

Shri Davara University , Raipur



Examination Scheme & Syllabus for Two Year Master of Science in Chemistry Programme M.Sc. Chemistry Semester-IV

(Effective from the session: 2025-2026)

Shri Davara University , Raipur



Shri Davara University

Raipur, Chhattisgarh

Faculty of Science

Department of Chemistry

Two Year Master of Science in Chemistry Programme M.Sc.

Chemistry Semester-IV

Scheme of Teaching and Examination

Outcome Based Education (OBC) and Choice Based Credit System (CBCS)
(Effective from the session: 2025-2026)

S. No.	Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuation Evaluation	Semester End Examination	Total	
1	MSCCH401P	Dissertation	-	-	36	18	135	315	450	-
2	MSCCH401P	Seminar and Viva Voce	-	-	8	4	35	70	100	5.0
3	MSCCH403P	Research paper	-	-	4	2	15	35	50	-
Total teaching hrs/week: 48			Total Credits			24	Total Marks		600	

Two year Master of Science in Chemistry programme
M.Sc. Chemistry Semester-IV
2025-2026

Course Title	Seminar and Viva voce				
Course Code	MSCCH401P				
Course Credits	L	T	P	TC	
	-	-	8	4	
Prerequisites	Knowledge of theory and practical chemistry.				
Course Objectives	- The capability to use a holistic view to critically, independently and creatively identify, formulate and deal with complex issues. - The capability to plan and use adequate methods to conduct qualified tasks in given frameworks and to evaluate this work. - The capability to create, analyse and critically evaluate different technical and feasible solutions. - The capability to critically and systematically integrate knowledge. - The capability to clearly present and discuss the conclusions as well as the knowledge and arguments that form the basis for these findings in written and spoken English. - The capability to identify the issues that must be addressed within the framework of the specific thesis in order to take into consideration all relevant dimensions of sustainable development. - A consciousness of the ethical aspects of research and development work				
Course Contents	Dissertation must be completed as per the following:- - The work must be in continuation with the title as selected in final year for the Preliminary work on Dissertation - Well-defined Engineering Research-based Problem must be selected - Motivation to select such problem - Literature Survey: Part 1 (What other researchers have done so far?) - Literature Survey: Part 2 (What are the Voids found?) - Problem Formulation (As per the voids detected) - Solution Methodology with respect to the: - Flowchart and Algorithm - What methods have been applied? - Why they have been applied? - How they have been applied? - Mathematical formulations to justify the work				

Two year Master of Science in Chemistry programme
M.Sc. Chemistry Semester-IV
2025-2026

	VI. -Case-based studies (if any) VII. -Results and Discussions (must be thorough) 8. So far Observations and further planning's 9. Any help to the Society through the selected research based problem 10. The thesis must be completed as per the following format: (Next Page)
Course Outcomes	• Demonstrate of well-defined selected project problem • Encourage to prepare one International Journal and attend two International Conferences related to their final project . • Present effectively each part of the dissertation in terms of motivation, literature, methodology, experimentation and final conclusions

Two year Master of Science in Chemistry programme
M.Sc. Chemistry Semester-IV
2025-2026

FORMAT OF THESIS

Binding of thesis	Cover	Five Hard Cover Binding
	Colour	Light Blue
	Margin Top	4 Cm
	Margin Bottom	4 Cm
	Margin Left	4 Cm
	Margin Right	2 Cm
	Printing on the Top	Title of the thesis in capital letters (24 font size) Times New Roman
	Printing in the middle of cover	Name of the candidate in capital letters (18 font size) Times New Roman
	Printing on Bottom	THESIS Submitted to SHRIDAVARA UNIVERSITY, RAIPUR for the award of the Degree of Master of Science in (subject) with Specialization Month, Year
	Printing on the Binding edge	The binding edge of the jacket should contain the name of the candidate, year and thesis title.
Inside of thesis	Printing	In 1½ space, All text in 11 Size with Arial font and all equations and symbols in 12 size with Times Roman font.
	Margin Top	3 Cm
	Margin Bottom	3 Cm
	Margin Left	4 Cm
	Margin Right	2 Cm
	Quality of paper	Good quality (Executive of 85 GSM)
	Size of paper	29 cms long, 23 cms wide
	Table of contents	(i) Printing of cover to be repeated on first page

Two year Master of Science in Chemistry programme
M.Sc. Chemistry Semester-IV
2025-2026

		(ii) Certificate of the supervisor(s)
		(iii) Acknowledgement
		(iv) Synopsis -To convey briefly the content of the thesis to draw attention to all new information and to the main conclusions. It should be factual and should be suitable for copying, quoting or indexing by information services.
		(v) Contents
		(vi) List of Tables
		(vii) List of Figures
		(viii) List of symbols and abbreviations, if any-The text which follows should have suitable titles and sub-titles with pages numbered at the top right hand corner 1 cm from top and 1 cm from right edge. First chapter should be 'Introduction' Second chapter should be "Review of Related Work" Third chapter should be "Problem Formulation and Solution Methodology" Fourth chapter should be "Experimental Results and Discussions" Fifth chapter should be "Applications of the work" and the last chapter should be 'Conclusions and Further Scope of the Work' Appendix (if any) can be kept after Bibliography
	Bibliography	Either the Harvard system, in which the names and dates given in the body of the text and the references to be alphabetically listed at the end of the thesis or a system in which numbers are inserted in the text e.g. [3], and references to those are given at the end of the thesis in a BIS system.

