Shri Vaishnav Vidyapeeth Vishwavidyalaya

M.Sc. (Chemistry)

Choice Based Credit System (CBCS)(Batch 2019-2021)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCHE 301	PG	Spectroscopic method structure determination	4	0	4	6	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To give basic knowledge of concept of Spectroscopic methods.
2. To develop the understanding of Spectroscopic methods.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The student will demonstrate capability of

CO1. Theoretical understanding of concept concept of Spectroscopic methods.

CO2. Became aware of Spectroscopic methods.

Syllabus:

UNIT I

Nuclear Magnetic Resonance: The contact and pseudo contact shifts, factors affecting nuclear relaxation, some applications including biological systems, an overview of NMR of metal nuclides. Chemical shift, spin-spin interaction, shielding mechanism, complex spin-spin interaction, virtual coupling stereochemistry, hindered rotation, variation of coupling constant with dihedral angle, nuclear magnetic double resonance, simplification of complex spectra, shift reagent, spin tickling, nuclear overhauser effect (NOE), resonance of other nuclei. 13C NMR: Chemical shift, 13C coupling constants, two-dimensional NMR spectroscopy, NOISY, DEPT, INEPT.

UNIT II

Emission Spectroscopy: Elementary idea of emission spectroscopy, introduction, elementary theory, instrumentation, types of flames, interferences, factors affecting flame photometry, applications to qualitative and quantitative analysis, limitations.

Fluorescence and Phosphorescence: Spectrophotometry Theory of fluorescence and phosphorescence, quantum yield, factors affecting fluorescence and phosphorescence, relation between concentration and intensity, instrumentation, applications, an elementary idea of chemiluminiscence

UNIT III

Electrochemical techniques: CV, polarography, coulometry, amperometry. Thermal Methods: TGA, DSC and DTA

Other Spectro-analytical techniques:

(A) Introduction, general principle, instruments for nephelometry and tubidimetry, applications of nephelo
metry and turbidimetry to analytical chemistry. (B) Dispersion Refrectometry and Flame photometry
(C) Polarometry, circular dichrosim (CD) and optical rotatory dispersion (ORD).

UNIT IV

Mass Spectrometry : Theory and principles of mass spectrometry, Instrumentation, low and high resolution mass spectra, Ionization techniques – Electron Impact (EI) ionization, Chemical Ionization (CI), Field Desorption (FD), Fast Ion Bombardment (FAB), Electronspray Ionization (ESI) and Matrix Assisted Laser Desorption/Ionization (MALDI),
Mass spectrometry – fragmentation patterns of simple organic molecules, solving structure elucidation problems using mass spectrometry
Raman spectroscopy: Introduction, principle, instrumentation and applications

UNIT V

Infra-red spectroscopy – basic concepts, experimental methods, functional group analysis and identification using IR spectroscopy, structural effects on vibrational frequency.
UV-Vis spectroscopy, electronic transitions in organic molecules, selection rules, application of Beer Lambert law, qualitative and quantitative analysis by UV-Vis spectroscopy.
X-ray crystallography: Bragg‘s law, different X-ray diffraction methods including rotating crystal technique, X-ray powder technique, applications of X-ray diffraction.

Text Books:

1. Spectroscopy, D. L.Pavia, G. M.Lampman, G. S. Kriz,J. R. Vyvyan,Cengage Learning(Indian Edition),2007.
2. OrganicSpectroscopy,William Kemp, 3rdEdition, 1991,Macmillan (IndianEdition).
3. NMR Spectroscopy,H. Gnther, secondedition, John Wileyand sons, 1998.

List of Practical’s: (If Practical Credit Shown in Syllabus)

Guidelines for Practical:

A two credit lab is to be conducted by covering the most relevant and useful topics from mentioned syllabus.

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCHE 302	PG	Surfactants and Macromolecules	4	0	4	6	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To give basic knowledge of concept of Surface Chemistry.
3. To develop the understanding of Surface Chemistry.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The student will demonstrate capability of

CO1. Theoretical understanding of concept concept of Surface Chemistry

CO2. Became aware of Surface Chemistry.

