

SNDT Women's University

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Syllabus – M. Sc. Analytical Chemistry



SNDT Women's University
1, Nathibai Thackersey Road,
Mumbai 400 020
Revised – 2008

Eligibility:

B.Sc. Chemistry

B.Sc. Microbiology with 5 Units in the subject of Chemistry

Objective:

- a) To provide access to the field of higher education for women.
- b) To provide a job-Oriented course to meet the socio-economic demands.
- c) To arrange in-plant training programme to provide opportunities for experiential learning.
- d) To Develop scholarship and research in emerging areas of study.
- e) To achieve excellence in the academic disciplines, research and extension activities through emphasis on 'Quality in every activity'

SYLLABUS FORMAT**Faculty Name: Science****Course Name : M Sc. – Analytical Chemistry****SCHEME:****Semester I**

	Subjects	L	Cr	P	D	TP	TW	P/V	T
1	Analytical chemistry Paper I	4	10	12	3	100	50	50	200
2	Food Analysis	4	10	12	3	100	50	50	200
Total		08	20	24	6	200	100	100	400

Semester II

	Subjects	L	Cr	P	D	TP	TW	P/V	T
1	Analytical Chemistry II	4	10	12	3	100	50	50	200
2	Pharmaceutical Analysis	4	10	12	3	100	50	50	200
Total		8	20	24	6	200	100	100	400

Semester III

	Subjects	L	Cr	P	D	TP	TW	P/V	T
1	Advance Analytical Chemistry I	4	10	12	3	100	50	50	200
2	Organic Analysis	4	10	12	3	100	50	50	200
3	Packaging & Drug Laws	4	10	--	3	100	--	--	100
Total		12	30	24	9	300	100	100	500

Semester IV

	Subjects	L	Cr	P	D	TP	TW	P/V	T
1	Advance Analytical Chemistry II	4	10	12	3	100	50	50	200
2	Microbiological Method of Analysis	4	10	12	3	100	50	50	200
- 3	Cosmetic & Water Analysis	4	10	12	3	100	50	50	200
Total		12	30	36	9	300	150	150	600

Industrial Training: At the end of the IV Semester, the Students go for 2 Months Industrial Training.

L = No. of Lectures / week, P / T = Practical / Tutorial in hrs, D = Duration of Theory paper for Examination in hrs, TP = Theory Paper-marks, Internal = Internal Assessment in marks, P/V = Practical / Viva Voce - marks, T = Total

Semester I

	Subjects	L	Cr	P	D	TP	TW	P/V	T
1	Analytical chemistry Paper I	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
1	Analytical Chemistry – scope, functions, analytical process.	2	5
2	Sampling – Collection, Preservation and preparation of sample, Techniques of sampling solids, liquids and gases, Operation of drying and preparing a solution of the analyte.	5	5
3	Introduction to Volumetric Method of Analysis:-	10	10
	Calibration of volumetric apparatus, Primary and Secondary standards, Principals of volumetric analysis, Acid – base titration. Titration in non-aqueous solvents, Complexometric titrations, Precipitation titrations, Redox titrations, Theoretical aspects of titration curves and end point evaluation, Choice and suitability of indicators in each case.		
4	Introduction to Gravimetric Analysis:-	3	2