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)



**Faculty of Science
(FOS)**

Department of Chemistry

CURRICULUM

for

Master of Science (M.Sc) in Chemistry
PROGRAM CODE: FOSMSC2CHE

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Master of Science (M.Sc) in Chemistry-2 Years

Department of Chemistry, Faculty of Science

Shri Davara University, Naya Raipur

Semester-III

(Effective Session: 2024-25)

CourseType	CourseCode	Course Tittle	LTP Ratio				Assessment Marks		
			L	T	P	Credits	Formative	Summative	Total
Semester-III									
CORE	MSCCH301	Natural Product and Medicinal Chemistry	4	-	-	4	30	70	100
CORE	MSCCH302	Biochemistry and Environmental chemistry	4	-	-	4	30	70	100
Elective	MSCCH303	Elective I	4	-	-	4	30	70	100
Elective	MSCCH304	Elective II	4	-	-	4	30	70	100
Elective	MSCCH305	Elective III	4	-	-	4	30	70	100
Practical	MSCCH306	Chemistry Lab Course: V	-	-	4	2	15	35	50
Practical	MSCCH307	Chemistry Lab Course: VI	-	-	4	2	15	35	50
	Total		20	-	8	24			600

Table – I

S.N.		Subject Code	Subject
1	Elective I	MSCCH303A	Green Chemistry
2		MSCCH303B	Materials / Nuclear and Radiochemistry
3	Elective II	MSCCH304A	Pharmaceutical Techniques Technologies Development
4		MSCCH304B	Newer Synthetic Reactions and Reagents / Heterocyclic Chemistry
5	Elective III	MSCCH305A	Industrial Chemistry
6		MSCCH305B	Polymers

*** Students need to opt any one paper, separately for Major Elective I, II and II

*** At least 5 students need to opt a particular paper to run the course.

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Title	NATURAL PRODUCT AND MEDICINAL CHEMISTRY				
Code	MSCCHT301				
Credit	L	T	P	TC	
	4	-	-	4	
Prerequisite	Basic knowledge of chemistry				
Objective	Natural Product and Medicinal Chemistry in advance and establish foundation to research in the respective domain.				
Content	UNIT I Terpenoids and Carotenoids: Classification, nomenclature, occurrence, isolation, general methods of structure determination of Citral, Geraniol, α-Terpeneol, Menthol, Farnesol, Zingiberene, Santonin, Phytol, Abietic acid and β – Carotene. Alkaloids: Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on Nitrogen heterocyclic ring, role of alkaloids in plant. Synthesis and biosynthesis of the following: Ephedrine, (+)-Coline, Nicotine, Atropine, Quinine and Morphine. UNIT II Steroids: Isolation, structure determination and synthesis of Cholesterol, Bile acids, Androstereone, Testosterone, Esterone, Progesterone, Aldosterone and Biosynthesis of cholesterol. Plant Pigments: Occurrence, nomenclature and general method of structure determination. Isolation and synthesis of Apigenin, Luteolin, Quercetin, Myrcetin, Quercetin-3-glucoside, Vitexin, Diadzin, Butein, Aureusin, Cyanidin-7-arabinoside, Cyanidin, Hirsutin. Pyrethroids and Rotenones: Synthesis and reaction of Pyrethroids and Rotenones. UNIT III Drug Design: Development of new drugs procedures followed in drug design, concepts of lead compound and lead modification, concepts of prodrugs and soft drugs, Structure-Activity Relationship (SAR), Factors affecting bioactivity, resonance, inductive effect. Theories of drug activity: occupancy theory, rate theory,				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	induced fit theory. Quantitative Structure Activity Relationship (QSAR). Physico-chemical parameters: lipophilicity, partition coefficient, electronic ionization constants, steric, Shelton and surface activity parameters and redox potentials. General introduction of pharmacokinetics and pharmacodynamics. UNIT IV Antineoplastic Agents: Introduction cancer chemotherapy, special problems, role of alkylating agents and anti metabolites in treatment of cancer. Mention of carcinolytic antibiotics and mitotic inhibitors. Synthesis of mechloreethamine, cyclophosphamide, melphalan, uracil, mustards and 6-mercaptopurine. Recent development in cancer chemotherapy Hormone and natural Products. Cardio vascular Drug: Introduction, cardiovascular diseases, drug inhibitors of peripheral svmpathetic function central intervention of cardiovascular output, Direct acting arteriolar dilators. Synthesis of anyl nitrate, sorbitrate, diltiazemquiniidine, verapamil, melhyldopa, atenolol oryprenolol. Local Antiinfective Drugs: Introduction and general mode of action, Synthesis of sulphonamides, furazolidone, nalidixic acid, ciprofloxacin, norfloxacin, dapsone, aminosalicyclic acid, isoniazid. ethionamide, ehtambutal, fluconazole, econozole, griseofulvin, cholroquin and primaquine. Psychoactive Drugs -The Chemotherapy of Mind: mode of action of hypnotics, sedatives, anti-anxiety drugs, synthesis of diazepam, oxazepam, chlorazepam, alprazolem, phenytoin. ethosuximide. trimethadione, barbitrates, thiopental sodium, glutethimide. Antibiotics: Constitution and synthesis of penicillins, chloramphenicol, tetracycline and streptomycin.
Outcome	On the completion of this course successfully student will be able to understand the development of the inorganic chemistry.
Text Books	1. Natural Products: Chemistry and Biological Significance, J. Mann, R. S. Davidson, J. B. Hobbs. 2. D. V. Banthroe and J. B. Harbrone, Longman, Essex., Organic Chemistry, Vol. 2, I. L. Finar, ELBS. 3. Chemistry, Biological and Pharmacological properties of Medicinal Plants from the Americans, Ed. Kurt Hostettmann, 4. M. P. Gupta and A. Marston, Harwood Academic Publishers.

