B.Pharm (4th Semester Structure)

IV SEMESTER									
Theory							Practical		
Subject Group	Subject Code	Course Name	Hours /Week L/T	Credit Theory	University marks	Internal Evaluation	Hours /week L/T	Credit Practical	Marks
PC	15PH401	Physical Pharmaceutics-II	3-0	3	100	50	3	2	50
BE	15PH402	Pharm. Engineering-II	3-0	3	100	50	3	2	50
PC	15PH403	Biochemistry	3-0	3	100	50	3	2	50
BS	15PH404	Computer Application	3-0	3	100	50	3	2	50
BS	15PH405	Organic Chemistry - III	3-0	3	100	50			
BS	15PH406	Mathematics & Statistics	3-1	3	100	50			
		Total	18-1	18	600	300	12	8	200
		Total Hours/Week 31							
		Total Credits 26 (PC 10 BE 05 BS 11)							
		Total Marks 1100							

Lateral Entry students with D.Pharm qualification are required to take course no. 15PH205
(Business Communication in English theory and practical) as the case may be in addition to the above courses of 4th Semester.

DETAILED SYLLABUS OF IV SEMESTER B.PHARM

Physical Pharmaceutics – II (15PH401)

THEORY 3 hours/week

UNIT -I

1. **Micromeretics and powder Rheology :** Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle size, volume, shape, surface area, specific surface, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT -II

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

UNIT -III

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, electrical properties. Freudlich and Gibbs adsorption isotherms, Langmuir theory of adsorption, BET equation.

UNIT –IV

4. **Colloidal Dispersion Systems:** Colloidal dispersions, types, optical, kinetic and electrical properties of colloids, protective colloids, applications of colloids in pharmacy;

UNIT –V

5. **Coarse Dispersion Systems :**

Suspensions: Interfacial properties of suspended particles, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations, Emulsions: theories of emulsification, physical stability and rheological considerations.

PHARMACEUTICS-III (Physical Pharmacy – II)

PRACTICAL 3 hours/ week (A minimum of 15 experiments shall be conducted)

1. Determination of particle size and particle size distribution using various methods of particle size analysis (optical microscopy, sieving and sedimentation).
2. Determination of derived properties of powders like density, porosity, compressibility, angle of repose etc.
3. To determine viscosity of liquid using Ostwald viscometers.
4. To determine viscosity of liquid using Brookfield viscometers
5. To determine surface tension of different liquid using Ostwald stalgmometer.
6. To determine interfacial tension between two liquid using Ostwald stalgmometer
7. Determination of HLB value of different surfactant
8. To determine critical micellar concentration of surfactants using Ostwald stalgmometer
9. Preparation of various types suspensions and determination of their sedimentation parameters.
10. Preparation and stability studies of emulsions.
11. Other experiments based on theory

RECOMMENDED BOOKS:

1. Martin's Physical Pharmacy & Pharmaceutical Sciences by P.J.Sinko.(Lippincott Williams and Wilkins, Baltimore)
2. Cooper and Gunn's Tutorial Pharmacy edited by S.J. Carter (CBS Publishers, Delhi)
3. Bentley's Textbook of Pharmaceutics edited by E.A. Rawlins (All India Traveler Book Seller, New Delhi)

Pharm. Engineering-II (15PH402)

THEORY

UNIT -I

1. **Fluid Flow:** Type of flow, Reynold's number, Viscosiy, concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure. Application of fluid flow. A few numerical problems may be solved.

2. **Dehumidification and Humidity Control:** Basic concepts and definition, wet bulb and adiabatic saturation temperature, psychrometric chart and measurement of humidity, application of humidity, measurement in pharmacy, equipments of dehumidification operations.

UNIT -II

3. **Material Handling Systems:**

Liquid handling – different types of pumps.

Gas handling – various types of fans, blowers and compressors.

Solid handling – Conveyers

UNIT -III

4. **Crystallization:** Characteristics of crystals like – purity, size shape, geometry, habit, forms size and factors affecting them. Solubility curves and calculation of yields, material and heat balances around Swenson Walker Crystalizer. Supersaturation theory and its limitations, nucleation mechanisms, crystal growth, study of various types of crystallizer, tanks, agitated batch, Swenson Walker, single vacuum, circulating magma and Krystal crystallizer, caking of crystals and its prevention, numerical problems on yields.

UNIT -IV

5. **Materials of Construction:** General study of composition, corrosion, resistance, properties and applications of materials of construction with special reference to stainless steel and glass.