	Precipitation reactions, conditions of precipitation, nucleation, particle size, crystal growth, colloidal state, aging, impurities in the analytical precipitate, co-precipitation, precipitation from homogenous solution, drying and ignition of precipitation, Applications.		
5	Solvent extraction-	5	5
	Efficiency of extraction, Selectivity of extraction, Extraction system, Method of Extraction, applications.		
6	Chromatographic methods:-	5	15
	Principals, classification of chromatographic techniques, Technique and applications of paper chromatographic, Thin – layer chromatographic, HPTLC, Column chromatography.		
7	<u>SECTION II (30 Credits) Statistics.</u>	30	30
	Evaluation and Procession of Analytical Data, Precision and Accuracy, Types of Errors, Normal Distribution Curve, Standard deviation, Confidence limit, Graphical presentation of result- Method of average, Method of Linear list square, Significant figures, Statistical aid to hypothesis testing-t –test, F-test, ci 2 test, Correlation coefficient, Rejection of data.		
	REFERENCES:-		
	Fundamental of Analytical Chemistry-Skoog D.A. and West D.M. Saunders, College Publication		
	Textbook of Quantitative Inorganic Analysis-Vogel A.I.		
	Principles and Practice of Analytical Chemistry-Fifield F.W. and Kealey D, Black well Science		
	Instrumental Analysis R. Braun, Mcgraw Hill, International Edition		
	Analytical Chemistry, Christain, WSE / Wiley		
	Instrumental Analysis, Willard Merilt, CBS.		
	Chemical Analysis, Brawn, Mcgraw Hill.		
	Chemical Analysis, Underwood PH Publication Co.		

	Subjects	L	Cr	P	D	TP	TW	P/V	T
2	Food Analysis	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
	Objective :- To familiarise students with theoretical aspects and application to analysis of food.		
1	Introduction to foods	5	5
2	Introduction to general Constituents of foods	10	10
3	Proximate Constituents and their analysis	5	10
4	Additives – Introduction – Types – Study of preservatives colours and Antioxidants and method of estimation	5	10
5	Adulteration- Introduction, Types, Tests for adulterants, Control	10	10
6	Introduction, standards composition and analysis of following foods :-	20	50
	Wheat, Bread, Biscuits, Jam, Jelly, Honey, Milk, Ice Cream, Butter, Cheese, Milk Powder, Oils and Fats, Tea, coffee, Soft drinks, Alcoholic beverages, Cercals and pulses, Confectionery, Fruits, Vegetable, Egg, Fish, Meat.		
7	Techniques of Analysis:-	5	5
	Introduction to Instrumental and Non-instrumental method and applications.		
	REFERENCES:-		
	Pearson's Chemical /analysis of food – Persons Orient Longman 1998		
	Food Analysis –Nielsen 2000		
	AOAC – Recent edition.		
	Food Analysis, Pomeranz, Meloan, Chapman Hall		
	Module # 3 PRACTICALS - Volumetric Analysis – Preparation and Standardization of commonly used titrants, Acid-base titration, Redox titration, Complexometric titration, Precipitation titration, Non-aqueous titration.	25	25
	Module # 4 PRACTICALS – Gravimetric Analysis-Gravimetric estimations of metals.	25	25
	Module # 5 PRACTICALS – Food Analysis – Milk and Milk Products	25	25
	Module # 6 PRACTICALS – Food Analysis – Jam, Tea, Squash, Edible Oil	25	25

Semester II

	Subjects	L	Cr	P	D	TP	TW	P/V	T
1	Analytical Chemistry II	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
	Module # 7 ANALYTICAL CHEMISTRY – II (Modern method of Analysis)		
	Objective :- To familiarize students with concepts of spectroscopy and electrochemistry		
1	Analytical Spectrometry:-	5	10
	Interaction of radiation with concepts matter, Beer's law. Deviation from Beer's law.		
2	Ultraviolet and visible spectrometry:-	10	10
	Instrumentation. Absorbing species. Qualitative and Quantitative analysis		
3	Infrared Spectrometry:-	10	10
	Theory of Infrared Absorption. Spectrometry. Instrumentation. Sample handling. Qualitative and Quantitative analysis.		
4	Flame emission Spectrometry:-	5	10
	Instrumentation. Flame characteristics. Flame processes, Emission Spectra, Quantitative measurements, Interferences, Application.		
5	Atomic absorption Spectrometry:-	8	10
	Theory of atomic absorption spectrometry, Instrumentation, interferences,		
6	Turbidimetry and Nephelometry:-	3	10
	Theory, Instrumentation, Applications.		
7	Potentiometry:-	5	10
	Electrodes, electrode systems, Determination of cell EMF, Potentiometric titrations,		
8	Conductometry:-	3	10
	Principles, Instrumentation, Analytical applications.		