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Reference Books	1. Introduction to Flavonoids, B. A. Bhom, Harwood Academic Publishers. 2. New Trends in Natural Product Chemistry, Att-ur-Rahman and M. I. Choudhary, Harwood, Academic Publishers. 3. Insecticides of Natural Origin, SukhDev, Harwood Academic Publishers. 4. Introduction to medicinal Chemistry, A Gringuage, Wiley-VCH. Burger's Medicinal Chemistry-1 (Chapter-9 and Ch- 14), Drug Ed. M. E. Discovery, Wolff, John Wiley.
----------------------------	---

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Title	BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY				
Code	MSCCHT302				
Credit	L	T	P	TC	
	4	-	-	4	
Prerequisite	Knowledge of chemistry				
Objective	To study Biochemistry and Environmental chemistry in advance and establish foundation to research in the respective domain.				
Content	UNIT I Bioenergetics: Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP. Electron transfer in biology: Structure and function of metalloproteins in electron transport processes –cytochromes and iron-sulphur proteins, synthetic models. Transport and storage of dioxygen: Heme proteins and oxygen uptake, structure and function of haemoglobin, myoglobin, haemocyanins and haemerythrin, model synthetic complexes of iron, cobalt and copper. UNIT II Enzymes: Nomenclature and classification of induced Enzyme. fit hypothesis, concept and identification of active site by the use of inhibitors. Co-enzyme chemistry: Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD⁺, NADP⁺, FMN, FAD, lipoic acid, vitamin B12 . Enzyme models: Host-guest chemistry, chiral recognition and catalysis, molecular recognition, molecular asymmetry and prochirality. Biomimetic chemistry, Cyclodextrin-based enzyme models, calixarenes, ionophores, synthetic enzymes or synzymes. UNIT III Metalloenzymes: Zinc enzymes –carboxypeptidase and carbonic anhydrase. Iron enzymes – catalase, peroxidase and cytochrome P-450. copper enzymes- superoxide dismutase. Molybdenum oxatransferase enzymes –xanthine oxidase. Biopolymer Interaction: forces involved in biopolymer interaction. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	interactions. Multiple equilibria and various types of binding processes in biological systems. Hydrogen ion titration curves. Thermodynamics of biopolymers solutions: Thermodynamics of biopolymer solution, osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechnochemical system UNIT IV Environment:-Introduction, Composition of atmosphere, vertical temperature, heat budget of earth atmospheric system, Biogeochemical cycle of C, N, P, S and O. Atmosphere:-Chemical composition of atmosphere- particles, ions and radicals and their formation. Chemical and photochemical reactions in atmosphere, smog formation, oxides of N,C,S and their effect, pollution by chemicals, petroleum,chlorofluoro, hydrocarbons.Green house effect, acid rain, air. Hydrosphere:Chemical composition of water bodies-lakes, streams, rivers and wet lands etc.Hydrological cycle. Aquatic pollution- inorganic, organic, agricultural, industrial and sewage, detergents, oil spills and oil pollutants. Analysis of Water:Water quality parameter - dissolved oxygen biochemical oxygen demand, solids metals, sulphate, phosphate, nitrate, microorganism, Water Quality standard. analytical methods for measuring BOD, DO, COD, F, oils metals (As, Cd, Hg, Pb) Residual chloride and chloride demands, Heavy metal pollution - public health significance of cadmium, chromium, copper, lead, zinc, manganese, mercury and arsenic. General survey of instrumental technique for the analysis of heavy metals in aqueoussystems. Industrial Pollution:-Cement, Sugar, distillery, paper and pulp, Thermal power plants, Nuclear power plants, Radio Nuclide analysis disposal of waste and their managementChemical solutions to environmental problems, biodegradability, principles of decomposition better industrial processes. Bhopal gas tragedy, Chernobyl, Three Mile Island and Minamata disasters.
Outcome	On the completion of this course successfully student will be able to understand the development of the Bio Chemistry andEnvironmental chemistry
Text Books	1. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books. 2. Bioinorganic Chemistry, I. Bertini, H.B. Gray, S.L. Lippard and J.S. Valentine,

