



**SIES**

**College of Arts,  
Science &  
Commerce**

**RISE WITH EDUCATION**

**Sion (West), Mumbai – 400022.**

*Department of Chemistry*

**Program: B.Sc.**

**Course: Applied Component (Drugs & Dyes)**

**Syllabus for T.Y.B.Sc. Semester V & VI**

**(Implemented from 2018 – 2019)**

**Autonomy**

**Credit Based Semester and Grading System**

## SEMESTER V

<b>Contents:</b>		
<b>Paper I</b>	:	<b>Applied Component (Drugs &amp; Dyes)</b>
SIUSACDD51.1	:	General Introduction to Drugs
SIUSACDD51.2	:	Analgesics, Antipyretics and Anti-inflammatory Drugs
SIUSACDD51.3	:	Introduction to the dye-stuff Industry
SIUSACDD51.4	:	Colour and Chemical Constitution of Dyes
<b>Practical</b>		
SIUSACDD5P1	:	Drugs and Dyes Chemistry Practical

## SEMESTER VI

<b>Contents:</b>		
<b>Paper I</b>	:	<b>Applied Component (Drugs &amp; Dyes)</b>
SIUSACDD61.1	:	Drug Discovery, Design and Development.
SIUSACDD61.2	:	Chemotherapeutic Agents continued.
SIUSACDD61.3	:	Classification of Dyes based on Chemical Constitution and Synthesis of Selected Dyes.
SIUSACDD61.4	:	Colour and Chemical Constitution of Dyes.
<b>Practical</b>		
SIUSACDD6P1	:	Drugs and Dyes Chemistry Practical

## APPLIED COMPONENT: DRUGS AND DYES

### SEMESTER V

Course Code	Unit	Topics	Credits	L/Week	
SIUSACDD51	1	<b>General Introduction to Drugs</b>	2	1	
		1.1 General Introduction to Drugs			
		1.2 Routes of Drug Administration and Dosage Forms			
		1.3 Pharmacodynamic agents:			
	2	<b>Analgesics, Antipyretics and Anti-inflammatory Drugs</b>		2	1
		2.1 Analgesics and Antipyretics			
		2.2 Antihistaminic Drugs			
		2.3 Cardiovascular drugs			
		2.4 Antidiabetic Agents			
		2.5 Antiparkinsonism Drugs			
		2.6 Drugs for Respiratory System			
	3	<b>Introduction to the dye-stuff Industry</b>		2	1
		3.1 Introduction to the dye-stuff Industry			
		3.2 Substrates for Dyes : Types of fibres			
		3.3 Classification of dyes based on applications and dyeing methods			
	4	<b>Colour and Chemical Constitution of Dyes</b>		2	1
4.1 Colour and Chemical Constitution of Dyes					
4.2 Unit process and Dye Intermediates					
SIUSACDD5P1		<b>Drugs and Dyes Practical</b>	2	4	

# APPLIED COMPONENT: DRUGS AND DYES

## SEMESTER V

COURSE CODE: SIUSACDD51

CREDITS: 2

LECTURES: 60

DRUGS	
UNIT- I , 1L/week	
<b>COURSE CODE: SIUSACDD51.1</b> <b>LEARNING OBJECTIVES:</b> <i>1. To familiarize the basic nomenclature of drug, classification and important terms.</i> <i>2. To familiarize students with the mode of action of drugs.</i> <i>3. To know the uses and the side effects of certain drugs for various diseases.</i> <i>4. To study the synthesis of different drug intermediates and drugs.</i>	
<b>1 General Introduction to Drugs</b>	<b>15L</b>
<b>1.1 General Introduction to Drugs</b> <b>1.1.1</b> Definition of a drug, sources of drugs, requirements of an ideal drug, classification of drugs (based on therapeutic action) <b>1.1.2</b> Nomenclature of drugs: Generic name, Brand name, Systematic name <b>1.1.3</b> Definition of the following medicinal terms: Pharmacon, Pharmacology, Pharmacophore, Prodrug, Half – life efficiency, LD <sub>50</sub> , ED <sub>50</sub> , GI <sub>50</sub> Therapeutic Index. <b>1.1.4</b> Brief idea of the following terms: Receptors, Agonists, Antagonists, Drug-receptor interaction, Drug Potency, Bioavailability, Drug toxicity, Drug addiction, Spurious Drugs, Misbranded Drugs, Adulterated Drugs, Pharmacopoeia.	<b>8L</b>
<b>1.2 Routes of Drug Administration and Dosage Forms:</b> <b>1.2.1</b> Oral and Parenteral routes with advantages and disadvantages. <b>1.2.2</b> Formulations & combination formulation, Different dosage forms (including Patches & Adhesives, emphasis on sustained release formulations and enteric coated tablets).	<b>2L</b>