9	Coulometry:-	3	10
	Basic Principles, Potentiostatic coulometry titrations, Stripping analysis		
10	Polarography:-	8	10
	Basic principles, Diffusion current, polarized electrode, Micro electrode, Dropping Mercury Electrode Ilkovic equation, Polarographic wave, Qualitative, and Quantitative analysis, Stripping methods.		
	REFERENCES:-		
	Fundamentals of Analytical Chemistry-Skoog D.A and West D.M, Saunders.		
	Analytical Chemistry-Christain G.D, Wiley WSE.		
	Textbook of Quantitative Inorganic Analysis, Menohemetal, Pearson Educatoin		
	Principles and Practice of Analytical Chemistry-Fifield F.W. and Kealey D, Blackey Academic		

	Subjects	L	Cr	P	D	TP	TW	P/V	T
2	Pharmaceutical Analysis	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
	Module # 8 PHARMACEUTICAL ANALYSIS		
	Objective:- To Familiarize students with theoretical aspects pharmaceutical analysis		
1	Introduction to drugs	5	10
2	- Introduction, Tablets, Capsules, Injections, Ointments, Creams, Oral solution, Aerosol.	10	20
3	Pharmacopoeia:-	10	10
4	Impurities and Limit test	5	10
5	Techniques of Analysis-Introduction-PRACTICALS considerations and application. Gravimetric-Volumetric-Physical-Chemical, Chromatographic-UV-Visible-IR fluorimetry-Flame Photometry.	10	10
6	Assay of main classes of drugs Chemotherapeutic agents-with reference to Introduction-Type-Properties-Method of Analysis.	20	40
	REFERENCES:-		
	Beckett & Stenlake-Vol. (I) (II) PRACTICALS Pharmaceutical chemistry, Athlone Press London		
	Connors-Text Books of pharmaceutical Analysis-J. Wiley 2001		
	Chemical Analysis of Drug Higuchi, Interscience 1995		
	Remingtons Pharmaceutical Science 2000		
	Dosage form-Aulton 1996		
	Module # 9 PRACTICALS -Colorimetric-Colorimetric analysis of mixture, Simultaneous estimation of metals spectrophotometrically, pk value of indicator by Spectrophotometry	10	20
	Module # 10 PRACTICALS -Chromatography- Ion- exchange chromatography, Thin layer chromatography.	10	20
	Module # 11 PRACTICALS – Pharmaceutical Analysis-Assay of alcohols, Vitamins, Antibiotic, Sulphadugs.	10	20
	Module # 12 PRACTICALS – Pharmaceutical Analysis-Dissolution test, Disintegration test, Weight Variation test, Test for uniformity of content.	20	40

Semester III

	Subjects	L	Cr	P	D	TP	TW	P/V	T
1	Advance Analytical Chemistry I	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
	Module # 13 <u>Advanced Analytical Chemistry –I (Chromatographic and Spectral Methods)</u>		
	Objective :- To familiarize students with theoretical aspects of column chromatographic methods and spectral methods		
	<u>(A) Chromatography:-</u>		
1	<u>GLC :-</u> Principal of GL.C. Instruments for GLC –Gas Chromatographic Columns and Stationary phases. Applications.	5	10
2	<u>HPLC :-</u> Principals of HPLC. Instrumentation.	5	10
3	<u>Ion Chromatography:-</u>	5	5
	Ion exchange Equilibria. Ion-exchange packings. Inorganic Applications of Ion Chromatography		
4	<u>Exclusion (Size) Chromatography:-</u>	5	5
	Column packing, Theory of size of exclusion chromatography. Application of size exclusion chromatography.		
5	<u>Supercritical Fluid Chromatography:-</u>	5	10
	Properties of supercritical Fluid SFC-Instrumentation and operating variables, comparison with other types of chromatography. Applications.		
6	<u>Capillary Electrophoresis and Capillary Electro chromatography:-</u>	5	10
	Over view of Electrophoresis, capillary electrophoresis, Applications of capillary Electrophoresis capillary electro chromatography.		
	<u>(B) Spectroscopy:-</u>		
1	<u>Molecular Luminescence spectroscopy:-</u>	5	5
	Theory of fluorescence and phosphorescence, variable that affects fluorescence and phosphorescence. Instruments for measuring fluorescence, phosphorescence, application of fluorescence and phosphorescence.		
2	<u>NMR:-</u> Theory of NMR-Quantum description, classical description of NMR, Relaxation Processes in NMR. Environmental effects on NMR	5	10

