w. e. f. AY 2016-17

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. PHARMACY COURSE STRUCTURE (2016-17)

II YEAR II SEMESTER

S. No	Course Code	Subject	L	T	P	Credits
1	PS401	Pharmaceutical Unit Operations - II	4	1	0	4
2	BS402	Biochemistry	3	1	0	3
3	PS403	Pharmaceutical Jurisprudence	4	1	0	4
4	PS404	Physical Pharmacy – II	4	1	0	4
5	OE	HS405: Intellectual Property Rights PS405: Herbal Drugs Technology BS405: Green Chemistry	3	0	0	3
6	PS406	Pharmaceutical Unit Operations – II Lab	0	0	3	2
7	BS407	Biochemistry Lab	0	0	3	2
8	PS408	Physical Pharmacy – II Lab	0	0	3	2
9	*MC409	Gender Sensitization Lab	0	0	3	0
		Total	**18**	**4**	**12**	**24**

***MC – Mandatory Course**

PS401: PHARMACEUTICAL UNIT OPERATIONS – II

B. Pharm II Year II Sem

L	T	P	C
4	1	0	4

Course Objectives: The student shall be taught on operations like evaporation, drying, objective of size reduction, size separation and mixing.

Course Outcome: Student will be familiar with concepts of evaporation, drying, size reduction, mixing and understand the pharmaceutical applications in industry.

UNIT - I

Evaporation: Basic concept of phase equilibria, factors affecting the evaporation, evaporators, film evaporators, and single effect evaporators.

UNIT - II

Drying: Moisture content and mechanism of drying, rate of drying and time of drying calculations, classification and types of dryers, dryers used in pharmaceutical industries tray dryer, Fluid bed dryer, spray dryer and freeze-dryer.

UNIT - III

Size Reduction: Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mill, types of mills including ball mill, hammer mill and fluid energy mill.

UNIT - IV

Size Separation: Official standards for powders, sieves, modes of motion in size separation. Sieve Analysis – Testing of powders. Equipment for size separation.

UNIT - V

Mixing: Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipment, double cone, twin-shell, silverson mixer, colloid mill, sigma blade mixer, planatery mixer, propeller mixer and turbine mixer.

TEXT BOOKS:

1. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy, 6th ed., CBS publisher, Delhi.
2. CVS Subhramanyam, Pharmaceutical Engineering.
3. K. Samba Murthy, Pharmaceutical Engineering

REFERENCE BOOKS:

1. W.I. Macebe and J. C. Smith Macro, Unit Operations To Chemical Engineering, Hill Int. Book Co., London.
2. L. Lachman, H. Lieberman & J. L Kaniz, The Theory And Practice Of Industrial Pharmacy, Lee & Febiger Philadelphia, USA

BS402: BIOCHEMISTRY

B. Pharm II Year II Sem

L	T	P	C
3	1	0	3

Course Objectives: The metabolism of complex biochemical substances are discussed in detail.The Biochemical organization and Bioenergetics which will help the students to understand the concepts of biochemistry.

Course Outcome: The metabolism of complex biochemical compounds would make the students to gain a good knowledge about biochemical organization in the human system.

UNIT - I

(a) Biochemical organization of the cell, molecular constitutents of membrane, active & passive transport process, sodium and potassium pumps, osmoregulation and heamostatis.

(b) **Bio-energetics:** The concept of free energy, laws of thermodynamics.Determination of change in free energy from equilibrium constant & reduction potential.

(c) The respiratory chain & its role in energy capture & its control. Oxidative phosphorylation & its energetics & Electron Transport Chain, mechanism of actions. Production of ATP and its biological significance

UNIT - II

Enzymes & Co-enzymes: Classification, Structure, mechanism of action, properties, factors affecting enzymes action. Activators & de activators of enzymes, enzyme kinetics & enzyme inhibitions, repressions with reference to drug action.

UNIT - III

Metabolism of Carbohydrates: Biochemistry of carbohydrates, Glycolysis, glycogenesis, glycogenolysis, gluconeogenesis, Kreb's cycle, HMP shunt & uronic acid pathways, anaerobic respiration in muscle.

UNIT - IV

Metabolism of Proteins: Biochemistry of proteins, *Amino acid structure & classifications, de amination, Trans-amination, de-carboxylation, Urea cycle, Metabolism of* valine, cystine, cystein, tryptophan, tyrosine, methionine.

UNIT - V

a) **Metabolism of Lipids:**
Biochemistry of lipids, Alpha, Beta, Gama & Omega oxidations of fatty acids, bio-synthesis of fatty acids, cholesterol, ketogenesis.

b) Introduction to xenobiotic metabolism, detoxification mechanisms, biochemistsry and metabolism of nucleic acids and vitamins.

