॥ अंतरी पेटवू ज्ञानज्योत ॥

NORTH MAHARASHTRA UNIVERSITY, JALGAON

Syllabus for

B. PHARMACY

(SECOND YEAR)

(w.e.f. July, 2001)

NORTH MAHARASHTRA UNIVERSITY, JALGAON

SCHEME OF EXAMINATION OF B. PHARMACY,

SECOND YEAR B. PHARMACY.
(*With effect from July, 2001*)

Sr. No.	Subjects	Theory				Practicals			
		University		Sessional	Total	University		Sessional	Total
		Hrs.	Marks	Marks	Marks	Hrs.	Marks	Marks	Marks
2.1	Physical Pharmacy	03	80	20	100	04	80	20	100
2.2	Pathophysiology & Clinical Biochemistry	03	80	20	100	04	80	20	100
2.3	Organic Chemistry - I	03	80	20	100	06	80	20	100
2.4	Pharmaceutical Analysis - I	03	80	20	100	04	80	20	100
2.5	Elements of Calculus & Biostatics	03	80	20	100	--	--	--	--
2.6	Computer Application	02	40	10	50	--	--	--	--
2.7	Microbiology & Immunology	03	80	20	100	06	80	20	100
2.8	Business Mathematics	02	40	10	50			--	--
				Total:	**700**				**500**

Grant Total: 1200

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF B. PHARMACY COURSE & SCHEME OF TEACHING

SECOND YEAR B. PHARMACY

(With effect from July, 2001)

Sr. No.	Subject	Theory	Practical
2.1	Physical Pharmacy	03	03
2.2	Pathophysiology & Clinical Biochemistry	03	03
2.3	Organic Chemistry - I	03	03
2.4	Pharmaceutical Analysis - I	02	04
2.5	Elements of Calculus & Biostatics	03	--
2.6	Computer Application	01	01
2.7	Microbiology & Immunology	03	03
2.8	Business Mathematics	01	--
	Total :-	19	17

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SECOND YEAR B. PHARMACY SYLLABUS
2.1-Physical Pharmacy (Theory)
(3Hrs/week)

(With effect from July, 2001)

Section-I

TOPICS	Hrs
1. States of Matter: A. Gases and liquids Introduction: Real gases: Deviation from gas theory, effects of temperature and pressure compressibility factor; Critical phenomenon, Critical constant and determination; Vander waals equation and critical state, correction for pressure and volume, law of corresponding states (Equation only, no derivation), liquefaction of gases, Lindes process. Claudes process, Application of liquefaction to aerosols i.e. principle of aerosols, 2 phase and 3 phase system, mechanism of working of aerosols. B. Solids Crystallization ,factors affecting crystallization and crystal size: method of crystal analysis (X-ray crystallography) Braggs method and powder method; polymorphism: Defination, different shapes of polymorphs, examples and its application to pharmacy, mention detection techniques. NOTE:- Problems only using Bragges equation to calculate 'd' and 'n'	05
2. Thermodynamics: First law of thermodynamics: Various forms of first law, Concept of adiabatic, isothermal and reversible processes & enthalpy. Introduction to exothermic & endothermic reactions, heat of reaction, heat of formation, heat of combustion, Hesses law of constant heat summation; Second law of thermodynamic: Introduction; Third law of thermodynamics. Introduction, concept of Gibbs and Helmholtz free energy Note: No Derivations only equations.	06
3. Diffusion and dissolution Introduction and related phenomenon like Dialysis, osmosis, and ultrafiltration; laws of diffusion, measurement of diffusion ,dissolution studies apparatus, Noyes and Whitney equation.	07
4. Solution of non electrolytes: Properties and types of solutions, Ideal & real solution, Raoults law and deviation from it, Henrys law, Boiling point diagram, Azeotrops; Colligative properties: Lowering of vapor pressure- methods to study, problems	05

involving molecular weight determination, Elevation of boiling point , depression of freezing point, Osmotic pressure: semipermiable membrane and osmotic pressure, measurement of osmotic pressure, Van'Hoff & Morse equation for osmotic pressure.	
5. Solution of electrolyte: Electrolysis, conductance: Equivalent and specific conductance, conductometric titration, conductance and degree of dilution, Colligative properties of solution of electrolyte, Arrhenius theory and Debye- Huckel theory.	05
6. Solubility and distribution phenomenon : General principles, types of solvent, solubility of gases in liquids, effect of temperature, pressure, chemical reaction and salting out of gases, solubility of liquids in liquids, solubility of salts: solubility of slightly soluble electrolyte, solubility of weak electrolyte- influence of PH, influence of solvent, combine influence of PH and solvents, influence of surfactants: Distribution coefficient(Nernst coefficient), True and Apparent Distribution Phase rule – 1 component system(water); co-solvency	08

SECTION –II

TOPICS	Hrs.
1 **Chemical Kinetics:** Rate , order, and molecularly of reaction, mathematical treatment of zero order reaction, first order , second order reaction, half life of reaction and problems involving this; Complex reaction, determination of order of reaction ; energy of activation: effect of temperature, Arrhenius equation and shelf life determination, collision theory, and transition state theory. Accelerated stability studies.	06
2. **Interfacial phenomenon:** Surface tension & surface free energy; Young Laplace equation, measurement of surface tension and interfacial tension- capillary rise method, Du Nouy ring method, drop method, spreading of liquids; adsorption at liquid interfaces. study of surfactants including like wetting and antifoaming agent; HLB determination and importance with respect to suspension & emulsion, Adsorption isotherms- Detail discussion on Freundlich and Langmuir adsorption isotherm, electrical properties of	06

interfaces: Electrical double layer, Nernst and zeta potential, effects of electrolytes.	
3. **Colloids:** Introduction and types, size and method of preparation in brief, optical properties- Faraday Tyndall effect, light scattering and electron microscopy; Kinetic properties- Brownian motion, diffusion, osmotic pressure , Electrophoresis, electroosmosis (Problems on determination of Mol. Wt. Of colloids); Donnan membrane equilibrium and its application. Stability of colloidal system: Schulz Hardy rule, coacervation,; sensitization and protective colloids, solubilization of colloids: include factors affecting it ; Kraft point and Cloud point.	06
4. **Rheology:** Introduction, Newtonian system- Viscosity, Newton's law of flow, Non-Newtonian system- plastic flow, Pseudoplastic flow, dilatent flow, viscosity measurements- viscometer for Newtonian and non Newtonian system, thixotropy and its pharmaceutical significance, viscoelasticity, application of rheology to pharmacy.	06
5. **Physical properties of drug molecule:** Additives, constitutive and Colligative properties; Dielectric constant: Molar polarization (concept) Polarisability. Dielectric constants, permanent dipole moment and its determination, its significance to pharmacy; refractive index and molar refraction : defination, application and problems related.	05
6. **Micromeritics:** Introduction to fundamental & derived properties, Fundamental properties:- Particle size and size distribution, method to determine particle size, particle Shape and surface area, methods to determine surface area, pore size, derived properties, porosity and packing density and bulkiness, flow properties, compaction.	07
Total Hours:	**72**