	Spectra-Chemical shift, spin splitting. Rules governing the interpretation of first order spectra. Effect of chemical exchange. NMR Spectrometers Applications of proton NMR, c-13 NMR.		
3	<u>ESR:-</u> Principals, Instrumentation, ESR spectra.	5	10
4	<u>X-Ray Fluorescence method:-</u> Principals-Characteristics x-ray emission. Instrumentation x-ray tube, Radioactive sources. Wavelength dispersive instruments. Energy dispersive instruments. Analytical Applications-Qualitative Analysis-Quantitative Analysis.	5	10
5	<u>Photo acoustic spectroscopy:-</u>	5	5
6	Photo acoustic effect, spectra, Instruments, Applications.	5	10
	<u>Atomic Emission Spectroscopy:-</u> Principal, Instrumentations and Applications.		
	<u>Reference:</u>		
	1) Ewings Analytical Instrument hand book – Cazes, Marcel Dekkar		
	2)Analytical Chemistry, Kellner etal, Wiley VCH		
	3)Instrumental Techniques for Analytical Chemstry settle – PTR PH		
	4)Deans Analytical Chemistry Handbook – Patnaik, Mcgraw Hill Co.		
	Module # 14 : PRACTICALS:- Advanced spectral methods – spectroscopy determination of elements. Standard addition method and method of least squares extractive photometry, photometric titration.	25	25
	Module # 15 : PRACTICALS :- Fluorimetry flame photometry – fluorimetry, flame photometry	25	25
	REFERENCES :-		
	1) Analytical Chemistry		
	Edited by R. Kellner, J.M. Mermet, Motto.		
	2) Principal of instrumental analysis		
	Skoog Holler – Niemann.		
	3) Principal of Instrumental analysis		
	Skoog D.A. and West D.M.		
	4) Instrumental analysis		
	Wi;;ard, Dean and merit		
	5) Instrumental analysis		
	Ewing		
	6) Principal and PRACTICALS analytical chemistry		
	Fifield and Kealey		

	Subjects	L	Cr	P	D	TP	TW	P/V	T
2	Organic Analysis	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
	Module # 16 ORGANIC ANALYSIS		
	Objective:- To familiarize student with theoretical aspects of organic analysis.		
1	I Organic Micro-analysis:-	15	20
	Detections of elements like carbon, hydrogen, nitrogen, oxygen, halogen, sulphur and some metallic elements by traditional method and modern method like modified elements analyzer, pyrolytic reduction, coulometer at control potential and Gravimetric methods.		
2	II Functional group analysis:-	15	20
	Hydroxyl group like alcohols, Glycols, Phenols by esetrification procedure with various reagents.		
	Carbonyl group by Oxime, Bisulphite, Hydrazone, Oxidation, Schiff's base methods.		
	Carboxylic acids and its derivatives (salt, esters, amides, chlorides anhydrides) by titrimetric, Combustion, Saponification, Potentiometric, and Reduction methods.		
	Amino group by titration, Acylation, Drazotization, Bromination methods.		
	Unsaturation by Bromination. Iodine number, Hydrogenation. Ozonization, epoxidation methods.		
	Alkoxy group by acidimetric and Iodometric methods.		
3	III Spectrometric identification of organic compound:-	15	50
	Ultraviolet and visible spectroscopy:-		
	General applications to Isolated double bond, conjugated dienes, functional groups, halogens, Aromatic system monocyclic, polycyclic heteroaromatic compound etc. Shift of bands in spectra with various solvents used. Problems based on spectra analysis.		
	Infrared Spectroscopy:-		
	Interpritation of IR Spectroscopy, Finger print region, characterization		