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	University Science Books. 3. Inorganic Biochemistry vols II and I. Ed G.L. Eichhorn, Elsevier. 4.
Reference Books	1. Bioorganic Chemistry: A Chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer-verlag. 2. Understanding Enzymes, Trevor palmer, Prentice Hall. 3. Enzyme Chemistry : Impact and Applications, Ed. Collin J Suckling, Chapman and Hall 4. Biochemistry, L. Stryer, W.H. Freeman.

Title	GREEN CHEMISTRY				
Code	MSCCHT303A				
Credit	L	T	P	TC	
	4	-	-	4	
Prerequisite	Knowledge of chemistry				
Objective	Green Chemistry in advance and establish foundation to research in the respective domain.				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Content	UNIT I Introduction to Green Chemistry: Green chemistry - Anastas' twelve principles of green chemistry - Principle of atom economy. Examples of reactions following the principles of green chemistry and atom economy. A. Green Preparation of propene B. Green synthesis of Ibuprofen UNIT II Green Reactions: Acetylation of primary amine, base catalyzed aldol condensation (synthesis of dibenzalpropanone)- halogen addition to C=C bond (bromination of trans-stilbene)- [4+2] cycloaddition reaction (Diels-Alder reaction between furan and maleic acid). Rearrangement reaction (benzyl-benzilic acid rearrangement)- coenzyme catalyzed benzoin condensation (thiamine hydrochloride catalyzed synthesis of benzoin). UNIT III Green solvents: Introduction – classification of ionic liquids- synthesis of ionic liquids – Ionic liquids: simple preparation – types – properties and application – ionic liquids in organic reactions (Heck reaction, Suzuki reactions and epoxidation)- Analytical chemistry - gas chromatography stationary phases – advantages and disadvantages. Reactions in water and supercritical water and carbon dioxide. Green Catalyst: Supported metal catalysts – mesoporous silica. Phase transfer catalyst - Synthesis – applications. Magnetically recoverable catalysts. UNIT IV Alternative Synthesis, Reagents and Reaction Conditions: Photo reduction of benzophenone to benzopinacol using sunlight. Photochemical alternative to Friedel-Crafts reaction and use of dimethyl carbonate as a methylating agent. Reaction in water - furan and maleic acid. Supercritical liquids – water and CO₂. Extraction of D-limonene from orange peel. Green chemistry examples based on sonochemistry and mechanochemistry and photochemical principles in green chemistry. Application of Green Chemistry in real world cases: Wealth from waste, Industrial case studies Green Nanotechnology, Greener approaches for
---------	---

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	nanoparticle synthesis Pharmaceutical industries: The largest waste producer problems and solutions through Green Chemistry benefits of greening industries, Need for Academia-Industry collaborations, Innovations stemming from Academia-Industry collaborations Emerging Green Technologies. Green solvents, Next generation catalyst design, Microwave assisted synthesis etc.
Outcome	On the completion of this course successfully student will be able to understand the green solvents and green catalysts
Text Books	1. V.K. Ahluwalia, Green Chemistry – Environmentally benign reactions. Ane Books, India, 2006. 2. Paul T. Anastas & Tracy C., Williamson, Green Chemistry – Designing Chemistry for the Environment, 2nd edition, 1998. 3. Paul T. Anastas & Tracy C., Williamson Green Chemistry – Frontiers in benign chemical synthesis and processes, Oxford University Press, New York, 1998. 4.
Reference Books	1. Rashmi Sanghi, & M. M. Srivastava, Green Chemistry – Environment friendly alternatives, Narosa Publishing House, 2003. 2. M.C. Cann & M. E Connelly, Real world cases in Green Chemistry, American Chemical Society, 2008. 3. P. Tundo, A. Perosa and F. Zechini, Methods and Reagents for Green Chemistry, John Wiley & Sons Inc. New Jersey, 2007.