BOOKS:

Text Books:

1. Physical pharmacy- Martin, Swarbrick and Commarata

Reference Book:

1. Elements of physical chemistry -Glasstone and Lewis.
2. Physical chemistry- Maron S. and Pruton
3. Remington's pharmaceutical sciences
4. Theory and practice of Industrial Pharmacy- Lachman and Liebermann
5. Physical Chemistry- Bahl and Tuli
6. Pharmaceutical Technology- Eugene Parrott.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SECOND YEAR B. PHARMACY SYLLABUS
2.1-Physical Pharmacy (Practicals)
(3Hrs/week)

(*With effect from July, 2001*)

1. Kinetics-
   A) First order kinetics
      a) Determination of degree of hydrolysis of given ester.
      b) Determination of relative strenngth of two acids
      c) Determination of degree of hydrolysis of urea hydrochloride
      d) Determination of order of reaction by equal fraction method.
   B) Second order reaction
      a) to find the degree of hydrolysis of a second order reaction when a=b
      b) To verify Oswald's dilution law for second order reaction
   C) Determination of energy of activation of acid hydrolysis of methyl acetate

2. Polarimetry
      a) Kinetics of inversion of cane sugar
      b) Determination of specific rotation of optically active substances and also its concentration in sample
3. Determination of molecular weight of a substance by ebulloscopic method
4. Surface tension
      a) Determination of surface tension of given liquid
      b) Determination of critical micelle concentration of surfactant with stalagmometer
5. Determination of HLB of glyceryl monosterate
6. Conductivity-
      a) Determination of normality of a given acid by conductometric titration
      b) Verification of Oswald's dilution law by conductometry
7. Determination of specific surface area of charcoal by adsorption method
8. Distribution coefficient
      a) Determination of partition coefficient of iodine between carbon tetrachloride and water
      b) Determination of partition coefficient of benzoic acid between water and benzene
9. Determination of critical solution temperature of phenol-water system
10. Determination of composition of binary mixture by viscosity method
11. Diffusion from an uncoated tablet using simple diffusion cell
12. Determination of viscosity by Brookfield viscometer (Demonstration only)
13. Determination of particle size distribution of any material by
      a) Sieve analysis
      b) Microscopy

Books :

1. Physical Pharmacy – Martin, Swarbrick and Commarata
2. Practical Physical pharmacy – Dr U B. Hadkar, T. N. Vasudevan, K. S. Laddha
3. Practical Pharmaceutical Technology – Engeen Parrot.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SECOND YEAR B. PHARMACY SYLLABUS
2.2- Pathophysiology and clinical Biochemistry (Theory)
(3 Hrs/week)

(With effect from July, 2001)

Section –I

TOPICS	Hrs
1. Introduction to subject	01
2. Water balance, osmolality, electrolytes, pH and blood gases: Introduction- water compartments, water balance, electrolyte distribution, physiologic mechanism which maintain fluid volume, osmotic concentration and ionic composition. Normal H+ concentration. Processes which defend normal pH range Types of acid base derangement's. The H2CO3- HCO3 buffer system. Deficiency of water and solute balance- deficiency of water relative to solute, with or without volume depletion- dehydration, hypernatremia, hyperosmolar states. Excess fluid and electrolyte (Na), Hypervolemia, Hyperkalemia, Hypokalemia. Prevention and management:- Disorders of acid base balance. Respiratory acidosis, respiratory alkalosis, metabolic acidosis, metabolic alkalosis. Arterial oxygen tension and Hemoglobin oxygen saturation- gaseous exchange blood gas transport, arterial hypozemia.	06
3. Disorders of gastrointestinal tract (GIT)- i) Disorders of oesophagus- Achalsia, gastrooesophagial refelx and oesophagatis, causes consequenses and management. ii) Disorder of stomach and small intestine- Peptic ulcer disease- acute ulcer, chronic peptic ulcer. Ulcerative colitis, Crohn's disease, Tuberculosis of intestine, Acute intestinal obstructions- cause and clinical presentation iii) Disorders of large intestine- Constipation, Diarrhea, Hirschsprung's disease(General disorders of GIT e.g. vomitting Nausea, Flatus etc. should also be covered) iv) Disorders of liver- infectious hepatitis, types of hepatitis, liver changes in viral hepatitis, assessment- course and complications. Alcoholic liver diseases – fatty liver , alcoholic hepatitis cirrhosis. Lacnnec's cirrhosis, portal hypertension, hepatic encephalopathy. v) Disorders of the gall bladder and bile ducts – Gall stone formation- types of gall stones assessments and management. Acute cholecystitis- cause and pathological changes vi) Disorders of exocrine pancreas- acute pancreatitis- alcohol induced, acute pancreatitis resulting from gall bladder and biliary tract disease, changes within the gland. Chronic pancreatic- cause, abnormalities, assessment and management.	10