	of functional groups and frequency shifts associated with structural elucidation.		
	Nuclear magnetic resonance spectroscopy:-		
	PMR spectrum an introduction to:-		
	Types of Protons (equivalent and non equivalent), chemical shift, signal intensities, spin-spin splitting. Application of PMR spectroscopy in structure elucidation.		
	Carbon –13 NMR Spectroscopy:-		
	Multiplicity – H decoupling, Noise decoupling, off resonance decoupling, chemical shifts, correction in shifts of aromatic carbon atoms of mono substituted benzenes. Spectrometric identification of organic compounds.		
4	IV <u>Organic trace analysis:-</u>	15	10
	General aspects, sampling, treatment of sample before analysis, separation method and concentration steps, detection of compound, applications of trace analysis.		
	Module # 17 : PRACTICALS :- Identification of functional groups Alcoholic group, phenolic group carbonyl group, carboxylic group, ester group, nitro group, amino group, amide group hydrocarbons unsaturation	25	25
	Module # 18 : PRACTICALS :- Estimation of functional group like alcoholic hydroxyl, phenolic, amino, carboxylic ketones and aldehyde, Estimation of unsaturation, amide alkoxy, amino acids etc.	25	25
	REFERENCES:-		
	1) Modern Organic elemental analysis By :- T.S. Ma and R.C. Rittner		
	2) Quantitative organic analysis via functional group By :- S. Siggia and J.C. Hanna		
	3) Spectrometric identification of organic compounds By :- R. M. Silverstein, G.C. Bassler and T.C. Morrill, J. Wiley & Sons		
	4) Application of absorption spectroscopy of organic compounds By :- J.R. Dyer		

	5) Organic trace analysis		
	By :- K. Beyermann		
	6) Spectroscopic method in organic chemistry		
	By :- D.H. Williams and I Fleming		
	7) NMR and Chemistry		
	By :- J.W. Akitt		
	8) Modern experimental organic chemistry		
	By :- R.M. Roberts, J.C. Gilbert, L.B. Rodewald and A.S. Wingrove		

	Subjects	L	Cr	P	D	TP	TW	P/V	T
3	Packaging & Regulating Aspects	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
	Module # 19 Packaging & Regulatory Aspects.		
	Objective :- To familiarize students with packing material & regulation acts used in Food & Pharmaceutical industries		
1	PACKAGING :		
	1) Introduction	6	5
	2) Types of packing material and their study	6	5
	3) Requirements of industry	6	5
	4) Testing of material for Packing	6	25
	5) Legal consideration in Packing	6	10
2	FOOD DRUG COSMETIC – REGULATORY ASPECTS:-		
	Regulatory aspects of food , Drugs and cosmetic	2	10
	1.Salient features of – (Relevant Provision)		
	1. The Drug & cosmetic Act, 2940 and the Drug & Cosmetic Rules, 1945.	5	20
	2. The Prevention of Food – Adulteration Act, 1954, and the prevention of Food Adulteration Rules.	5	10
	3. Fruit Product Order.	5	5
	4. Meat Product Order.	5	5
	5. I.S.I. , Agmark and other standard for goods & Cosmetic particularly with reference the testing of foods, drug and cosmetic and the raw material concerned. The Govt. authorities, concerned with the testing-their qualification, duties, powers and procedure to be followed-	5	10
	1. Record to be maintain under the Acts.		
	2. C.G.M.P. and C.G.L.P.S.		

	3. Requirements of QC Dept. for 'WHO' certification.		
	PACKAGING : References		
	1. Principles of package Development Gribbin et al.		
	2. Modern Packaging Encyclopaedia and planning guide –Macqra Wreyco.		
	DRUG LAWS:-		
	1. Handbook of drug law-Mehta-Univ. Book agency Allahabad.		
	2. Govt. of India publications of food drug cosmetic Acts and Rules.		