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Title	MATERIALS / NUCLEAR AND RADIOCHEMISTRY				
Code	MSCCHT303B				
Credit	L	T	P	TC	
	4	-	-	4	
Prerequisite	Basic knowledge of material and nuclear chemistry				
Objective	Materials / Nuclear and Radiochemistry in advance and establish foundation to research in the respective domain.				
Content	UNIT I Introduction to the solid state, metallic bond, Band theory (Zone model, Brillouin Zones, Limitations of the Zone model); Defects in solids, <i>p</i>-type and <i>n</i>-type; Inorganic semiconductors (use in transistors, IC, etc.); Electrical, optical, magnetic and thermal properties of inorganic materials. Superconductors, with special emphasis on the synthesis and structure of high temperature superconductors. UNIT II Solid State Lasers (Ruby, YAG and tunable lasers): Inorganic phosphor materials; Synthesis and advantages of optical fibres over conducting fibres. Diffusion in solids, catalysis and Zone refining of metals. UNIT III Preparation of nanomaterials and their characteristic differences over bulk materials. Principles of Electron Microscopy, Dynamic Light Scattering, Atomic Force Microscopy and characterization of nanomaterials. UNIT IV Nuclear structure and nuclear stability, Nuclear models, Radioactivity and nuclear reactions (including nuclear fission and fusion reactions). Hot atom chemistry, Nuclear fission and fusion reactors. The interaction of nuclear radiations with matter. Radiation hazards and therapeutics. Detectors and their principles. The direction of radioactivity. The counting errors and their corrections. Tracer techniques and their applications. Isotope dilution and radio-activation methods of analysis. Fission product analysis (e.g., the technique of isolating two or three				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	different fission products of U or Th and determining the yields).
Outcome	On the completion of this course successfully student will be able to understand the green solvents and green catalysts
Text Books	1. West, A.R. Solid State Chemistry & its Applications, John Wiley & Sons(1987). 2. West, A.R. Basic Solid State Chemistry, 2nd Edition, John Wiley & Sons(2000). 3. Smart, L.E. & Moore, E.A. Solid State Chemistry - An Introduction, 3rd Edition, CRC Press(2005). 4. Rodgers, G.E. Descriptive Inorganic, Coordination & Solid-State Chemistry, 3rd Edition, Brooks/Cole, Cengage learning(2002).
Reference Books	1. Tilley, R.J.D. Understanding Solids: The science of materials, 2nd Edition, John Wiley & Sons(2004). 2. Harvey, B. C. <i>Introduction to Nuclear Chemistry</i> Prentice-Hall(1969). 3. Friedlander, G. Kennedy, J.W., Marcus, E.S. & Miller, J.M. <i>Nuclear & Radiochemistry</i>, John Wiley & Sons (1981). 4. Timp, G., Ed. <i>Nanotechnology</i> Springer-Verlag: N. Y.(1999).

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Title	PHARMACEUTICAL TECHNIQUES TECHNOLOGIES DEVELOPMENT				
Code	MSCCHT304A				
Credit	L	T	P	TC	
	4	-	-	4	
Prerequisite	Knowledge of pharmaceutical chemistry				
Objective	To acquire knowledge of drug design, and development, pharmacokinetics, and pharmacodynamics.				
Content	UNIT I Importance of Targeted Drug Delivery, Efficacy, Safety and Toxicity Issues. Molecular basis of targeted drug delivery. Drug Release and Uptake Phenomenon. Drug Encapsulation Technologies. Different Carriers for Drug Encapsulation: Nanomaterials (metal-based, metal oxide based and polymeric) in drug encapsulation and drug delivery: their characterization, generation, efficacy, toxicity and release profile. Factors affecting drug loading and drug release. UNIT II Techniques to measure degree of loading and release efficiency. Metabolism and excretion of drug delivery carriers. General considerations; Methods of preparations, characterization and applications of liposomes, ionosomes, resealed erythrocytes, nanoparticulate systems, solid-liquid nanoparticles, dendrimers, organogels, multiple emulsions and nanoemulsions. UNIT III Overview and application of aquasomes, pharmacosomes, liquid crystalline systems, protein and peptide-based drug delivery systems. Polymers in drug encapsulation and drug delivery: Classification, synthesis and applications of biodegradable and natural polymers in formulation of controlled drug delivery systems. UNIT IV Drug discovery, lead identification and lead optimization, Chemical, pharmaceutical and clinical technology development. Investigational New Drug (IND) and its Applications: criteria, contents, categories, submission,				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	regulation, noteworthy examples. Clinical trials: Phase I, II and III clinical trials. Pilot Plant Scale-Up Techniques: Primary function of the pharmaceutical pilot plant, factors to be considered during development, reporting responsibilities, personnel requirements, space requirements, review of the formula, raw materials, relevant processing equipments, production rates, process evaluation, master manufacturing procedures, GMP consideration, pilot plant design for tablet development.
Outcome	On the completion of this course successfully student will acquire knowledge of drug designing and development, their SAR and QSAR, mode of action of different drugs, role of drugs to inhibit the particular enzymes and treatment of disease, drug delivery and pharmaceutical technologies development
Text Books	1. Mathiowitz, E., Ed. Encyclopaedia of controlled delivery(1999). 2. Joseph R. Robinson and Vincent H. L. Lee Controlled Drug Delivery – Fundamentals and Applications. 3. Saltzman, W. Mark Drug Delivery: Engineering Principles and Drug Therapy (OxfordPress)
Reference Books	1. Loyd V. Allen, Jr., Nicolas G. Popovich and Howard C. ArselAnsel's Pharmaceutical Dosage Forms and Drug DeliverySystems. 2. The Art, Science and Technology of Pharmaceutical Compounding – Loyd V. AlenJr. 3. Theory and Practice of Industrial Pharmacy –LachmannPharmaceutics –Aulto