6. **Industrial Hazards and safety Precautions:** Mechanical, Chemical, Electrical, fire and dust hazards, industrial dermatitis, accident records etc.

UNIT -V

7. **Centrifugations:** Principles of centrifugation, **classification of centrifuges** industrial centrifugal filters and centrifugal sedimenters such as **perforated basket centrifuge, semi-continuous centrifuge, super centrifuge, De laval clarifier.**

RECOMMENDED BOOKS:

1. Cooper and Gunn's Tutorial Pharmacy Edited by S.J.Carter (CBS Publishers, Delhi)

2. Pharmaceutical Engineering by K.Sanbamurty (New Age International, New Delhi)

3. Chamical Engineering by Badger and Banchero (Mc Graw Hill, New Delhi)

4. Pharmaceutical Dosage forms by Aulton.(Churchill Livingstone, Edinburg)

5.Pharmaceutical engineering(principles and practice) by C.V.S. Subramanyam,J. Thimma Setty,Sarasija Suresh,Mrs V.Kusum Devi

Pharm. Engineering-II

PRACTICAL 3 hours/ week

(A minimum of 15 experiments shall be conducted)

1. Determination of rate of evaporation.
2. Determination of overall heat transfer coefficient.
3. Experiments based on steam, extractive and azeotropic distillations.
4. Experiments based on determination of radiation constant.
5. Experiments based on sieve analysis.
6.Experiments based on size reduction using ball mill
7. Experiments to illustrate the influence of various parameters on the rate of drying.
8.Measurement of flow of Determination of rate of drying, free moisture content and bound moisture content.
9. Experiments to illustrate solid – solid mixing, determination of mixing efficiency using different types of mixers.
10.fluids and their pressure, determination of Reynolds number.
11. Determination of humidity – use of Dry Bulb and Wet Bulb temperatures and Psychrometric charts.
12. Experiments to demonstrate applications of centrifugation.
13. Experiments based on crystallization.
14 .Other experiments based on theory.

BIOCHEMISTRY (15PH403)

THEORY 3 hours/week

UNIT -I

1. Biochemical organization of the cell and transport processes across cell membrane. Outlines of biochemistry of cell division and metastasis.
2. The concept of free energy, determination of change in free energy from equilibrium constant and reduction potential, bioenergetics, production of ATP and its biological significance.

UNIT -II

3.Enzymes: Nomenclature, factors affecting enzyme action, enzyme kinetics and its mechanism of action, mechanism of inhibition, enzymes and iso-enzymes in clinical diagnosis.
4.Co-enzymes: Vitamins as co-enzymes and their significance, metals as co-enzymes and their significance.

UNIT -III

5.Carbohydrate Metabolism: Chemistry of Carbohydrates, Glycolysis and fermentation and their regulation,
Gluconeogenesis, Glycogenolysis, Glycogenesis, and Pentose phosphate Pathway.
6.The Citric Acid Cycle:Significance, reactions and energetic of the cycle, Amphibolic role of the cycle and Anaplerosis.

UNIT -IV

7. Lipid Metabolism: Chemistry of lipids & Fats, Oxidation of fatty acids; β-oxidation & energetics,α-oxidation, ω- oxidation, Biosynthesis of ketone bodies and their utilization, Biosynthesis of saturated and unsaturated fatty acids, control of lipid metabolism, Essential fatty acids & Bio synthesis of eicosanoids (prostagla
ndins, thromoboxanes and leukotrienes), phospholipids and sphingolipids.

UNIT-V

8. Chemistry of Proteins and Nucleic acids: Outlines of the mechanism of protein and nucleic acid synthesis and catabolism. Principles of biological oxidation
and detoxification mechanisms.

BIOCHEMISTRY

PRACTICAL 3 hours/week
(A minimum of 15 experiments shall be conducted)

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH.
2. Colorimetric estimation of blood glucose.
3. Estimation of cholesterol, creatinine, urea and uric acid in biological fluids.
4. Qualitative test for normal and abnormal constituents of urine.
5. Estimation of reducing sugars in urine.
6. Estimation of bilirubin content the blood.
7. Enzymatic hydrolysis of glycogen by alpha and beta amylases.
8. Effect of temperature on the activity of alpha amylases.
9. Estimation of Blood Cholesterol
10. Estimation of SGOT, SGPT by UV Spectrophotometer.
11. Estimation of serum alkaline phosphate and acid phosphatase levels.
12. Estimation of serum sodium, potassium and calcium levels.