1.3	<p><b>Pharmacodynamic agents:</b></p> <p>Pharmacodynamic agents: A brief introduction of the following pharmacodynamic agents and the study with respect to their chemical structure, chemical class, therapeutic uses, and side effects.</p> <p><b>1.3.1 CNS Drugs:</b></p> <p>Classification based on pharmacological actions: CNS Depressants &amp; CNS Stimulants. Concept of sedation and hypnosis, anaesthesia.</p> <ul style="list-style-type: none"> <li>• Phenytoin (Hydantoin)</li> <li>• Trimethadione (Oxazolidinediones) (<b>Synthesis from acetone</b>)</li> <li>• Alprazolam (Benzodiazepines)</li> <li>• Levetiracetam (Pyrrolidines)</li> <li>• Amphetamine (Phenethylamine) (<b>Asymmetric synthesis from phenyl acetic acid</b>)</li> <li>• Chlorpromazine (Phenothiazines)</li> </ul>	5L
<b>UNIT- II, 1L/week</b>		
<p><b>COURSE CODE: SIUSACDD51.2</b></p> <p><b>LEARNING OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li>1. To familiarize students with the mode of action of drugs.</li> <li>2. To know the uses and the side effects of certain drugs for various diseases.</li> <li>3. To study the synthesis of different drug intermediates and drugs.</li> </ol>		
2	<b>Analgesics, Antipyretics and Anti-inflammatory Drugs</b>	15L
2.1	<p><b>2.1.1 Analgesics and Antipyretics</b></p> <ul style="list-style-type: none"> <li>• Morphine (Phenanthrene alkaloids)</li> <li>• Tramadol (Cyclohexanols) (<b>Synthesis from salicylic acid</b>)</li> <li>• Aspirin (Salicylates)</li> <li>• Paracetamol (p-Amino phenols)</li> </ul> <p><b>2.1.2 Anti-inflammatory Drugs</b></p> <p>Mechanism of inflammation and various inflammatory conditions.</p> <ul style="list-style-type: none"> <li>• Steroids: Prednisolone, Betamethasone</li> </ul> <p>Sodium Diclofenac, Aceclofenac (N- Aryl anthranilic acids) (<b>Synthesis from 2,6-dichlorodiphenyl amine</b>)</p>	4L

2.2	<b>Antihistaminic Drugs:</b> <ul style="list-style-type: none"> <li>• Diphenhydramine (Ethanol amines)</li> <li>• Cetrizene (Piperazine) (<b>Synthesis from 4-Chlorobenzhydryl chloride</b>)</li> <li>• Chlorpheniramine maleate (Ethyl amines)</li> <li>• Pantoprazole (Benzimidazoles)</li> </ul>	2L
2.3	<b>Cardiovascular drugs:</b> Classification based on pharmacological action <ul style="list-style-type: none"> <li>• Isosorbide dinitrate (Nitrates)</li> <li>• Valsartan (Amino acids) (structure not expected)</li> <li>• Atenolol (Aryloxy propanol amines) (<b>Synthesis from 3-Hydroxy phenyl acetamide</b>)</li> <li>• Amlodipine (Pyridines)</li> <li>• Frusemide /Furosemide (Sulfamoyl benzoic acid)</li> <li>• Rosuvastatin (Pyrimidine)</li> </ul>	3L
2.4	<b>Antidiabetic Agents</b> General idea and types of diabetes; Insulin therapy <ul style="list-style-type: none"> <li>• Glibenclamide (Sulphonyl ureas)</li> <li>• Metformin (Biguanides)</li> <li>• Dapagliflozin (Pyranose)</li> <li>• Pioglitazone (Thiazolidinediones) (<b>Synthesis from 2-(5-ethylpyridin-2-yl) ethanol</b>)</li> </ul>	2L
2.5	<b>Antiparkinsonism Drugs</b> Idea of Parkinson's disease. <ul style="list-style-type: none"> <li>• Procyclidine hydrochloride (Pyrrolidines)</li> <li>• Ethopropazine hydrochloride (Phenothiazines)</li> <li>• Levodopa (Amino acids) (<b>Synthesis from Vanillin</b>)</li> </ul>	2L
2.6	<b>Drugs for Respiratory System</b> General idea of: Expectorants; Mucolytes; Bronchodilators; Decongestants; Antitussives <ul style="list-style-type: none"> <li>• Ambroxol (Cyclohexanol) (<b>Synthesis from paracetamol</b>)</li> <li>• Salbutamol (Phenyl ethyl amines)</li> <li>• Oxymetazoline (Imidazolines)</li> <li>• Codeine Phosphate (Opiates)</li> </ul>	2L