4.	Renal disorders: Urine analysis- Macroscopic and physical examination. vol., color, odour, specific gravity, osmolarity. Quantitative and semiquantitative tests- pH, protein , glucose, ketone bodies, blood, bilirubin, uribilinogen, and leukocyte esterase, microscopic examination. Glomerular disease:- types of glomerulonephritis and nephrotic syndromes, Chronic renal failure Acute renal failure- Obstructive renal failure pre-renal acute renal failure, acute tubular necrosis Urinary tract infections and pylonephritis- lower urinary tract infection, acute pylonephritis, chronic pylonephritis.	12
5	Pain: Pain syndromes- Headache assessment structures involved in headache and headpain . Types of headaches- migraine, duster, muscle contraction, (tension headaches), headaches affecting elderly Joint pain:-Degenerative joint diseases- osteoarthritis, osteoarthrosis- types, causes and abnormalities assessment. Subjective, objective, signs and symptoms according to specific joint involvement laboratory and X-ray management. Rheumatoid arthritis- cause abnormalities, course and prognosis assessment- subjective, objective management. Gout- cause abnormalities, chronic changes, tophaceous gout- asymptomatic hyperuricemra, chronic gout, maintenance, the acute attack.	06
6.	Disorder of respiration: Neural and chemical regulation of respiration O2 and CO2 carriage and hypoxia. Chronic disorders- chronic obstructive pulmonary disease, asthma, diffuse interstitial lung disease. Acute disorder of respiratory system, aute respiratory failure, pneumonia, pulmonary embolism.	03
7.	Cerebrovascular system: Seizure, convulsion, and epilepsy. Neural basis of epilepsy, types of epilepsy. Eschemia infarction and intracranial haemorrhage, anoxia . brain death.	03

Section –II

TOPICS	Hrs
1. Introduction to clinical biochemistry	01
2. Use and interpretation of biochemical data- Diagnostic, prognostic and screening test . Normal and abnormal range. Concept of core biochemical tests like renal function test(RFTs), liver function test(UFB) etc. Specified test- harmones, specific test- HIV etc.	02
3. Clinical enzymology: Analytical, diagnostic and therapeutic uses of enzymes	01
4. Diseases related to carbohydrate metabolism- diabetes mallitus, galectosemia, glycogen storage disease , lactose intolerance test, glucose tolerance test.	03
5. Diseases related to protein metabolism- aromatic amino acid metabolism, sulphur containing amino acid metabolism, branched chain amino acid metabolism. Urea cycle disorder associated with urea cycle, disorder associated wit the mentioned amino acid metabolism. Kawashiorbur and Marasmus	03
6. Disorder related to lipid metabolism. Cholesterol metabolism and transport adipose tissue metabolism hyperlipidemia, fatty liver and lipotropic factors. Hyper lipoprotenous, atherosclerosis and obesity.	04
7. Liver function tests. Brief mention of functions of liver tests, functions of plasma proteins. Jaundice alcohol abuse, metabolism of alcohol. Chronic liver disease	03 01
8. Renal function tests- blood urea nitrogen, creatinin uric acid	01
9. Gastric function tests- Renin, pepsin fractional test meal, stimulation of gastric secretion, hypersecretion and its treatment	01
10.Thyroid function tests- determination of harmones- T3, T4, TSH uptake studies.	01
11.Pancreatic function tests- acute and chronic pancreatitis, serum amylase and serum lipase.	01
12.Nutrition –adequate diet, malaborption syndrome, intestinal and pancreatic, mal absorption, abnormal bacterial flora , steathorhoea.	01
13.Cancer- Types,Mechanism of carcinigenesis, mode of action of chemotherapeutic drugs.	03
14.Cardiovascular system:(CVS) Anatomy of heart, cardiac cycle, stroke volume, cardiac output, control of Heart rate and stroke volume. The failing heart- type of heart failure, causes of heart failure heart cell changes in the heart failure, consequences of decreased myocardial contractility. Clinical manifestation of congestive heart Failure and their pathophysiological basis, management of chronic heart failure. Blood supply to the myocardium ischaemic heart disease, coronary artery atherosclerosis- the process and consequences. Angina pectoris- types and causes. Diagnosis of ischaemic heart disease, management of ischaemia and angina pectoris- hypertension	08 03
15.Disorders caused by biological and environment agents: Etiological agent of diseases, diagnosis of effectius diseases- test selection, specimen collection and transportation, testing and data interpretation. Diarrhea,	02

food poisoning, STD-S typhoid, cholera, tuberculosis 16.Cell injury and inflammation:- Meaning terminology types . silent feature with examples. 17.Endocrine Diabetes- Types etc., thyroid- hypo/ hyper	01 02
Total hours :	**79**

BOOKS:

1 Practical clinical biochemistry- Harold Varley, A H. Gomerlock and Mourice Bell: 5th edition
2 Clinical chemistry in diagnosis and treatment 5th edition. J.F Ziwa, P.R. Pannall and P D. Mayne
3. Clinical chemistry(Principles, procedures , correction) edited by M L. Bishop, J.L. Duber, Von Laugen, Edward P Fody
4 Clinical biochemistry- F A Gowan et al
5 Clinical chemistry – Marshall
6. Physiology- Guyton
7 Physiology- V.D Joshi
8. Physiology- Chatteerjee
9 Robins pathologic basis of disease- 5th edition
10 Text book of pathology- Harsh Mohan (2nd edition)
11 Text book of pathology by IAPM- editors: S.J. Naglotimath, V H. talib, K.P. Deodhar

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SECOND YEAR B. PHARMACY SYLLABUS
2.2- Pathophysiology and Clinical Biochemistry. (Practicals)
(3 Hrs/week)

(With effect from July, 2001)

A) Introduction :-

I] Introduction to laboratory equipments & basic laboratory operations use & care of laboratory, glass ware & plastic ware, use of bulb for pipetting, use of gloves, mask & safety wear.

II] Instruments :-

a) Care & use of common laboratory instruments including microscope, colorimeters, centrifuge & balance
b) Distilled water, demineralised water & its testing.
c) Introduction to vortex mixer & magnetic stirrer.
d) Introduction to autoclave, Hot Air Oven, incubator.

III] Collection of urine, sputum, throat swab, stool collection, cerebrospinal fluid, urethral swab(only explanation). Collection & preservation of samples of hair, nail & skin scrapings.

B) Haematology :-

i) Specimen collection of blood, storage using diff Anticoagulant (to be done using any one), preparation of serum
ii) Routine Haematological test & their clinical significance.
iii) Determination of haemoglobin by Cyan methahaemoglobin method or any other suitable method.
iv) Determination of haemeotocrit.
v) Determination of total serum cholesterol by Lieberman – Burchard method
vi) Determination of serum triglycerides
vii) Determination of inorganic phosphorus & chlorides from plasma & their clinical significance.
viii) Study of stained blood smear of differential count & cell morphology with their clinical significance.
ix) Coagulation test, determination of prothrombin time & its clinical significance, mention of other parameters such as plasma recalcification time, thrombin time, thromboplastin time etc.
x) Bleeding disorders determination, whole blood clotting time by Lee-white clotting method, clot retraction & lysis.
xi) Visit to blood bank wherever facilities are available.