RECOMMENDED BOOKS:

1. Harper's Biochemistry R.K.Murray and Others (Prentice Hall of India, New Delhi)
2. Biochemistry by Stryer.(W.H.Freeman, New York)
3. Text Book of Biochemistry by West & Todd (Oxford & IBH Pub., Co., New Delhi)
4. Fundamentals of Biochemistry by Dr.A.C.Deb (New Central Book Agency, Calcutta)
5. Text Book of Biochemistry by Dr.A.V.S.S.Rama Rao (UBS Publishers & Distributors,New Delhi)
6. Text Book of Biochemistry by Dr.Satyanarayana

COMPUTER APPLICATIONS (15PH404)

UNIT-I

Introduction: Introduction computer, Generation and Classifications of computer (According to size and use)

Hardware: Architecture of a microcomputer, CPU, ALU, Internal memory (RAM & ROM), various peripheral devices such as Input devices, Output devices, Storage devices. Various ports and slots such as PCI, Parallel, Serial, PS/2, USB etc.

Number System: Binary, Octal and Hexadecimal Number Systems. Addition and subtraction binary numbers (1's & 2's complement method)

Software: Introduction to software. Different computer languages (such as Machine, Assembly and High-level languages). Classification of application software according their use.

UNIT-II

Operating Systems: Introduction to various operating systems, Different Type of file manipulation and storage management such as Directory/folder handling, Copy, moving , deleting, searching etc of files. Various storage maintenance tasks such as Checking, Scanning, and Formatting storage device (eg. HDD or Pen drive, DVD etc) by using the Windows-XP & Linux

Application of Computers in Pharmacy: Various use of computer in pharmaceutical research and development, industries, education and hospitals.

UNIT-III

Programming with JAVA

Introduction to programming: Problem Analysis, algorithm, flow chart, coding, execution, debugging & testing and programming documentation.

Introduction to JAVA: Hostory of Java, Introduction to OOP. Idea about class and objects, Java program structure, Java tokens and key words, identifiers, variables & constants, data types, declaration & initialization of variables, Operators and expressions, writing and running simple Java programmes using BlueJ.

UNIT- IV

Control statements: Decision making by using if, if…else, nested if..else, Switch..case statement. Looking statements like while, for, do..while statements.

Input and output in Java: Input the values by using, Scanner & BufferedReader. Output the data by using println() method etc. Exception handling (simple cases only).

Java Methods (functions): Definition, declarations and calling of Java methods, discussion about library methods(functions) to handle mathematical, character, string, date & time problems.

Array: Introduction to array, Declaration & use of 1-D and 2-D array. Sorting and searching in 1-D array.

UNIT-V

Computer Networking: Introduction to Computer networking, Mode of transmission (simplex, duplex, Half-duplex). Classification of networking like LAN, MAN & WAN. Network topologies, Network protocols, OSI layers

Internet: Introduction to internet, TCP/IP, Internet browsers, URL. Introduction to e-mail and its use. Important websites related to pharmaceutical information –like sites for information regarding drugs, medical literature, plants, clinical data, patent sites, FDA, WHO etc.

RECOMMENDED BOOKS:

Computer Fundamentals, P.K.Sinha, BPB Publications

Computer Applications in Pharmacy -William and Fassett

The ABC's of the Internet - Cristain Crumlish, BPB Publications, N. Delhi – 01

PROGRAMMING WITH JAVA - **E Balagurusamy, Amazon India**

COMPUTER APPLICATIONS (PRACTICAL)

1. Demonstration of computer hardware.
2. Operating system: Windows & Linux
   Understanding the sub-directories/folders, copying, moving, deleting & searching of files/folders etc
3. MS-WORD: Create and save a document in Ms-word, text editing, text formatting.
4. MS-EXCEL: Understanding a work sheet, Create and save a work-book file. Input various values of data types into a woksheet cell, using of formulas & functions and plotting of graph using Excel
5. Write Simple Java programmes in BlueJ Environment: At least 10 programmes should be developed in order to learn use of conditional statements, looping statements, Java methods, Array etc.
6. Preparing a presentation by using Power Point.
7. Use of Internet: Use of various search engines, creation and use of e-mail id and groups.