Syllabus:

UNIT I

Surface tension and its determination, thermodynamics of liquid interface, surface energy and free energy of liquids, Adhesion and cohesion, surface tension of solution. Binary systems: Gibbs equation.
Monomolecular films: Gibbs monolayer, Traube's rule. Langmuir Blodgett films. Spreading.

UNIT II

Insoluble spread monolayer. Surface pressure, potential and viscosity. Uses of monolayer. Forces : long and short range, contact angle, Young's equation, wetting,. Adsorption of nonelectrolytes. Langmuir (statistical Thermodynamical) and BET equation. Adsorption of electrolytes. Lubrication and foams. Emulsions. HLB number. The ageing and inversion of emulsions. Ellipsometry.

UNIT III

Recapitulations, morphologies, aggregation number and its determination(SANS and DLS), Kinetics in Micellar media, reverse micellar solutions and their applications, Physico-chemical characterization of micro-emulsions, interfacial compositions.

UNIT IV

Block co-polymers: Pluronics, Clouding phenomenon and effect of additives. Clouding in ionic surfactant solutions: Cloud point extraction methodologies, mechanism and variation. Bio-surfactants and drug delivery systems. Surfactant polymer interactions, phase behaviour, PIT and HLB.

UNIT V

Enzymes (continued) Enzyme mechanisms, Nucleic acids, Lipids and Membranes, Vitamins and Coenzymes, Carbohydrates, Bioenergetics Metabolism.

Text Books:

1. Non-ionic surfactants by M. J. Schick, Surfactant Science Series, (1985)
2. Colloids and Interface Science by P. Ghosh, PHI learning Pvt. Ltd. New Delhi (2009).
3. Surfactants and Interfacial Phenomena by M. J. Rosen, John Wiley, New Jersey (2004).
4. Handbook of surfactants, M. R. Porter, Chapman and Hall, London (1994).
5. The Hydrophobic Effect by C. Tanford, John Wiley, New York (1980).
6. Physical Chemistry of Surface, A.W. Adamson, John Wiley (1976).
7. Physics and Chemistry of Surfaces , J. Oudar, Blackie & Sons (1975)

List of Practical's: (If Practical Credit Shown in Syllabus)

Guidelines for Practical:

A two credit lab is to be conducted by covering the most relevant and useful topics from mentioned syllabus.

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M.Sc. (Chemistry)

Choice Based Credit System (CBCS)(Batch 2019-2021)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCHE303	PG	Chemistry of Natural Products	4	0	4	6	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Understand the field of natural products chemistry.
2. Identify natural products and their probable biosynthetic pathways.
3. Enhance their understanding of biological and biochemical sciences.

Course Outcomes:

1. The graduates will become familiar with fundamentals of various natural products subjects and probable biosynthetic pathways.

Syllabus:

UNIT I: Alkaloids

Introduction and functions of alkaloids. General methods of structural elucidation, synthesis and biological properties of coniine, piperine, nicotine and papaverine

UNIT II: Terpenoids and Carotenoids :

Terpenoids

Introduction, Isoprene rule General methods of determining structure and synthesis of citral, menthol, Geraniol and camphor.

Carotenoids

Introduction, geometrical isomerism Structure determination and synthesis of β-carotene and vitamin-A

UNIT III: Anthocyanines and flavones

Anthocyanines

Introduction to anthocyanines. Structure and general methods of synthesis of anthocyanines. Cyanidine chloride: structure determination and importance.

Flavones

Structure and determination of flavones and flavonoids. Quercetin: Structure determination and importance.

UNIT IV: Purines and Steroids

Purines

Introduction, biological importance Synthesis and structural elucidation of Uric acid, Xanthine, Caffeine and Theophylline.

Steroids

Introduction, stereochemistry and nomenclature. Structural determination and synthesis of cholesterol.

UNIT V: Natural Dye

Occurrence, colour and constitution Structural determination and synthesis of indigoitin and alizarin.

