | | PHARM C | |
| THURS | THIRD SEM | APHE II SK(T) | PHARM CHEM IV SW | APHE II SK | PHARM CHEM IV SW(T) | | PHARM A C | |
| | FIFTH SEM | PHARM CHEM V SNS | PHARMACEUTICS VI AB | PHARMACOGONOSY IV SW | | | PHARMA IV LA | |
| | SEVENTH SEM | PHARMACEUTICS VIII RKC | PHARMA. BIOTECH SNS(T) | PHARMACOLOGY III RP | ELECTIVE OPT | | ELECTIVE | |
| FRI | THIRD SEM | APHE II SK | PHARMACUTICAL CHEMISTRY IV LAB SW | | | | | APHE I |
| | FIFTH SEM | PHARMACOGONOSY IV SW | PHARMACEUTICS V RKC | PHARMACOGONOSY IV SW(T) | PHARMACEUTICS V RKC(T) | | PHARMA LAB O | |

| | | | | | | |
|-----|-------------|------------------------|------------------------|---------------------|----------------------|---------------|
| | SEVENTH SEM | | ELECTIVE OPT (T) | ELECTIVE OPT | PHARMA. BIOTECH.SNS | PHARMA III RK |
| SAT | THIRD SEM | PHARMACOGONOSY II NRB | PHARM CHEM IV SW | PHAR ANAL II GT | PHARMACEUTICS III AB | |
| | FIFTH SEM | PHARM CHEM V SNS(T) | PHARMACOLOGY I SK | PHARMACEUTICS VI AB | PHARMACOGONOSY IV SW | |
| | SEVENTH SEM | PHARMACOLOGY III RP(T) | PHARMA. INDUST. MANAG. | PHARMA. BIOTECH SNS | | |

COURSE DESCRIPTIONS: PHARMACEUTICS -I

B. PHARM – FIRST SEMESTER

1. Course Syllabus

Module-1

Matter, Properties of Matter: State of matter, change in the state of matter, latent heats and vapor pressure, sublimation-critical point, Eutectic mixtures, gases, aerosols-inhalers, relative humidity, liquid, complexes, liquid crystals, glassy state, solids-crystalline, amorphous and polymorphism.

Module-2

Micromeretic and Powder Rheology : Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle volume, optical microscopy, Asieving, sedimentation, measurement, particle shape, specific surface, methods for determining surface area; permeability, adsorption, derived properties of powders,

porosity, packing arrangement, densities, bulkiness & flow properties

Module-3

Surface and Interfacial Phenomenon: Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, Spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid-gas and Solid-liquid interfaces, complex films and electrical properties of interface

Module-4

Viscosity and Rheology: Newtonian systems, Law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling ball, rotational viscometers

Module-5

Dispersion Systems: Colloidal Dispersions: Definition, types, properties of colloids, protective colloids, applications of colloids in pharmacy; Suspensions and Emulsions: Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian movement" sedimentation of flocculated articles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations; Emulsions-types, theories, physical stability

Module-6

Complexation : Classification of complexes, methods of preparation and analysis, applications

Module-7

Kinetics and Drug Stability: General considerations & concepts, half-life determination, Influence of temperature, light, solvent, catalytic species and other factors, Accelerated stability study, expiration dating.

Module-8

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 iso tonicity

Recommended Books:

1. Martin's Physical Pharmaceutical Sciences by P. J. Sinko (Lippincott William and Wilkins, Baltimore).
2. Cooper and Gunn's Tutorial Pharmacy edited by S.J. Carter.
3. Bently's Textbook of Pharmaceutics edited by E.A. Rawlins.
4. Bahl & Tuli: "Essentials of Physical Chemistry," S. Chand & Co.
5. Gennaro et al., "Remington's The Science & Practice of Pharmacy" (Lippincott William and Wilkins, Baltimore).
6. Banker & Rhodes,. "Modern Pharmaceutics"
7. Aulton, "Pharmaceutics – The Science of Dosage Form Design"

2. Program Objectives (PO's)

The graduates of the program will demonstrate:

1. Possess strong knowledge of Pharmaceutical Sciences required to pursue career/higher education or to become entrepreneur.
2. Acquire professional skills in making the products and providing services in health care system.
3. Be effective communicators, contributors in teams and efficient managers.

4. Be ethical, professional and conscious of their environmental and social responsibilities.
5. Possess an attitude for continuous learning and practicing in the field of work.