RECOMMENDED BOOKS:

1. Computer Fundamentals, P.K.Sinha, BPB Publications
2. Fundamentals of Computers, V. Rajaraman, Prentice Hall of India Pvt. Ltd., 1986.
3. Computer Applications in Pharmacy -William and Fassett -
4. The ABC's of the Internet - Cristain Crumlish, BPB Publications, N. Delhi – 01
5. Programming with Java - **E Balagurusamy, Amazon India**
6. Complete Reference MS- Office
7. Complete Reference Windows XP.
8. Complete Reference Internet

Organic Chemistry-III (15PH405)

THEORY 3 hours/week

UNIT-I .

Heterocyclic Compounds Containing Two Hetero Atoms

Nomenclature, Synthesis, reaction and medicinal uses of following compounds Pyrazole, Benzimidazole, Oxazole, thiazole, pyrimidine, purine and phenothiazine**.**

UNIT-II

Carbohydrates: Classification, reducing and non-reducing sugars, chemistry (Excluding structure elucidation) of glucose, fructose, starch and cellulose,

Lipids (Fats and Oils): Classification and structure, physical and chemical properties (saponification, Hydrogenation, oxidation)analysis of (acid value, iodine value, saponification value,Reichert-Meissl value).

UNIT-III

Amino acids and Proteins: Structure of commonly occurring amino acids, Synthesis of amino acids and their physical properties and some characteristic chemical reactions, classification of proteins, physical properties, purification of proteins, concept of polypeptides.

Nucleic acids: Nucleic acids and their components(DNA & RNA bases,Nucleosides,Nucleotides), structure of RNA &DNA.

UNIT-IV

Study the following reactions with mechanism.

Benzoin condensation reaction, Reformatsky reactions, Beckmann rearrangement, Michael addition, Mannich reaction, Oppenaur oxidation, Claisen condensation, Knoevenagel condensation, Perkin reactions and their applications.

UNIT-V

Pericyclic Reaction :

Electrocyclic: Pericyclic rearrangement, Thermal reactions of HOMO and LUMO

Cycloaddition: Woodward–Hoffmann rules for electrocyclic reactions, Diels – Alder reaction.

Sigmatropic reactions: Cope rearrangements, Claisen rearrangements

RECOMMENDED BOOKS:

1. Organic Chemistry by R.T. Morrison and R.N.Boyd.(Prentice Hall of India, New Delhi)
2. Advanced Organic Chemistry by B.S.Bahl and Arun Bahl.(S.Chand, New Delhi)
3. Bentley and Driver's Text Book of Pharmaceutical Chemistry.(Oxford University Press, New Delhi)
4. Organic Chemistry – Reactions and Reagents by O. P.Agarwal.
5. Organic Chemistry by I.L. Finar Vol. I & Vol. II.(Longman, Singapore)
6. Advanced Organic Chemistry: Reactions and Mechanisms,by M.S. Singh, Dorling Kindersley (India)

MATHEMATICS AND STATISTICS (15PH406)

THEORY 3 hours/week

UNIT -I

Integration:- Integration as inverse process of differentiation, Definite integrals (simple cases). Integration by (i) Decomposition (ii) by substitution (iii) by parts.Integration of Logarithmic,Trigonometric, Algebraic and exponential functions.

UNIT -II

Differential Equations:- Introduction to differential equations, Formation of different equations, Solution of differential equations of first order and first degree by the methods of variable separable, Homogeneous, reducible
to homogeneous and linear equations , Reducible to linear equations ,
Exact differential equations. Differential equations of order greater than one with constant coefficients , Pharmaceutical applications.

UNIT -III

Laplace transforms : Theorem, properties and uses (problems)

UNIT -IV

Statistics -I:- Introduction to statistics, Data collection random and noon -random sampling methods, Sample size, Diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, Measures of central tendency , Measures of dispersion , Standard deviation , Measures of skew-ness , Measures of kurtosis , Correlation and regression analysis , Methods of least squares, Probability and events, Probability theorems, Baye's Theorem on probability.

UNIT -V

Statistics- II:- Probability Distributions – Binomial , Poisson and normal
distributions (normal curve and properties) , Tests of hypothesis(statistical inference) Standard error, Fudicial (confidence) limits , Tests of significance for small samples- Students t-distribution and t- tests, Paired t-test, chi-square tests and F-test (Pharmaceutical applications).

RECOMMENDED BOOKS:

1.Integral Calculus by Shanti Narayan.
2.Statistical Methods by S.P.Gupta. (S.Chand, New Delhi)
3.Higher Engineering Mathematics by B.S. Grewal. (Khanna Publishers, Delhi)
4.Mathematical Methods by Potter & Gold Berg.(Prentice Hall of India, New Delhi