C) Urine analysis:

i) Routine examination of urine including color, pH , odour , appearance , their clinical significance, specific gravity. Determination by calibrated urinometre, R.I by hand refractometer.
ii) Microscopic examination of urine sediment (For RBC, WBC, epithelial cell, casts, fat bodies microorganism, crystal like calcium oxalate, sodium urate and uric acid, phosphate, crystal, eosin, and tyrosine crystals)
iii) Estimation of glucose by Benedict's reagent.

iv) Measurement of glucose by glucose meter(Demonstration)
v) Qualitative test for proteins and their clinical significance, sulphosalicylic test, Bence Jones, proteins- Ketone bodies, creatinin, clinical significance of microalbuminuria (Explanation only)
vi) Determination of albumin, globulin and total protein.
vii) Determination of bilurebin and blood in urine

D) Diagnostic Microbiology.
i) Microbiological examination of pathogens, systematic grouping of pathogenic bacteria into gram –ve , gram –ve, acid fast and others.(Spirochetes and filamentous bacteria e g. Nocardia and Actinomyces
ii) Classification of enterobacteriaceae(only explanation)
iii) Examination of swab from upper respiratory tract, nose, throat, nasopharynx and their clinical significance(explanation only)
iv) Examination of nose and ear exudates And skin flora(demonstration only)
v) Demonstration too grow anaerobic cultures by using anaerobic jar.
vi) Antimicribial susceptibility tests- Use of antibiotics and antibacterial disc for used for wound exudates, blood, pus and sputum

E) Enzymology
i) SGOT, SGPT, and LDH (Lactic dehydrogenase)
ii) Alkaline and acid phosphates

Reference:

1. Manual of clinical Lab procedure for Non- Routine problems- by : S. Winstane and F. dalal publication- CRC Press.
2. Clinical lab methods- john D Baver / Philip G. Ackermann / Gelson Toro
3 A workbook of clinical chemistry- Philip D Mayne, Andrew P Day
4 Clinical Chemistry – Interpretation & technique- Alex Kaplen, Laueren L szabo. Kent e. Ophein
5. Fluoromeric technique in clinical chemistry – Lecitch Fraclin R.
6. Text book of clinical (medical) biochemistry and immunology- Dr. S Ramakrishnan, Dr. Rajiv Swami
7 An introduction to practical biochem- Plummer Tata
8. Practical clinical enzymology - J. king
9. Handbook of expt. Physiology and biochemistry - Dr P.V Chadha Jaypee brothers Dehli.

Text Book:

1. Medical Laboratory technology Vol I, II & III by Kinari L. Mukherjee.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SECOND YEAR B. PHARMACY SYLLABUS
2.3- Organic Chemistry-I (Theory)
(3 Hrs/week)
(*With effect from July, 2001*)
Section- I

TOPICS	Hrs
1. IUPAC Nomenclature - a) Alkanes, alkenes, alkynes, alkylhalides, nitroalkanes, alcohols, ethers, aldehydes and ketones, phenols, esters, carboxylic acids, acid halides, amides, cyanides, anhydrides, sulphonic acids, amines. b) Compounds containing more than one functional group	06
2. Classes of reactions and classes of reagents including electrophiles, nucleophiles and radicals.	04
3. Transient reactions intermediates : Carbocations, Carbanions & Carbenes- Generation, Structure, Stability and reactions	02
4. Factors affecting electron availability in bonds and at individual atoms – electronegativity, inductive effect and resonance effect including rules of resonance Concept of Tautomerism, types of tautomerism	05
5. Theories of acidity and basicity; Inductive and resonance effects on acidity and basicity.	04
6. Energy profile Diagrams, Energetic of reactions, Energy Profile Diagrams and Kinetic and Thermodynamic control of the reaction	02
7. Brief description of methods of formation of alkyl halides and nucleophilic substitution at saturated carbon SN1 and SN2 reactions : Mechanism and Stereochemistry (examples of compounds containing one asymmetric carbon atom only) Factors affecting substitution : Substrate structure nature of nucleophile, nature of leaving group and solvent.	08
8. Alkenes : Preparations and Reactions E1 and E2 elimination- Mechanism and Stereochemistry. Saytzeff and Hofmann rules. Factors affecting substitution v/s elimination. Addition reaction of alkenes : Mechanism, Regioselectivity (Markonikov and anti- Markonikov) in addition of hydrogen, halogen, hydrogen halide, halohydrin formation, oxymercuration Demercuration hydroboration-oxidation, hydroxylation, allylic substitution (using NBS) and ozonolysis.	08
9. Conjugated dienes : Structure, Electrophilic addition to dienes : 1,2 & 1,4-addition, Diels Alder Reaction : (Mechanism only)	02
10. Alkynes : General methods of preparation and reactions	02

Section– II

	TOPICS	Hrs.
1	Hazards & safety in Chemical Laboratory : Organic general consideration Conduct in lab personal protection, storage of chemicals and waste disposal Explosion and fire hazards Explosive compounds, fire hazards, potentially dangerous mixtures. Reactive inorganic reagents · Strong acids, Strong bases, halogens, and reactive halides. Hazards due to toxic chemicals . Highly toxic solids, Dangerously toxic gases, Dangerously toxic liquids and severe irritants. Treatment for Electric shock, gas leak, bleeding, burns and scalds, spillage.	02
2.	Introduction to Steroisomerism · Meaning of constitution, configuration and conformation Concept of optical isomerism in compounds containing one asymmetric carbon atom (R/S nomenclature not expected)	03
3	Alcohols and Ethers : General methods of preparation including Grignard reactions. All general reactions including Lucas Test Ethers : General methods of preparation and reactions.	04
4.	Benzene and aromatically · Huckel rule, resonance in benzene and derivatives. Mechanism of electrophilic aromatic substitution : Halogenation, Nitration, Sulphonation and Friedel craft s reaction, orientation and reactivity in Electrophilic aromatic substitution Mechanism of nucleophilic aromatic substitution Addition- elimination and elimination – addition (reactions involving benzyne intermediate)	10
5	Aldehydes and Ketones . General methods of preparation, mechanism of Nucleophilic addition and condensation reactions · Acetyl, amine, oximes, hydrazones, semicarbazones, examine preparation and use Addition of Grignard Reagents and hydrides, MPV reduction, Oppenaur oxidation, Aldol Condensation. Cannizzarro's reaction, Reformatsky reaction, Perkin reaction, Knoevenagel reaction, Haloform reactions and Mannich reaction	12
6.	Carboxylic acids (aromatic & aliphatic): Methods of preparation and reactions Functional derivatives of carboxylic acids: Acid halides, Anhydrides, Esters and Amides – General methods of preparation and reactions Mechanism of esterification, transesterification and ester hydrolysis.	07
7	B- Keto esters · Mechanism of Claisen and Dieckmann reactions. Use of aceto acetic ester and malonic ester in synthesis. Unsaturated compounds : Michael Addition and addition of Grignard Reagents.	04
8.	Amines · General methods of preparation and reactions Hinsberg methods of separation of amines. Use of diazonium salts in synthesis	02
9.	Phenols · Preparation and reactions	04
10.	Sulphonic acids : Preparation and reactions.	04
	Total Hours:	**75**