TEXT BOOKS

1. Harper's Biochemistry
2. A.L.Lehninger, Principles of Biochemistry.
3. Satyanarayana, Text Book of Biochemistry

REFERENCES

1. L.Stryer, Text Book of Bio Chemistry.
2. E.E Conn & P.K. Stumpf, Outlines of Biochemistry by, Publ, John Wiley & sons, New York.

PS403: PHARMACEUTICAL JURISPRUDENCE

B. Pharm II Year II Sem

L	T	P	C
4	1	0	4

Course Objectives: The objective of the course is to expose the students, all the laws and roles, which are vogues in the country. The scope of the course is extended to update the all the laws and roles including recent amendments taken place.

Course Outcome: The outcomes which are expected from the students at the end of the course are: Familiarization of the students with all the legal tenets and enforceable in the country, besides Pharmaceutical ethics and policies.

UNIT - I

Introduction

a. Pharmaceutical Legislations - A brief review
b. Drugs & Pharmaceutical Industry - A brief review
c. Pharmaceutical Education - A brief review.
d. Pharmaceutical ethics & policy

An elaborate study of the following

a. Pharmacy Act 1948
b. Drugs and Cosmetics Act 1940 and Rules 1945

UNIT - II

Medicinal & Toilet Preparations (Excise Duties) Act 1955
Drugs (Prices Control) Order 1995.

UNIT - III

Narcotic Drugs & Psychotropic Substances Act 1985 & A.P. N. D. P.S Rules 1986

UNIT - IV

Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 and Rules 1955.

UNIT - V

A. study of the salient features of the following.

a. Prevention of Cruelty to animals Act 1960.
b. AP State Shops & Establishments Act 1988 & Rules 1990.
c. Factories Act 1948.
d. WTO, GATT and The Indian Patents Act 1970
e. Pharmaceutical Policy 2002.

Note: The teaching of all the above Acts should cover the latest amendments.

TEXT BOOKS:

1. B.M.Mithal, Text book of Forensic Pharmacy, publ by Vallabh Prakashan
2. Prof. Suresh Kumar J.N, Text book of Forensic Pharmacy by. Frontline Publications
3. C.K.Kokate & S.B.Gokhale, Textbook of Forensic Pharmacy

REFERENCE BOOK:

1. Bare Acts and Rules Publ by Govt of India/state Govt from time to time.
2. AIR – reported judgments of Supreme Court of India and other High Courts

PS404: PHYSICAL PHARMACY – II

B. Pharm II Year II Sem	L	T	P	C
	4	1	0	4

Course Objectives: The student shall be taught on industrial phenomenon of liquids, rate & order of reactants, micromeritics, flow of liquids and type of colloids and their properties.

UNIT - I

Kinetics: Rates and orders of the reaction. Influence of temperature and other factors on reaction rates. Decomposition and stabilization of medicinal agents, kinetics in the solid state and accelerated stability analysis (relevant numerical problems).

UNIT - II

a. Interfacial Phenomena: Liquid interfaces, measurement of surface and interfacial tensions, adsorption at liquid interfaces. Surface-active agents and HLB scale. Adsorption at solid interfaces. Electrical properties of interfaces.

b. Colloids: Introduction, types of colloidal systems, solubilization, Stability of colloids, optical properties, kinetic properties, electrical properties and Donnan Membran equilibraium.

UNIT - III

Micromeritics: Particle size and size distribution, methods for determining surface area, methods for determining practicle size, pore size, particle shape and surface area, derived properties of powders.

UNIT - IV

Rheology: Newtons law of flow, Newtonian systems, non-Newtonian systems, thixotropy, measurement and applications in formulations. Determination of viscosity (study of working of different viscometers like cup and bob, Brookfield, ostwald's, cone and plate, capillary viscometers) and its applications.

UNIT - V

Coarse Dispersions: Suspensions: Types of suspensions, interfacial properties of suspended particles, stability evaluation, settling in suspensions, formulation of suspensions.

Emulsions: Theories of emulsification, physical stability of emulsions, preservation of emulsions, rheological properties of emulsions and suspensions.

Outcome: Student will know about influence of temperature and other factors on rate of reactants, interfacial phenomena, particle size & distribution, Newtonian and Non-Newtonian flows.

TEXT BOOKS

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences 5th Edition.

2. CVS Subhramanyam, Physical Pharmacy, Vallabh prakashan.
3. L. Lachman, H. Lieberman The Theory And Practice Of Industrial Pharmacy J. L Kaniz Lee & Febiger Philadelphia, USA

REFERENCE

1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
2. M.E. Aulton, Pharmaceutics –The science of dosage form design, 2nd edn

HS405: INTELLECTUAL PROPERTY RIGHTS
(Open Elective)

B. Pharm II Year II Sem

L	T	P	C
3	1	0	3

Course Objectives: Various types of Intellectual Property Rights Patentable Subject History of Indian Patent Protection, Patent filing procedure in India, Opposition- pre-grant opposition and post-grant opposition, Patent filing procedure under PCT, advantages, patent search and literature and Salient features of Indian Patents are discussed in detail.