	Subjects	L	Cr	P	D	TP	TW	P/V	T
1	Advance Analytical Chemistry II	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
	Module # 20 <u>Advanced Analytical Chemistry-II</u>		
	Objective :- To familiarize to students with Advanced analytical techniques		
1	<u>Nuclear methods:-</u>	2	5
	Radioactive Decay products and processes. Radioactive decay rates. Instrumentation.		
	<u>Neutron activation method:-</u>	2	5
	Destructive, non-destructive. Applications of Neutron Activation.		
	<u>Isotope dilution method:-</u>	2	5
	Principals, Applications.		
2	<u>Electron Spectroscopy for chemical analysis (ESCA):-</u>	2	15
	Principals, Instrumentations, Applications.	2	5
	<u>Auger electron spectroscopy:-</u>	2	5
	Principals, Instrumentations, Applications.		
	<u>Raman Spectroscopy:-</u>	2	5
	Theory of Raman spectroscopy, Instrumentation, Application.		
	<u>Scanning Electron Microscopy:-</u>	5	10
	Principals, Instrumentation, Applications.		
3	<u>Mass Spectrometry:-</u>	5	10
	Molecular Mass Spectra. Ion sources, Mass Spectrometers Application of Molecular Mass Spectrometry, Secondary Ion Mass Spectrometry (SIMS)		
4	<u>Hyphenated Techniques:-</u>	5	5
	GC-MS, LC-MS, MS-MS (Tandem) Spectrometry, ICP-MS,		

	GC-IR.		
5	<u>Thermal methods:-</u>	10	10
	TGA :- Principals, Instrumentation, Application		
	DTA :- Principals, Instrumentation, Application		
	DSC :- Principals, Instrumentation, Application		
6	<u>Electro analytical method:-</u>	15	15
	Cyclic Voltammetry, Amperometric titration:- Principal titration curves. Differential pulse polarography Square wave polarography		
7	<u>Line (Process) Analysis:-</u>	6	15
	Process Analysis, Techniques and Applications, Sampling Strategies, Process control strategies via process Analysis. Future of process Analysis.		
8	<u>Computers in Chemistry:-</u>	10	10
	Computer terminology, Components of computer, Computer software-Scientific packages, Applications of computers-Passive and Active, Computers networks, LIMS.		
	REFERENCES :		
	1) Analytical Chemistry		
	Edited by R. Kellner, J.M. Mermet, Motto.		
	2) Principal of instrumental analysis		
	Skoog Holler – Niemann.		
	3) Principal of Instrumental analysis		
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	5) Instrumental analysis		
	Ewing		
	6) Principal and PRACTICALS analytical chemistry		
	Fifield and Kealey		

	Subjects	L	Cr	P	D	TP	TW	P/V	T
2	Microbiological Method of Analysis	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
	Module # 24 MICROBIOLOGY		
	Objective:- To familiarize students with basic concepts of microbiology.		
1	Introduction to Microbiology, Application to pharmacy, study of bacteria, yeasts, moulds, viruses, rickettsiae, algae and protozoa w.r.t. morphology, cell characteristics, habits, nutrition, reproduction, cultivation. Growth phases to bacteria, measurement of growth, factors affecting growth. Principles of microbiology.	12	30
2	Staining method:- Gram's stain, negative staining, acid-fast staining, spore staining, capsule staining, flagella staining, cell wall staining, observation of motility.	12	10
3	Culture media:- Cultivation and storage media, enrichment media, differential media, special purpose media, maintenance & preservation of pure culture, flora of human body.	12	10
4	Medical microbiology:- Study of pathogenic organisms of common occurrence-mycobacterium, salmonella, staphylococci, pseudomonas, shigella, clostridium, treponema species and diseases caused by them, fungi and yeast causing skin infection.	6	10
5	Medical parasitology :- Protozoa and protozoan infection entamoeba histolytica treponemal parasites etc. Method for detection of common pathogens like entamoeba, pseudomonas, salmonella, shigella, staphylococci and E. Coil.	6	5
6	Sterilisation :- Principal, method used in general and as applied to pharmaceutical products.	12	35
	Disinfectants:- Classification, mode of action, efficiency.		
	Antiseptic techniques:-Sterility tests for typical pharmaceutical products. Surgical dressing, ligatures, sutures, sterile medicaments. Microbial limit tests for pharmaceutical products and cosmetics. Microbial assay of vitamins, antibiotics, amino acids.		
	Module # 25 PRACTICALS-(MICROBIOLOGY)	25	25
	Study of microscope, Preparation and sterilization of nutrient agar, both, slants, stabs, plates, inoculation technique. Colony		