RECOMMENDED BOOKS:

1 Organic Chemistry Morrison & Boyd
2. A Guide to reaction Mechanism in organic Chemistry · Peter sykes.
3 Principles of Organic Chemistry: R.O C Norman
4 Fundamental of Organic Chemistry: I.L Finar (Vol I & Vol II)
5. Principles of Organic Chemistry: T.A Geissman
6 Basic principles of organic chemistry. John D. Robert & Majorie C Caserio
7 Organic Chemistry James B Henricson, Donald J. Crain

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SECOND YEAR B. PHARMACY SYLLABUS
2.3- Organic Chemistry-I (Practical)
(3 Hrs/week)
(*With effect from July, 2001*)

1. Synthesis
   a) Benzoylation
      Schotten – baumann Reaction
      Benzanilide, phenylbenzoate / B- napthyl benzoate
   b) Sulphonation:
      Sodium p-toluenesulphonate
   c) Bromination:
      p-bromoacetanilide, 2,4,6- tribromoaniline
   d) Nitration :
      m-dinitrobenzene, p-nitroacetanilide
   e) Oxidation
      benzil, benzoic acid(from toluene)
   f) Reduction
      m-nitroaniline (from m-dinitrobenzene)
2. Qualitative analysis- one compound of each group
   a) Carbohydrate
   b) Alcohols
   c) Phenols
   d) Ethers
   e) Aldehydes
   f) Ketones
   g) Esters
   h) Hydrocarbons
   i) Acids
   j) Amines
   k) Basic compounds
   l) Miscellaneous

Recommended books:

1. Vogels textbook of practical organic chemistry
2. Practical organic chemistry by F.G, Mann and B.C. Saunders
3. Qualitative Analysis in organic Chemistry By Prof. V.V Nadkarny & Dr. P.S. fernandes
4. A laboratory hand – book of organic qualitative analysis and separation by V.S. Kulkarni and S.P. Pathak

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SECOND YEAR B. PHARMACY SYLLABUS
2.4-Pharmaceutical Analysis-I (Theory)
(2Hrs/week)

(*With effect from July, 2001*)

Section-I

TOPICS	Hrs.
1. Introduction: Defination and scope of pharmaceutical analysis Introduction to analytical techniques into volumetric, gravimetric, gasometric and instrumental technique Introduction to official compendia & monograph therein (Monograph of aspirin, paracetamol and calcium gluconate powder)-impurities- sources and limits Introduction to application of statistical techniques to pharmaceutical analysis: SD. %CV & test for significance Types of errors: Concept of errors, the mean, median, absolute and relative errors; precision, accuracy and relative precision, significant figures Classification of errors: Determination and indetermination errors. Determinate errors: Instrumental, operational and personnel or human errors.	04 04
2. Safety in analytical laboratory: Importance of safety, (fire and explosion, toxic hazard, waste disposal, foreign particles in the eye) Different hazards Dangerous properties of chemicals (flammable liquids, corrosive irritants, toxic chemicals, compressed gases) Prevention of harm: prevention of harm: Precautionary labels, safety materials, charts and proper labels, warning in handling the hazardous chemicals. Treatment: Electric shock, gas leak, Bleeding, Burn and scalds, spillage	 04
3. Official methods of control: Standardization of pharmaceutical chemicals (raw material analysis and formulated products (finished product analysis, FDA)- Use of Primary and Secondary standards. Manufacturing variations, storage, conditions of use and dosage forms Qualitative bench reagents, their preparation, care, storage and shelf life. Official monographs for pharmaceutical chemicals describing the following tests, their importance and determination : Melting point, Boiling point, optical rotation &specific optical rotation, osmomolarity, powder fineness, Refractive index, Viscosity. Test for identity, physical constants, chemical; methods, (Quantitative assay), Limit if impurities and storage conditions.	

(Monograph[h of Aspirin, Paracetamol and Calcium gluconate powder only to be studied).	
4. Theoretical basis and technique of quantitative analysis: Defination of- Solute solvent, solution, molarity, equivalent weight, stoichiometry & calculating the factor in the following reaction (in neutralization reaction, in complexation reactions, in precipitation reactions, in oxidation reduction reactions), parts per million, molarity, normality, calibration of volumetric apparatus, balances and weight box. Aqueous acid-base titration: Law of mass action, endpoint detection & neutralization indicators, theory of indicators.(no chemical structure should be included) preparation and standardization of 1 N NaOH. 1N NH_2SO_4, 1N HCl and 1N Na_2CO_3. (Refer I.P. for preparation and standardization) Application to I.P. products- Assay of aspirin powder, Boric acid powder, Ephedrine powder and Benzoic acid powder Titration in Non-aqueous solvent: Theory:- Protogenic and protophilic solvents, Amphiprotic and aprotic solvents standardization and preparation of 0.1 N perchloric acid (Refer I.P. for preparation and standardization) Application of I.P. products: Assay of Mebendazole powder, Atenelol powder, \norfloxacin powder, Karl Fischer method	08
5. Organically bound metals and non metals: Theory of oxygen flask combustion technique. Determination of Organically bound Iodine, Mercury Nitrogen determination by Kjeldahl's method. Application: Nitrogen determination by Kjeldahl's method. (saccharin B.P) Discussion on assay of organic compounds containing Gold (Sodium Aurothiomate B.P.), silver(mild and strong silver proteins. N.F., Zinc (Zinc Undecylenate, U.S.P). Lead (Lead acetate N.F.), Manganese(Manganese sulphate B.P.C.)	05