Course Outcome: The clear information about the patent laws and intellectual property rights in India and abroad is gained by the students.

UNIT - I

Introduction, Types of Intellectual Property Rights (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), Structure of patent (Components of patents), Types of patent,non-Patentable

UNIT - II

Patentable inventions, essential requirements for patentability , (Novelty, Non-Obviousness, Utility, enablement and Best mode), patent writing skills and significance of claims

UNIT - III

a) History of Indian Patent Protection, Rationale behind Patent System, Objectives and Advantages of Patent System.
b) Patent filing procedure in India (Patent Prosecution), Specifications (Provisional and Complete), Claims- types of claims and legal importance of claims, Grant of patent, Rights of Patentee and co-owners
c) Opposition- pre-grant opposition and post-grant opposition, Anticipation, Infringement, Compulsory Licensing, revocation of patents, and power of Controller.
d) Salient features of Indian Patents (Amendments) Act 1999, 2002 and 2005.

UNIT - IV

Background, Salient Features and Impact of International Treaties / Conventions like

a) Paris Convention, Berne convention
b) World Trade Organization (WTO)
c) World Intellectual Property Organization (WIPO)
d) Trade Related Aspects of Intellectual Property Rights (TRIPS)

UNIT - V

a) a.Patent filing procedure under PCT, advantages, patent search and literature
b) Patent search, literature and prior art search
c) Non- infringement techniques and design around strategies

TEXT BOOKS

1. IPR Handbook for Pharma Students and Researchers- Bansal
2. Intellectual Property Rights in Pharmaceutical Industry: Theory and Practice- Subba Rao Bayya
3. Protection of Industrial Property rights by P.Das and Gokul Das

REFERENCE BOOKS

1. Research Methodology concepts and cases by Depak Chawla, Neena Sondhi
2. Draft manual of Patent Practice and Procedure -2008 , The Patent Office, India

PS405: HERBAL DRUG TECHNOLOGY
(Open Elective)

B. Pharm II Year II Sem

L	T	P	C
3	1	0	3

Course Objectives: Helps the students in getting exposed to method s of extraction

Course Outcome: Helps the students to understand the organization and research of natural products in herbal drugs industries.

UNIT - I

Herbal Extracts: types of Extraction methods such as Maceration, Percolation, Super critical fluid extraction and Ultra – Sonic extraction

Equipment for preparing herbal extracts: Process and equipments-Name of the equipment and its uses with merits and demerits in each of the following unit operations in the extraction process.

1. Size reduction
2. Extraction
3. Filtration
4. Evaporation/Distillation
5. Solvent recovery
6. Drying of extracts

UNIT - II

Excipients:

Definition ,classification of natural Excipients: Source, chemical ,nature, description parameters pharmaceutical uses and storage condition of following natural excipients, binding agents, disintegrating agents, diluents, emulsifying agent:

Acacia, Tragacanth, Alginates, CMC, Gelatine, Pectin, Lactose, Starches, Talc, Ointment bases, suppository bases and Hardening agents: Bees wax, Cocoa butter, Lanolin, Hard Paraffin.

UNIT - III

Manufacturing:

Methods of Preparation and Evaluation of Herbal Tablets, Capsules, Semisolid dosage forms and liquids- study of any tree formulations under each category with respect to their formulas and claims for various herbs used in them.

UNIT - IV

Herbal drug Standardization:

a) Definition and Need for the study of standardization. General flow of activities in standardization.
b) WHO guidelines on standardization Parameters: Botanical, Physic Chemical, Pharmacological, Toxicological standardization.

UNIT - V

a) Name of the different companies' manufacturing different herbal extracts, standardized

extracts with concentration of marker compounds, active principles and claims regarding their uses.

b) **Herbal drug regulatory Affairs:**Introduction, objectives of Herbal Drug Regulation, Current Status of Herbal Drug Regulatory Affairs.

TEXT BOOKS:

1. Textbook of Pharmacognosy by G.E.Trease, W.C.Evans,ELBS
2. Textbook of HPTLC by P.D. Seth.
3. Herbal Perfumes and cosmetics by Panda

REFRENCES:

1. Pharmacognosy by V.E Tyler, LR Brandy and JE Robbers (KM Varghese & co., Mumbai)
2. Indian Pharmacopoeia

BS405: GREEN CHEMISTRY
(Open Elective)

B. Pharm II Year II Sem

L	T	P	C
3	1	0	3

Course Objectives: Emphasis about the chemicals and solvents intermediates which are environment friendly during chemical synthesis of pharmaceutical products.