	characteristics growth patterns in both of cocci and bacilli, Gram's staining, monochrome staining, acid vital staining, cell wall, spore capsule and flagella staining, motility by hanging drop technique. Observation of prepared slides of malarial parasites in blood, intestinal amoeba in stools.		
	Isolation of pure culture by pour plate methods, plate count, /thermal death time and temperature.		
	Module # 26 PRACTICALS-	25	25
	Study of yeast, aspergillus and penicillium w.r.t. morphology, MIC of Dettol, sterility tests of pharmaceutical products, testing sensitivity to sulphonamides for S. auruginosa and pyrogens. Microbial limit tests on starch, gelation of pharmaceutical grade Microbial assay of penicillium and vitamin B 12.		
	Special Biochemical tests:- Sugar fermentation, coagulase test, oxidase test, catalase test, IMVIC test, HCL test on E. coli, Salmonella, Shigella, S. aureus, P. aeruginosa, fecal Conkey, Brilliant green, lactose bile medium, Vogel Johnson, Cetrimide Agar, Streptococcal gelatin agar, cooked meat respectively.		
	REFERENCE:-		
	Microbiology - Pelczar & Reid, Tata Mcgraw		
	Fundamental of Microbiology - Frobischer, at al Toppan W. Japan		
	General Microbiology - Stanier, Prentice Hall		
	Fundamental Principal of bacteriology - Salle		
	Medical Microbiology - Cruick – Shank		
	Pharmaceutical Microbiology - Hugo Russel		
	Text book of Microbiology - Anantnarayan, Orient Longmann		

	Subjects	L	Cr	P	D	TP	TW	P/V	T
3	Cosmetic & Water Analysis	4	10	12	3	100	50	50	200

Sr. No.	Topic and Details	Marks assigned	Weight age in %
1	Cosmetics & Water Analysis	30	50
	COSMETICS :-		
	1. Introduction to Cosmetics 2. Evaluation of cosmetics materials, raw material and additives 3. Cosmetics colors 4. Perfumes in cosmetics 5. Cosmetics formulation-introduction, standards and methods of analysis. Creams, face powders, Make-up, Shaving preparations, Bath preparations, Manicure preparations, Hair products, Dental products, skin products for babies.		
	Ref : 1) Harry's Cosmeticology - Longman Scientific Co.		
	2) Formulation and Function of Cosmetics-So Jellineck		
	3) Cosmetic Technology-Saggarin		
	4) Modern Cosmetics-E. Thomessen Wiley Inter science		
	WATER ANALYSIS:-	30	50
	1) Requirement of water and sources 2) Water Quality Standards 3) Physico Chemical parameters and Significance-odor Temperature turbidity-Density-Solids-Hardness, Acidity, Alkalinity-Dissolved Oxygen-Organic Chemicals and BOD, COD 4) Determination of all above parameters. 5) Treatment of water		

	REFERENCES:-		
	WATER ANALYSIS:-		
	1) Standard method of water and waste water analysis APHA		
	2) Standard method of chemical analysis Ed.F. Welcher-Robert Kriegerco.		
	3) Water and water pollution-S.Cicacero Vol. (I-IV) marcell dekker Co.		
	4) Encyclopedia of Industrial Chemical analysis, Snell etal. Inter Science.		
	Module # 22 PRACTICALS:-	25	25
	Potentiometry, Conductometry: Conductometric titration of mixture of acids, pH metric titration of mixture of acids and selection of indicators for volumetric titration, pH metric titration of polybasic acids		
	Module # 23 PRACTICALS- Water Analysis, Analysis of Cosmetics.	25	25