Section-II

TOPICS	Hrs.
1. Volumetric titration: A) Complexometric Titration: Theory , detection of Endpoint, Metallochrome indicators (no chemical structure should be included) Masking and Demasking agents. Preparation and standardization of EDTA, Pb nitrate. (Refer I.P. for preparation and standardization). Application to I.P. products:- assay of ZnSO4 powder, Calcium gluconate powders and injections.	20

B) Oxidation-reduction titration. Theory, oxidation reduction indicators(self indicator, internal indicator) (No chemical structure should be included) Preparation and standardization of potassium permanganate solution (Refer I.P. for preparation and standardization). Application to I.P. products:- Assay of Ferrous sulphate powder Preparation and standardization of 0.05 N cerric ammonium sulphate Application to I.P products:-assay of ascorbic acid tablets, Ferrous fumarate table and ferrous sulphate powder C) Argentimetric titration: Theory, Preparation and standardization of 0.1 N AgNO3(Mohrs method and volhard's method), adsorption indicator Application: potassium Chloride and sodium Chloride injection D) Titanous Chloride Titration: Theory, Preparation and standardization of 0.1 N Titanous Chloride Application: assay of Methylene Blue. E) Sodium nitrite titration: Theory, Preparation and standardization of 0.1N $NaNO_2$ Application: Assay of sulphanilamide. F) Iodometric titration Theory, Preparation and standardization of Iodine Application. Assay of Isoniazide(INH).(Powder or tablet)	
2. **Principles of gravimetric analysis**: Principle, theory and applications - assay of sodium sulphate and alum by Oxime reagent.	05
Total Hours:	**50**

BOOKS:

1. Grant -Statistical Quality Control (MaGraw Hill).
2. Lamprecht- Implementing ISO-9000 series (Dekker)
3. Instrumental methods of analysis- Willard, Dean
4. Instrumental methods of analysis-Ewing.
5. Pharmaceutical analysis-Higuchi and brochmann
6. The quantitative analysis of drugs- Garrat
7. Analytical chemistry- MEITES H.B.
8. IP, USP,BP, European Pharmacopoeia, International pharmacopoeia
9. Analytical profiles of drug substances –Florey
10. Analytical chemistry- garry Chrisian
11. Principles of instrumental analysis- Skoog
12. Chromatography- Heftmann.
13. Chromatography-Browning
14. Quality assurance Guide- OPPI
15. Quality control handbook-Juran
16. Dangerous properties of industrial materials 5th edition- N. Irwin sax
17. Safety and accident prevention in chemical operation –Howard H. fawcett
18. Improving safety in chemical laboratory- A Practical guide- Jay A Young
19. Merck Index
20. Vogel textbook of practical organic chemistry- 4th edition
21. Guide for safety in chemical laboratory- 2nd edition- Van Nostrand Reinhold co.
22. Hazzards in chemical laboratory- 2nd edition –G.D. Muir Laboratory safety, principles and practices 2 nd edition- Diane O. Fleming, John H. Richardson
23. Pharmaceutical Analysis vol.-1A.V Kasture and S D. Wadhorkar.

Text book:

1 Practical pharmaceutical chemistry, part-I & II by Beckett and Stenlake

NORTH MAHARASHTRA UNIVERSITY, JALGAON.
SECOND YEAR B. PHARMACY SYLLABUS.
2.5-Elements of Calculus & Biostatastics. (Theory)
(3hrs/week)
(With effect from July, 2001)

Section-I

	TOPICS	Hrs.
1.	**Differential Calculus :-** Successive derivatives, Leibniz's rule for n^{th} derivatives, Lanrange's mean value theory (statements only), Roll's mean value theory (statements only), Taylors & Maclaurins series (without proof) with application curvature.	10
2.	**Partial Differentiation :-** Functions of two or three variables, Euler's theorem on homogenous f^n, change of variables (i.e. transformation of independent variable), application of errors & minima.	06
3.	**Integral Calculus :-** Integration by substitution, Integration by parts, properties of definite Integrals, reduction formulas.	10
4.	**Application of Integration :-** Rectification, areas of plane regions, volumes & surface revolution.	06
5.	**Differential equations :-** Formation of differential equation, solution of first order & first degree equations, linear differential equations of higher order with constant coefficients	06

Section-II

	TOPICS	Hrs.
1)	**Determinants & Matrices :-**Properties of determinants & applications, solutions of simultaneous equation with three variables by cramers method, type of matrices, inverses of matrix, rank of matrix, eigen values & vectors, claey Hamilton theorem.	10
2)	**Numerical Methods :-** Finite difference operators (Δ&E), Interpolation of equal & unequal intervals, Newton's method & Lagrange method. Numerical integration--- Trapezoidal rule, Simpson's $1/3^{th}$ & $3/8^{th}$ rule.	06
3)	**Measure of central tendency :-** Arithmetic mean, median & mode, measure of dispersion, range, quartile deviation, coefficient of variation, moment skewness & kurtosis.	08
4)	Probability expectation & variance, Binomial distribution, poisson distribution & normal distribution.	06
5)	Correlation of measurement, Linear regration analysis.	04
	Total Hrs. :-	72

Books :-

1) Introductory course in differential equations - Daniial Murvay.
2) A Textbook of matrices - Shantinarayan.
3) Integral Calculus - Shantinarayan.
4) A course in Mathematical statistics. - C.E. Weatherburn.
5) Introduction to biostatics - Mahajan.