3. Course Outcomes (CO's)

After completion of the course, the students are will be able to:

1. Describe the states of matter and changes in states of matter.

2. Discuss the thermodynamics with their first, second and third laws and properties of solutions like colligative properties, partition coefficient.(Knowledge)
3. Explain thixotropy & viscosity with Newtonian flow systems and non-Newtonian flow systems. (Comprehension)
4. Apply the concepts of Buffer solution, buffer equations, buffer capacity and surface and interfacial phenomenon and illustrate the various laws and equations of adsorption (Application)

4. Mapping of COs with PO's

| PO | CO1 | CO2 | CO3 | CO4 |
|----|-----|-----|-----|-----|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

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|----|--|--|--|--|
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |

5. Assessment Methods for CO'S

5.1. Theory

| S.No | Assessment Tools | Marks | Outcomes |
|------|------------------|-------|----------|
|------|------------------|-------|----------|

| | | | |
|---|------------------------|----|-----------------|
| 1 | Sessional Examination | 20 | CO1 CO2 CO3 CO4 |
| 2 | Assignment | 02 | CO1 CO2 CO3 CO4 |
| 3 | Presentation | 02 | CO1 CO2 CO3 CO4 |
| 4 | Quizzes | 01 | CO1 CO2 CO3 CO4 |
| 5 | Attendance | 05 | NA |
| 6 | University Examination | 70 | NA |

5.2. Practical

| S.No | Assessment Tools | Marks | Outcomes |
|------|---------------------------|-------|-----------------|
| 1 | Attendance | 05 | CO1 CO2 CO3 CO4 |
| 2 | Experiment valuation | 10 | CO1 CO2 CO3 CO4 |
| 3 | Internal Viva- voce | 05 | CO1 CO2 CO3 CO4 |
| 4 | University Practical Exam | 30 | CO1 CO2 CO3 CO4 |

6. Delivery Methodology

| Outcomes | Methods | Supporting Tools |
|----------|---|---|
| CO 1 | Chalk-Talk, Interactive classroom, ICT usage, Case study discussion about diseases, Group discussions, , Web based learning | Board, Laptop, Projector, You Tube, Whatsapp, Google, |
| CO2 | Chalk-Talk, Interactive classroom, ICT usage, Case study discussion about diseases, Group discussions, , Web based learning | Board, Laptop, Projector, You Tube, Whatsapp, Google, |
| CO3 | Chalk-Talk, Interactive classroom, ICT usage, Case study discussion about diseases, Group discussions, , Web based learning | Board, Laptop, Projector, You Tube, Whatsapp, Google, |
| CO4 | Chalk-Talk, Interactive classroom, ICT usage, Case study discussion about diseases, Group discussions, , Web based learning | Board, Laptop, Projector, You Tube, Whatsapp, Google, |

7. Teaching plan

7.1. Theory

| Lecture No. | Contents |
|-------------|---|
| 1 | Syllabus discussion |
| 2 | States of matter, solids crystalline, amorphous solid, Polymorphism |
| 3 | Liquid state |
| 4 | Gaseous state |
| 5 | Change in the state of matter, latent heat and vapour pressure |
| 6 | Sublimation, critical point, Eutectic mixture |
| 7 | Aerosols ,Inhalers, Class Test & Quiz |
| 8 | Liquid complexes, liquid crystals, glassy state |
| 9 | Liquid complexes, liquid crystals, glassy state, |
| 10 | Viscosity and Rheology |
| 11 | Law of flow, kinematic viscosity |
| 12 | Effect of temperature |
| 13 | Non-Newtonian systems, Pseudoplastic, dilatant, plastic flow |
| 14 | Thixotropy, thixotropy in formulation |
| 15 | Determination of viscosity using capillary, falling ball and rotational viscometers |
| 16 | Buffer solution, buffer equations and buffer capacity, |
| 17 | Buffers in pharmaceutical systems, buffered isotonic solutions |

| | |
|----|---|
| | Class Test |
| 18 | Measurements of tonicity |
| 19 | Calculations and methods of adjusting isotonicity. |
| 20 | Adsorption, Freundlich and Gibbs' adsorption isotherms |
| 21 | Freundlich and Gibbs' adsorption isotherms |
| 22 | Langmuir theory of adsorption, BET equation |
| 23 | Surface and Interfacial Phenomenon : Surface tension and interfacial tensions |
| 24 | Surface and Interfacial Phenomenon : Surface tension and interfacial tensions |
| 25 | Solid-gas and solid-liquid interfaces, surface free energy. |
| 26 | Solid-gas and solid-liquid interfaces, surface free energy. |
| 27 | Spreading coefficient, adsorption at liquid interfaces |
| 28 | Surface active agent, HLB |
| 29 | Adsorption at solid interfaces, complex films and electrical properties |
| | Class Test |

7.2. Practical

| Exp. No | Experiment |
|---------|--|
| 1 | To study of different states of matter of same/ different materials |
| 2 | To determine partition coefficients of any two suitable drug materials |
| 2 | To determine viscosity of liquid by using Ostwald's viscometer |
| 3 | To determine viscosity of liquid by using Ostwald's viscometer |
| 4 | To determine surface tension by stalagmometer & by capillary rise method |
| 5 | To determine parachor by stalagmometer & by capillary rise method |
| 6 | To prepare a given percentage of solution by allegation method |

| | |
|---|---|
| 7 | To prepare acetate buffer and compare theoretical pH value with the experimental value. |
| 8 | To determine the CMC of given the surfactant by surface tension method. |
| 9 | To study adsorption phenomenon by activated charcoal |