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Title	NEWER SYNTHETIC REACTIONS AND REAGENTS AND HETEROCYCLIC CHEMISTRY				
Code	MSCCHT304B				
Credit	L	T	P	TC	
	4	-	-	4	
Prerequisite	Knowledge of reactions and reagents				
Objective	to acquire the knowledge of enolates, umpolung and hetrocyclic chemistry				
Content	UNIT I Enolates, Thermodynamic versus Kinetic enolates, enonate equivalents and enamines: Applications in carbon-carbon bond formation and related reactions. Applications in chiral synthesis. Phosphorus, Sulphur and nitrogen ylides: Preparation, applications in organic synthesis and mechanism. UNIT II Umpolung reactions (sulphur compounds, nitro compounds, lithiated ethers and related compounds). Principles and applications of phase transfer catalysis, crown ethers and polymer-supported reagents in organic synthesis. UNIT III Introduction to heterocycles: Nomenclature, spectral characteristics, reactivity and aromaticity Synthesis and reactions of three and four membered heterocycles, e.g., aziridine, azirine, azetidine, oxiranes, thiarines, oxetenes and thietanes. UNIT IV Five membered rings with two heteroatoms: pyrazole, imidazole, oxazole, thiazole, isothiazole and benzofusedanalogs.				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	Benzofused five membered heterocycles with one heteroatom, <i>e.g.</i> indole, benzofuran, benzothiophene. Chemistry of bicyclic compounds containing one or more heteroatoms. Benzofused six membered rings with one, two and three heteroatoms: benzopyrans, quinolines, isoquinolines, quinoxalines, acridines, phenoxazines, phenothiazines, benzotriazines, pteridines. Seven and large membered heterocycles: azepines, oxepines, thiepinines. Chemistry of porphyrins and spiroheterocycles.
Outcome	On the completion of this course successfully student will be acquire knowledge of Application of modern synthetic reactions and reagents in organic synthesis (including Wittig and Umpolung reaction). Nomenclature and reactivity and synthesis of different heterocyclic compounds.
Text Books	1. Carey, F.A. & Sundberg, R. J. Advanced Organic Chemistry, Parts A & B, Plenum: U.S. (2004). 2. Carruthers, W. Modern Methods of Organic Synthesis Cambridge University Press (1971). 3. Acheson, R. M. Introduction to the Chemistry of Heterocyclic Compounds John Wiley & Sons (1976). 4. Anastas, Paul and Warner, John C., Green Chemistry- Theory and Practical, (2005).
Reference Books	1. Alhuwalia, VK and Kidwai, M. New trends in Green Chemistry. Anamaya Publishers, New Delhi (2003). 2. Ram V. J.; Sethi, A.; Nath, M.; Pratap, R.; (2019), The Chemistry of Heterocycles (Nomenclature and Chemistry of three to five membered Heterocycles), Elsevier publication. 3. Ram V. J.; Sethi, A.; Nath, M.; Pratap, R.; (2019), The Chemistry of Heterocycles (Chemistry of six to eight membered N, O, S, P and Se heterocycles), Elsevier publication