Course Outcome: The detailed study of Green chemistry in various reactions would help the students to understand the synthesis of organic compounds which are benign to environment and human life.

Basic principles, salient features and applications for the following units:

UNIT - I
Significance and importance of green chemistry and principles of green chemistry.

UNIT – II
Green chemical processes.

UNIT - III
Introduction to microwave synthesis.

UNIT - IV
Design and selection of safer chemicals and solvents.

UNIT - V
Use of catalytic reagent.

TEXT BOOKS:

1. Green Chemistry: Theory and Practice. P.T. Anastas and J.C. Warner. Oxford University Press.
2. Green Chemistry: Introductory Text. M. Lancaster Royal Society of Chemistry (London).
3. Introduction to Green Chemistry. M.A. Ryan and M.Tinnesand, American Chemical Society, (Washington).

REFERENCES:

1. P.Tundoet. al., Green Chemistry, Wiley –Blackwell, London (2007).
2. T.E Graedel, Streamlined Life cycle Assessment, Prentice Hall, NewJersey (1998).

PS406: PHARMACEUTICAL UNIT OPERATIONS - II LAB

B. Pharm II Year II Sem

L	T	P	C
0	0	3	2

List of Experiments:

1. Measurement of flow of fluids and their pressure, determination of reynold's number and calculation of frictional losses.
2. Evaluation of filter media, determination of rate filtration and study of factors affecting filtration including filter aids.
3. Experiments to demonstrate applications of centrifugation.
4. Determination of Humidity-use of Dry Bulb and Wet Bulb thermometers and Psychometric charts.
5. Determination of rate of evaporation.
6. Experiments based on steam. Extractive and azeotropic distillations.
7. Determination of rate of drying, free moisture content and bound moisture content.
8. Experiments to illustrate the influence of various parameters on the time of drying.
9. Experiments to illustrate principles of size reduction, Laws governing energy and power requirements of a size reduction.
10. Experiments to illustrate solid-solid mixing, determination of mixing efficiency using different types of mixers.

BS407: BIOCHEMISTRY LAB

B. Pharm II Year II Sem

L	T	P	C
0	0	3	2

List of Experiments:

1. To prepare standard buffers (citrate, phosphate & carbonate) and measure the pH.
2. Titration curve for amino acids.
3. Separation of amino acids by two dimensional paper chromatography & gel electrophoresis.
4. The separation of lipids by T.L.C.
5. Identification of carbohydrates
6. Identification of amino acid.
7. Identification of lipids.
8. Estimation of glucose in urine.
9. Estimation of creatinine in urine.
10. Estimation of urea in blood.
11. Estimation of creatinine in blood.
12. Estimation of Serum protein.
13. Estimation of bile pigments in serum.
14. Estimation of alkaline phosphatase in serum
15. Effect of temperature on the activity of alpha-amylase

PS408: PHYSICAL PHARMACY-II LAB

B. Pharm II Year II Sem

L	T	P	C
0	0	3	2

List of Experiments:

1. Determination of bulk density, true density and percentage of porosity.
2. Effect of particle size and effect of glidant on angle of repose.
3. Microscopic size analysis, plotting of the graphs, calculation of geometric mean, diameter etc.
4. Determination of particle size by andreason pipette.
5. Determination of CMC of a surfactant.
6. Adsorption Isotherm consturctions.
7. Partition coefficient determination.
8. Determination of sedimentation volume and degree of flocculation.
9. Determination of order of reaction – zero order
10. Determination of Order of reaction – First order.
11. Determination of Second order reaction rate constant.
12. Effect of temperature on solubility of solid in liquid.
13. Effect of addition of Salt/pH/cosolvent on the solubility
14. Surface tension determination using Stalagmometer.
15. HLB value estimation of surfactants.
16. Viscosity – by Ostwald Viscometer, Brookfield viscometer
17. Preparation of Multiple emulsions - Demonstration.
18. Preparation of Micro emulsion - Demonstration.
19. Determination of Zeta potential - Demonstration.
20. Determination of granular density
21. Preparation of emulsion, identification and evaluation

MC409HS: GENDER SENSITIZATION LAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	3	0

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT-I

UNDERSTANDING GENDER

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT-II

GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)

Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many? Struggles with Discrimination.

UNIT-III

GENDER AND LABOUR

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

ISSUES OF VIOLENCE

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu"*.

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT-V

GENDER: CO - EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXTBOOK

All the five Units in the Textbook**, *"Towards a World of Equals: A Bilingual Textbook on Gender"*** written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. *"I Fought For My Life…and Won."*Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/