NORTH MAHARASHTRA UNIVERSITY, JALGAON.
SECOND YEAR B. PHARMACY SYLLABUS.
2.6-Computer Applications. (Theory)
(1hr/week)
(*With effect from July, 2001*)
Section-I

TOPICS	Hrs.
1) **Fundamentals** :- The basic anatomy of computers, components of computer system viz - memory, CPU, various input-output units, low-high level languages, units of sizes (capacity), system software, application s/w. utility s/w, IBM compatible personal computer & its components.	06
2) **Operating system** :- Introduction & need, MS-DOS operating system, internal command, external command, batch file.	08
3) **Windows** :- Introduction, system requirement. a) Desktop metaphor - Program manager, group icon. title bar, work space, scroll bar. b) Mouse uses & terminology.:- Term - point, click, click & hold, drag & drop, double click, windows as icons. c) Windows elements.:- The control menu, menu bar & pull down menus, scroll bars, borders - resize of window border to any size. d) Multitasking with windows. - opening/running the several applications at the same time. e) Clipboard.:- cutting & pasting, with clip board. f) Exiting of windows.:- saving setting on exit & exit method	08 12
4) **Lotus 1-2-3** :- Introduction, using keyboard, basic skills, menu commands, command indicating, range of cells, moving pointer, constructing blank forms, changing entries into the cells, sorting the worksheet, using scientific formulae for calculation, graphs queering the worksheet, keyboard macros.	12
5) **Database management system (DBMS)** :- What is database? Commands for adding records, editing records, viewing all the records, viewing one record at a time as per the condition, creating labels, reports, sorting the database in ascending & descending order.	

Books :-

1) Donald Sanders - Computer Today (3rd edition) - McGraw - Hill Book Co
2) William & Fassett - Computer Application in Pharmacy
3) Computer - Aided Drug Design (Methods & Application) -Editor- Thomas Perun.
4) Computer Medicine- By J Rose
5) Computer Programming - By Sneha Phadake.
6) Windows 3 1 made easy by Tom Shelder.

NORTH MAHARASHTRA UNIVERSITY, JALGAON.
SECOND YEAR B. PHARMACY SYLLABUS.
2.6-Computer Applications. (Practicals)
(1hrs/week)
(With effect from July, 2001)

1) Calculation of mean & variance.
2) Preparation of frequency table.
3) Sorting of numerical data.
4) Sales analysis - Find area wise & salesman wise % of sales.
5) Inventory control - Designing a payroll system & library management system.
6) Generation of graphs
7) Batch file programming.
8) Simpson's 1/3 rule & trapezoidal rule.
9) Windows - a) Creation of program icon.
   b) Resizing of windows.
   c) Mouse tutorials.
   d) Switching from one application to another.

Books :-

1) Computer & common sense. - Roger Hunt & John Sheiley.
2) Your IBM PC made easy. - Johathan Sachs.
3) Computer concepts & application - Donald Sander.
4) International to Lotus 1-2-3. - Taxali & Chopra.
5) Understanding dBase III plus. - Allen Simpson.
6) Dbase III made simple with Dbase IV & Foxbase. - Taxali.
7) Computer Programming I . - Sneha Phadke.
8) Windows 3.1 made easy. - Tom Shelder.

NORTH MAHARASHTRA UNIVERSITY, JALGAON.
SECOND YEAR B. PHARMACY SYLLABUS.
2.7-Microbiology & Immunology. (Theory)
(3hrs/week)
(With effect from July, 2001)
Section-I

TOPICS	Hrs.
1) **Scope of Microbiology** :- Historical development, applications to pharmaceuticals.	01
2) **Classification of Micro-organism** :- in to bacteria, yeast, fungi, rickettsia & viruses. Introduction to microscopy (optical, electron, phase contrast, etc.)	02
3) **Biology of micro-organisms** :-	10
a) **Bacteria** :- Size & shape, structure, cell wall, cytoplasm, capsules, spores (properties, formation, germination), locomotion, reproduction, genetic exchange (transformation, conjugation & transduction), bacterial growth, growth requirement, culture media, growth curve, measurement of bacterial growth & mean generation time. Counting methods (total count & viable count), Identification, biochemical tests-pathogenic properties, endotoxins & exotoxins, characteristics of disease causing bacteria(Staphylococcus, Streptococcus, Diplococcus, Neisseria, Clostridium, Corynebacterium, Pseudomonas, Vibrio, Pasteurella, Hemophillus, Escherichia, Salmonella. Shingella, Proteus, Klebsiela, Helicobacter, Champylobactor, Mycobacterium, Treponema, Leptospira.)	03
b) **Yeast & Fungi** :- Introduction, characteristics & application of Sacharomyces cerevisiae, Penicillium & Aspergillus. Clinical significance of Epidermiphyton, Microsprum & Trichophyton.	02
c) **Rickettsia** :- Introduction. clinical significance & applications.	06
d) **Viruses** :- Introduction, general properties(size, nucleic acid content, metabolism), structure of viruses (helical symmetry & icosahedral symmetry), effect of chemical & physical agents on viruses, virus-host cell intraction, bacteriophage & its epidemiological uses.(lytic & lysogenic growth cycle), human viruses & their cultivation in cell culture, chick embryo & animal inoculation, multiplication of human viruses, Interferon, HIV, tumour viruses, prions.	
4. **Sterilisation & Disinfection** :-	08
a) **Sterilisation** :- Definition, classification into thermal & non-thermal methods, details of hot air sterilisation, autoclaving, gaseous, radiation, sterile filtration(method of packaging & equipment to be used should also be covered), bioburden determination, sterilisation monitors(physical, chemical & biological indicators). Sensitivity of micro-organisms, survivor curves, expression of resistance(D-value & z-value), Sterility assurance, Applications of autoclaving for sterilisation of rubber gloves, dressings, surgical instruments, syringes	08

& needles. b) **Disinfection** :- Definition, chemical classification, mode of action, factors affecting choice of antibacterial agent, factors affecting disinfection process, evaluation of disinfectant(RW coefficient, Kelsey-sykes test), dynamics of disinfection. 5) **Microbial Epidemiology** :- Portal of entry(respiratory tract, intestinal, urinogenital, skin & conjunctiva.). resistant to host defence, inflammatory response, avoidance of phagocytosis, manifestation of disease, damage to tissues.	03