Text Books:

1. O. P. Agarwal, Chemistry of Natural Products, Vol-1, Goel Publishing House, 1997.
2. Gurdeep Chatwal and Anand, Chemistry of Natural Products, Himalayan Publishing Co, 2001

Reference Books:

1. I. L. Finar, Organic Chemistry, Vol-2, 5th edition, Pearson education, London, 1975.

List of Practical's: (If Practical Credit Shown in Syllabus)

Guidelines for Practical:

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M.Sc. (Chemistry)

Choice Based Credit System (CBCS)(Batch 2019-2021)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCHE304 (A)	**PG**	**Electrochemistry and Molecular reaction dynamics**	**4**	**0**	**4**	**6**	**60**	**20**	**20**	**30**	**20**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To give basic knowledge of concept of Electrochemistry.
2. To develop the understanding of Electrochemistry.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The student will demonstrate capability of

CO1. Theoretical understanding of concept concept of Electrochemistry.

CO2. Became aware of Electrochemistry.

Syllabus:

Unit I :

Ion-solvent interactions: Non structural treatment, Born-model, modification of Born model, thermodynamics of Ion-solvent interaction.

Structural treatment: Structure of water, structure of water near an ion. Ion-dipole model of ion solvent interaction, ion-quadrupole model of ion-solvent interaction. Solvation number: Static and dynamic picture of ion-solvent molecules interaction.

Unit II:

Surface excess, electrocapillary phenomena, Lippmann theory, electrochemical kinetics, Butler-Volmer treatment, rate of electrode processes (stoichiometric numbers). Different electrochemical reactions; rapid Electrochemical reactions, organic electrode processes, Bio-chemical reactions, Electrocatalysis.

UNIT III

Introduction, importance of entropy in irreversible thermodynamics, postulates of irreversible thermodynamics, Flux and forces,. Caretheodory principle, general conservation equation for matter and Energy at the local equilibrium,. Curie-Prigogine principle, Diffusion in binary solution: Diffusion in free solution under concentration, pressure and electrostatic potential gradient, sedimentation and centrifugation. Electrochemical systems: Chemical reaction, Peltier and Seebeek effects. Uses of irreversible thermodynamics in membrane and soil science.

UNIT IV

Differential and integrated rate laws, reaction mechanism, temperature dependence, Collision theory and cross-section, thermal averages, threshold and activation energy, transition-state

theory. Intermolecular forces, potential energy surfaces, centrifugal barrier, molecular trajectories, Polanyi rules, scattering, transition-state spectroscopy.

UNIT V

Internal vibrational redistribution, intermolecular energy transfer, Landau-Teller model, Landau-Zener curve crossing, Cage effect, diffusion control, solvation energy, Marcus theory of electron transfer, Kramer's theory.

Text Books:

1. Modern Electrochemistry Vol. I & II , J.O.M Bockris & A. K. N. Reddy, Plenum Press (1998)

List of Practical's: (If Practical Credit Shown in Syllabus)

Guidelines for Practical:

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M.Sc. (Chemistry)

Choice Based Credit System (CBCS)(Batch 2019-2021)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCHE304 (B)	**PG**	**Applied Dairy Chemistry and Technology**	**4**	**0**	**4**	**6**	**60**	**20**	**20**	**30**	**20**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To give basic knowledge of concept of Dairy Chemistry.
2. To develop the understanding of Dairy Chemistry.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The student will demonstrate capability of

CO1. Theoretical understanding of concept concept of Dairy Chemistry

CO2. Became aware of Dairy Chemistry.

Syllabus:

UNIT I

Use of bio-protective factors for preservation of raw milk: effects on physicochemical, microbial and nutritional properties of milk and milk products, present status of preservation of raw milk by chemical preservatives; thermal processing for preservation.

UNIT II

Methods of determining lethality of thermal processing, UHT processed milk products, their properties and prospects, types of UHT plants, aseptic fillers, heat stability and deposit formation aspects, effect on milk quality; techno- economic considerations; retort processing.

UNIT III

Principles and equipment for bactofugation and Bactotherm processes, Microfluidization of milk: Principle, equipment, effects and applications, Homogenization and their applications in dairy industry.

UNIT IV

Dehydration: advances in drying of milk and milk products; freeze concentration, freeze dehydration: physicochemical changes during freeze drying and industrial developments.

UNIT V

Water activity; sorption behaviour of foods, energy of binding water, control of water activity of different milk products in relation to their chemical; microbiological and textural properties; hurdle technology and its application in development of shelf-stable and intermediate-moisture foods, Use of carbonation in extending the shelf life of dairy products.