<b>DYES</b>		
<b>UNIT III, 1L/week</b>		
<b>COURSE CODE: SIUSACDD51.3</b>		
<b>LEARNING OBJECTIVES:</b>		
<ol style="list-style-type: none"> <li>1. To study the concept of dyes, its property and <i>nomenclature dyes</i>.</li> <li>2. <i>To study the concept of natural and synthetic dyes.</i></li> <li>3. <i>To study the classification of dyes based on application.</i></li> <li>4. <i>To familiarize the students with the types of fibers, application of dyes and how the dyes are attached to them.</i></li> <li>5. <i>To study the concept of optical brighteners and their classes.</i></li> </ol>		
<b>3</b>	<b>Introduction to the dye-stuff Industry</b>	<b>15L</b>
<b>3.1</b>	<b>Introduction to the dye-stuff Industry</b> <b>3.1.1</b> Definition of dyes, requirements of a good dye i.e. Colour, Chromophore and Auxochrome, Solubility, Linearity, Coplanarity, Fastness, Substantivity, Economic viability. Definition of fastness and its properties and Mordants with examples Explanation of nomenclature or abbreviations of commercial dyes with at least one example suffixes – G, O, R, B, K, L, C, S H, 6B, GK, 6GK, Naming of dyes by colour index (two examples) used in dye industries.  <b>3.1.2 Natural and Synthetic Dyes</b> <b>Natural Dyes:</b> Definition and limitations of natural dyes. Examples and uses of natural dyes w.r.t Heena, Turmeric, Saffron, Indigo, Madder, Chlorophyll – <b>names</b> of the chief dyeing material/s in each natural dye [ <b>structures not expected</b> ].  <b>Synthetic dyes:</b> Definition of synthetic dyes, primaries and intermediates. Important milestones in the development of synthetic dyes – Emphasis on Name of the Scientist, dyes and the year of the discovery is required. (structure is not expected)	<b>5L</b>