Section-II

TOPICS	Hrs.
1) **Fundamentals of Immunology:-** a) **Immunity,** types, concept, T-cell, B-cells, types & structure of immunoglobulins, antigens, types of antigens, antisera.	04
b) **Pathogen & pathogenicity(virulence),** attenuation, exaltation, defence mechanisms of host, specific & non-specific defences(including types as skin & mucous membranes, phagocytosis, complement system, inflammation, host damage with exotoxins & endotoxins), monoclonal antibodies & their applications.	08
2) **Immunoregulation** :- Autoimmunity, different types of hypersensitivity(anaphylactic reaction, cytolytic reaction, complex mediated reactions, delayed hypersensitivity & stimulatory hypersensitivity), tissue transplantation & rejection.	06
3) **Vaccines** :- Introduction, live & killed vaccines, manufacturing(seed-lot system, fermentation, harvesting, blending, filling & drying). Quality control(identity, sterility, potency, safety). Bacterial vaccines & toxoids (tetanus, TAB, cholera. BCG, DPT), viral vaccines(small pox, polio [salk & sabin], rabies, MMR, hepatitis, chicken pox), antitoxic antisera (tetanus, diphtheria), antiviral antisera (rabbies).	08
4) **Clinical immunology** :- Introduction, immunodeficiency diseases(graft versus host diseases, rheumatoid arthritis), haematological diseases(leukaemia), allergic diseases, GIT(hepatitis, acute viral hepatitis, chronic hepatitis) & liver diseases, cardiac(good Pasteur's syndrome), renal diseases(glomerulonephritis-immune complex), dermatological diseases(candidiasis), neurologic diseases(myasthenia gravis), eye diseases(ocular sarcoidosis), parasitic diseases(malaria).(tables of each & one example in details)	08
Total Hrs. :-	77

References :-

1) Fundamentals of Microbiology. Frobisher.
2) Microbiology Wistreich & Lechtman.
3) Microbiology an introduction Tortora.
4) Microbiology, fundamental applications Purohit.
5) Immunology Joshi.
6) Immunology Stites, Terr & Parslov.
7) Clinical aspects of Microbiology Lachmann, Peters, Vol-I, II & III
8) A text book of Microbiology P. Chakrabarty..
9) Elementary Microbiology Modi.
10) General Microbiology Pawar & Daginawala
11) Pharm. Microbiology Hugo & Russel.
12) Tutorial Pharmacy Cooper & Gunn.

NORTH MAHARASHTRA UNIVERSITY, JALGAON.
SECOND YEAR B. PHARMACY SYLLABUS.
2.7-Microbiology & Immunology. (Practicals)
(3hrs/week)
(*With effect from July, 2001*)

1) Study of microscope & other lab. App.
2) Preparation & standardisation of nutrient borth, agar slants, stabs plates.
3) Techniques of inoculation on different types of media (cocci & bacilli)
4) Study of growth pattern of micro-organism on selective media.
5) Identification of isolated bacteria by various staining methods.
6) Observation of prepared(permanent)studies of malarial parasitism pathogenic fungi(Candida albicans, epimermophyton, flocossum or trichophyton rubrum, yeast infection), Mycobacterium tuberculosis sputum.
7) Study of yeast aspergillus & penicillium with respect to morphology.
8) Isolation of pure culture by pour plate & streak plate method
9) Study of metabolic characteristics of micro-organisms
10) Determination of thermal death temp. & time.
11) Determination of probability of water by MPN
    -- IMVIC test.
    -- TPC (total plate count)
12) Phenol coefficient of disinfectant by RW-coefficient.
13) Serological diagnosis of Typhoid by Widal test.
14) Antibiotic sensitivity of microbes by multidisc method.
15) Determination of microbial count of air by any suitable method.
16) Sterility testing of different pharmacological products.

References :-

1) Microbiological applications - A laboratory manual in general microbiology. 5th edition - Harold J Benson.
2) Microbiological Methods 7th edition - Collins & Lyne's.
3) Tutorial Pharmacy - Cooper & Gunn's.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
SECOND YEAR B. PHARMACY SYLLABUS
2.8- Business Mathematics (Theory)
(1 Hrs/week)

(With effect from July, 2001)

Section –I

TOPICS	Hrs
8. National Income Analysis and contribution of Pharmaceutical Industry to National Income. Pharmaceutical Industry as a component and function of national Income	01
9. Theory of the firm & objective of the firm.	01
10. Demand Analysis a) Demand Theory b) Characteristics of Demand c) Price income and cross elasticity of demand d) Demand estimation e) Demand forecasting	05
11. Cost volume profit analysis a) Break- even analysis b) Cost- benefit Analysis	03 03
12. Pricing * DPCO-only reference to made Types of competition- Products and firm Transfer pricing	01
13. Analysis of annual reports of pharmaceutical firm (including ratio analysis) to indicate the health of the firms and the industry **NOTE:** Illustration and case-studies will be taken from Pharmaceutical industry to illustrate the above concept.	

BOOKS:

1. Managerial economics in a global economy- Dominick Salvatole
2. Introduction to management accounting by Charles T. Holngeen Prentice Hall of India Publications.
3. Introduction to economics by Samuelson and Nordhams (16th Edition).

Section- II

Business Finance including cost accounting

TOPICS	Hrs
1. Financial statements	02
a) An overview of income statement and balance sheet (Vertical form)	
b) Understanding of each item appearing in the income statement and balance sheet	
2. Financial statement analysis	03
Understanding the income statement and balance sheet with the help of following accounting ratios:-	
A) Balance sheet ratios:	
a) Current ratio	
b) Liquid ratio	
c) Proprietary ratio	
d) Capital Gearing Ratio	
e) Debt equity ratio	
f) Stack working capital ratio	
B) Revenue statement ratio:	
a) Gross profit ratio	
b) Expences ratio	
c) Operating ratio	
d) Net operating profit ratio	
e) Net profit ratio	
C) Composite ratios:	
a) Return on capital employed (Include long term borrowing)	
b) Return on proprietors funds (equity shareholders funds, preference capital)	
c) Return on equity capital	
d) Earnings per share	
e) Divided pay out ratios	
f) Price earnings ratios	
g) Debtors turnover	
h) Stock turnover ratio	
i) Creditors turnover	
j) (Excluding problems on preparation of balance sheet from given ratio)	
3. Cost Accounting	03
a) Objective	
b) Element of cost	
c) Nature of cost	
d) Job cost sheet	
e) process costing (Simple, Excluding WIP)	
4. Budgeting	03
a) Meaning and purpose of budgetary control	
b) Organization for budgetary control	
c) Preparation of Functional budget	
d) Master Budget	
e) Fixed and flexible Budgeting	
Total Hours:	**25**

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