Text Books:

1. Burton H. 1998. Ultra-high Temperature Processing of Milk and Milk Products. Elsevier. Fellow P. 1988.
2 Food Processing Technology. Elliss Horwood Ltd. Gould GW. 1995.
3 New Methods of Food Preservation. Blackie. IDF Bulletin 1981. New Monograph on UHT Milk. Document No. 133, Intern. Dairy Fed., Brussels. Smit G. 2003.
4. Dairy Processing – Improving Quality. CRC-Woodhead Publ. Troller JA& Christian HB. 1978.
5. Water Activity and Food, Food Science and Technology. A Series of Monograph Academic Press, London. Walstra P, Geurts TJ, Noomen A, Jellema A & Van Boekel MAJS. 1999.
6. Dairy Technology – Principles of Milk Properties and Processes. Marcel Dekker.

List of Practical's: (If Practical Credit Shown in Syllabus)

Guidelines for Practical:

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M.Sc. (Chemistry)

Choice Based Credit System (CBCS)(Batch 2019-2021)

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCHE304 (C)	PG	Pharmaceuticals Chemistry	4	0	4	6	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Understand the Various types of pharmaceutical excipients.
2. Understand the process of manufacture of the following bulk drugs.

Course Outcomes:

1. The graduates will become familiar with fundamentals of pharmaceuticals.

Syllabus:

Unit- I

Historical background and development of pharmaceutical industry in India, Introduction to pharmacopoeias. Types of formulations and roots of administration. Aseptic conditions, need for sterilization, Method of sterilization, Introduction to types of hazards with special reference to chemical hazards and fire hazards, Material safety data sheet (MSDS), hazard labels of chemicals and personal protection equipment (PPE).

Unit-II

Various types of pharmaceutical excipients – their chemistry, process of manufacture and quality specifications – Glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, coloring agents, flavouring agents, gelatin and other additives, sorbitol, mannitol, viscosity builders.

Unit-III

Evaluation of crude drugs – moisture contents, extractive value, volatile oil content, foreign organic matter. Quantitative microscopic exercises including of starch, crude fiber content. Various isolation procedures for active ingredients.

Pharmaceutical Quality Control – sterility testing, pyrogenic testing, glass testing, bulk density of powders.

Unit-IV

Introduction, principle, instrumentation and application of: UV-Visible spectroscopy, IR Spectroscopy, Mass spectrometry, Chromatography, scanning electron microscopy (SEM), transmission electron, microscopy (TEM), Electron microscopy, NMR Spectroscopy, TGA, DTA and DSC.

Unit-V

Raw materials, process of manufacture of the following bulk drugs –

Sulpha drugs, Antimicrobial drugs, Analgesic-anti-inflammatory, Steroidal hormones, Antibiotics drugs, Antimalarial drugs, Anticancerous drugs, AntiAIDS vaccines

Text Books:

1. "Textbook of Pharmaceutical Chemistry-I (Inorganic)" by Mohammed Ali
2. "Pharmaceutical Chemistry-1" by Dr Kasture Dr Wadodkar
3. "Practical Pharmaceutical Chemistry: v. 2" by A H Beckett
4. "Medicinal and Pharmaceutical Chemistry" by V K Kapoor & Harkishan Singh
5. "Concise Organic Pharmaceutical Chemistry" by Deshmukh and Kuchekar

Reference Books:

1. Pharmacopoeia of India, Ministry of Health, Govt. of India.
2. Skoog D.A., Holler F.J., Crouch S. R., Instrumental Analysis, Indian Edition, Brooks/Cole, Boston.
3. Willard H.H., Merrit L.L., Dean J.A., Settle P.A., Instrumental Methods of analysis, CBS Publishers and Distributors New Delhi.
4. Becket A.H. and Stenlake J.B., Practical Pharmaceutical Chemistry Vol. I and II, The Athlone Press of the University of London.
5. Pavia D.L., Lampman G.M. and Kriz G.S., Introduction to Spectroscopy, Harcourt College Publishers, Philadelphia.
6. Chatten L.G., A Text Book of Pharmaceutical Chemistry, Vol. I and II, Marcel Dekker, New York.

List of Practical's: (If Practical Credit Shown in Syllabus)

Guidelines for Practical:

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