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Title	INDUSTRIAL CHEMISTRY				
Code	MSCCHT305A				
Credit	L	T	P	TC	
	4	-	-	4	
Prerequisite	Basic knowledge of Chemistry				
Objective	Industrial Chemistry in advance and establish foundation to research in the respective domain.				
Content	UNIT I Industrial Fuels:Energy sources- Classification of fuels –solid- liquid and gaseous.Calorific value of fuels and its determination.Solid fuels – coal- lignite-sub-bituminous coal- bituminous coal and anthracite.Coking and non-coking coal. Liquid fuels – petroleum refining and uses. Hydrodesulphurisation and cracking (thermal and catalytic - fixed bed and fluidised bed).Octane number.Production and uses of tetraethyl lead- ETBE and MTBE. Gaseous fuels - natural gas and gobar gas –production- composition and uses-gobar electric cell. UNIT II Chemistry in Agriculture:Fertilizers- NPK- superphosphate- triple superphosphate- uses of mixed fertilizers. Micronutrients and their role, biofertilizers- plant growth harmones. Pesticides- classification of pesticides with examples. Insecticides - stomach poisons contact insecticides- fumigants. Manufacture and uses of insecticides. DDT- BHC (gammmaxane: Conformation of gamma isomer) pyrethrin, banned pesticides. Herbicides -manufacture of 2,4-D and 2,4,5-T. Fungicides -preparation of Bordeauxmixture-lime-sulphur creosote oil (formula only).Sugar industry - double sulphitation process. Refining and grading of sugar. Saccharin - use as a sugar substitute-aspartame. UNIT III Water Treatment: Introduction-sources of water. Hardness of water- temporary and permanent hardness - units of hardness- disadvantages of hard water. Effect of iron and manganese in water.Estimation of hardness – EDTA method and alkali titration method. Water softening methods - Zeolite process- ion-exchange				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	demineralisation mixed– bed deionisation. Domestic waste water treatment. Purification methods –chlorination- break point chlorination. Reverse osmosis - Desalination. UNIT IV Food Analysis: Moisture, ash, crude protein, fat, crude fibre, carbohydrates, calcium, potassium, sodium and phosphate. Food adulteration-common adulterants in food, contamination of food stuffs. Microscopic examination of foods for adulterants. Pesticide analysis in food products. Extraction and purification of sample. HPLC. Gas chromatography for organophosphates. Thin-layer chromatography for identification of chlorinated pesticides in food products. Cement, Glass and Ceramics: Cement: Manufacturing – Wet Process and Dry process- types- analysis of major constituents- setting of cement- reinforced concrete. Cement industries in India. Glass: Composition and manufacture of glass. Types of glasses- optical glass coloured glasses and lead glass. Ceramics: Types- raw materials-white wares manufacture and uses.
Outcome	On the completion of this course successfully student will be able to understand the development of the manufacture of cement and glass, water, fuel and food analysis.
Text Books	1. R.Norris Shreve and Joseph A. Brink, Jr., Chemical process industries, 4th edition, McGraw – Hill, Kogakusha, Ltd, New York, 1977. 2. T. George Austin, Shreve's Chemical Process industries, 5th edition, McGraw –Hill, New York, 1984. 3. P. C. Jain and M.C. Jain, Engineering Chemistry, 10th edition, Dhanpat Rai and Sons, New Delhi, 1993.
Reference Books	1. A. K.De, Environmental Chemistry, 2nd edition, Wiley Eastern Ltd., Delhi, 1986. 2. E. S Manahan, Fundamentals of Environmental Chemistry, 2nd edition, CRC Press, Florida, 2000. 3. N. S. Subba Rao, Biofertilizers in Agriculture, Oxford and IBH Publishing Co Pvt Ltd, New Delhi, 1982.

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Title	POLYMERS				
Code	MSCCHT305B				
Credit	L	T	P	TC	
	4	-	-	4	
Prerequisite	Knowledge of chemistry				
Objective	Polymers in advance and establish foundation to research in the respective domain.				
Content	UNIT I Basics:Importance of polymers. Basic concepts: Monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Polymerization: condensation, addition, radical chain-ionic and co-ordination and copolymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems. UNIT II Polymer Characterization:Polydispersion-average molecular weight concept. Number, weight and viscosity average molecular weights. Polydispersity and molecular weight distribution. The practical significance of molecular weight. Measurement of molecular weights. End-group, viscosity, light scattering, osmotic and ultracentrifugation methods. Analysis and testing of polymers-chemical analysis of polymers, spectroscopic methods, X-ray diffraction study. Microscopy. Thermal analysis and physical testing-tensile strength. Fatigue, impact. Tear resistance. Hardness and abrasion resistance. UNIT III Structure and Properties:Morphology and order in crystalline polymers-configurations of polymer chains. Crystal structures of polymers. Morphology of crystalline polymers, strain-induced morphology, crystallization and melting. Polymer structure and physical properties-crystalline melting point T_m - melting points of homogeneous series, effect of chain flexibility and other steric factors, entropy and heat of fusion. The glass transition temperature, T_g-Relationship between T_m and T_g, effects of molecular weight, diluents, chemical structure, chain topology, branching and cross linking. Property requirements and polymer utilization.				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	UNIT IV Polymer Processing: Plastics, elastomers and fibres. Compounding. Processing techniques: Calendering, die casting, rotational casting, film casting, injection moulding, blow moulding, extrusion moulding, thermoforming, foaming, reinforcing and fibre spinning. Properties of Commercial Polymers : Polyethylene, polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers - Fire retarding polymers and electrically conducting polymers. Biomedical polymers -contact lens, dental polymers, artificial heart, kidney, skin and blood cells.
Outcome	On the completion of this course successfully student will be able to understand the polymer processing and its applications.
Text Books	1. Textbook of Polymer Science, F.W. Billmeyer Jr, Wiley. 2. Polymer Science, V.R. Gowariker, N.V. Viswanathan and J. Sreedhar, Wiley-Eastern. 3. Functional Monomers and Polymers, K. Takemoto, Y. Inaki and RM. Ottanbrite.
Reference Books	1. Contemporary Polymer Chemistry, H.R. Alcock and F.W. Lambe, Prentice Hall. 2. Physics and Chemistry of Polymers, J.M.G. Cowie, Blackie Academic and Professional.

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Course Title	CHEMISTRY LAB COURSE:V				
Course Code	MSCCH306P				
Course Credits	L	T	P	TC	
	-	-	2	2	
Prerequisites	Chemistry III				
Course objectives	1. To impart practical knowledge hands-on experience 2. To train the students to pursue further education. 3. Become familiar with chemical tools.				
Course Contents	1. Extraction of Organic Compounds from Natural Sources - Isolation of caffeine from tea leaves. - Isolation of casein from milk: perform colour reaction of protein. - Isolation of lactose from milk: purity of sugar should be checked by TLC and PC and R_f value reported. - Isolation of nicotine dipicrate from tobacco. - Isolation of cinchonine from cinchona bark. - Isolation of piperine from black pepper. - Isolation of lycopene from tomatoes. - Isolation of β-carotene from carrots. - Isolation of limonene from citrus rinds. - Isolation of protein and carbohydrates from seeds – colour test. - Extraction of fatty oil from seeds and determination of refractive index of the oil. 1. Isolation of protein and carbohydrate (as reducing sugars) from seed-colour test. 2. Analysis of soil - Determination of pH of soilsamples. - Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration - Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry. 3. Analysis of food products: - Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc. - Analysis of preservatives and colouring matter. - Spectrophotometric Identification and Determination of Caffeine				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	and Benzoic Acid in Soft Drinks d. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets. 4. Clinical chemistry: A diagnostic approach by blood/ urine analysis. a. Carbohydrates – qualitative and quantitative. b. Lipids – qualitative. c. Determination of cholesterol using Liebermann-Burchard reaction. d. Proteins – qualitative. e. Isolation of protein. f. Determination of protein by the Biuret reaction. g. Determination of nucleic acids 5. Drug Analysis: a. Detection of illegal drugs or steroids in athletes 6. Fuel analysis a. To determine moisture, volatile matter and ash content of a given sample of coal.
Course outcomes	1. Good quantitative skills such as the ability to accurately and reproducibly prepare reagents for experiments. 2. Ability to dissect a problem into its key features. 3. Ability to design experiments and understand the limitations of the experimental approach
Text Books	1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996. 2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960. 3. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011). 4. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry, Universities Press. 5. Cooper, T.G. Tool of Biochemistry. Wiley-Blackwell (1977).
Reference Books	1. Wilson, K. & Walker, J. Practical Biochemistry. Cambridge University Press (2009). 2. Varley, H., Gowenlock, A.H & Bell, M.: Practical Clinical Biochemistry, Heinemann, London (1980). 3. Devlin, T.M., Textbook of Biochemistry with Clinical Correlations, John Wiley & Sons, 2010.

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

Course Title	CHEMISTRY LAB COURSE:VI				
Course Code	MSCCH307P				
Course Credits	L	T	P	T C	
	-	-	2	2	
Prerequisites	Chemistry IV				
Course objectives	1. To impart practical knowledge hands-on experience 2. To train the students to pursue further education. 3. Become familiar with chemical tools.				
Course Contents	1. Error Analysis and statistical data analysis. Errors, types of errors, minimization of errors, statistical treatment for error analysis, standard deviation, method of least squares. Calibration of volumetric apparatus, burettes, pipettes, standard flask, weight box etc. 2. Volumetric Analysis a. Determination of dissolved oxygen in water. b. Determination of Chemical Oxygen Demand (COD) c. Determination of Biological Oxygen Demand (BOD) d. Percentage of available chlorine in bleaching powder. e. Measurement of chloride, sulphate and salinity of water samples by simple titration method (AgNO_3 and potassium chromate). f. Estimation of total alkalinity of water samples (CO_3^{2-}, HCO_3^-) using double titration method. g. Measurement of dissolved CO_2. h. Study of some of the common bio-indicators of pollution. i. Estimation of SPM in air samples. 3. Bio-Inorganic Chemistry: (I) Extraction of chlorophyll from green leaves of student's choice. Separation of chlorophylls and their electronic spectral study. (II) Complexation study of Cu (II) ion with biologically important amino acids. 4. Green Chemistry: a. Preparation and characterization of biodiesel from vegetable oil. b. Extraction of D-limonene from orange peel using liquid CO_2 prepared from dry ice. c. Mechano chemical solvent free synthesis of azomethine.				

SHRI DAVARA UNIVERSITY NAYA RAIPUR (C.G.)

	d. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II). e. Photoreduction of benzophenone to benzopinacol in the presence of sunlight f. Preparation of propene by two methods can bestudied (I) $\text{Triethylamine ion} + \text{OH}^- \rightarrow \text{propene} + \text{trimethylpropene} + \text{water}$ (II) $\text{1-propanol} \xrightarrow{\text{H}_2\text{SO}_4/\Delta} \text{propene} + \text{water}$
Course outcomes	1. Good quantitative skills such as the ability to accurately and reproducibly prepare reagents for experiments. 2. Ability to dissect a problem in to its key features. 3. Ability to design experiments and understand the limitations of the experimental approach
Text Books	1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th Edition, 1996. 2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.
Reference Books	1. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011). 2. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry, Universities Press.