<p><b>3.2</b></p>	<p><b>Substrates for Dyes : Types of fibres</b></p> <p><b>3.2.1</b> Natural: cellulosic and proteinaceous fibres, examples – wool, silk and cotton structures and names of dyes applied on each of them.</p> <p><b>3.2.2</b> Semi – synthetic: definition and examples [structures not expected]</p> <p><b>3.2.3</b> Synthetic: Nylon, Polyesters and Polyamides structures and names of dyes applied on each of them</p> <p><b>3.2.4</b> Blended fabrics: definition and examples [structures not expected]</p> <p><b>3.2.5</b> Binding forces of dyes on substrate: ionic forces, covalent linkages, hydrogen bonding, van der-Waals forces.</p>	<p><b>3L</b></p>
<p><b>3.3</b></p>	<p><b>Classification of dyes based on applications and dyeing methods</b></p> <p><b>3.3.1 Dyeing methods</b></p> <p>Basic Operations involved in dyeing process:</p> <p>i. Preparation of fibres                      ii. Preparation of dyebath</p> <p>iii. Application of dyes                      iv. Finishing</p> <p>Dyeing Method of Cotton Fibres:</p> <p>(i) Direct dyeing                      (ii) Vat dyeing</p> <p>(iii) Mordant dyeing                      (iv) Disperse dyeing</p> <p><b>3.3.2 Classification of dyes based on applicability on substrates (examples with structures)</b></p> <p>(a) Acid Dyes- Orange II,</p> <p>(b) Basic Dyes-methyl violet,</p> <p>(c) Direct cotton Dyes- Benzofast Yellow 5GL</p> <p>(d) Azoic Dyes – Diazo components; Fast yellow G, Fast orange R. Coupling components. Naphthol AS, Naphthol ASG</p> <p>(e) Mordant Dyes-Eriochrome Black A, Alizarin.</p> <p>(f) Vat Dyes- Indanthrene brown RRD,</p> <p>(g) Sulphur Dyes- Sulphur Black T (no structure)</p> <p>(h) Disperse Dyes-Celliton Fast brown 3R,</p> <p>(i) Reactive Dyes- Cibacron Brilliant Red B,</p> <p><b>3.3.3 Optical Brighteners:</b> General idea, important characteristics of optical brighteners and their classes [Stilbene, Coumarin, Heterocyclic vinylene derivatives, Diarylpyrazolines, Naphthylamide derivatives] general structure of each class.</p>	<p><b>7L</b></p>



**COURSE CODE: SIUSACDD51.4****LEARNING OBJECTIVES:**

1. To study the relation between colour and chemical compounds.
2. To study the concept of Unit process and Dye Intermediates.
3. To study the synthesis of Dyes intermediate.

<b>4</b>	<b>Colour and Chemical Constitution of Dyes</b>	<b>15L</b>
<b>4.1</b>	<b>Colour and Chemical Constitution of Dyes</b> <b>4.1.1 Absorption of visible light, Colour of wavelength absorbed, Complementary colour.</b> <b>4.1.2 Relation between colour and chemical constitution.</b> <ol style="list-style-type: none"> <li>(i) Armstrong theory (quinonoid theory) and its limitations.</li> <li>(ii) Witt's Theory: Chromophore, Auxochrome, Bathochromic &amp; Hypsochromic Shift, Hypochromic &amp; Hyperchromic effect</li> <li>(iii) Valence Bond theory, comparative study and relation of colour in the following classes of compounds/dyes: Benzene, Nitrobenzene, Nitroanilines, Nitrophenols, Benzoquinones, Azo, Triphenyl methane, Anthraquinones.</li> <li>(iv) Molecular Orbital Theory.</li> </ol>	<b>4L</b>
<b>4.2</b>	<b>Unit process and Dye Intermediates</b> <b>4.2.1 A brief idea of Unit Processes</b> Introduction to primaries and intermediates Unit processes: definition and brief ideas of below unit processes: (a) Nitration (b) Sulphonation (c) Halogenation (d) Diazotization: (3 different methods & its importance) (e) Ammonolysis (f) Oxidation NB: Definition, Reagents, Examples of each unit processes mentioned above with reaction conditions (mechanism is not expected) <b>4.2.2 Preparation of the Following Intermediates</b> <u>Benzene derivatives:</u> Benzenesulphonic acid; 1,3-Benzenedisulphonic acid; sulphanilic acid; o-, m-, p-chloronitrobenzenes; o-, m-, p-nitroanilines; o-, m-, p-phenylene diamines; Naphthol ASG. <u>Naphthalene Derivative:</u> Schaeffer acid; Tobias acid; Naphthionic acid; N.W. acid; cleve-6-acid; H-acid; Naphthol AS. <u>Anthracene Derivative:</u> 1-Nitroanthraquinone; 1-Aminoanthraquinone Anthraquinone-2-sulphonic acid; Benzanthrone.	<b>11L</b>

### **SUGGESTED REFERENCE SIUSACDD51 (Drugs)**

1. Foye's principles of medicinal chemistry. 6th Edition, Edited by Davis William & Thomas Lemke, Indian edition by B I Publication Pvt Ltd, Lippincott Williams & Wilkins.
2. Text book of organic medicinal & pharmaceutical chemistry. Wilson & Gisovolds, 11th Edition by John H Block, John M Beale Jr.
3. Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4<sup>th</sup> edition.
4. Burger's Medicinal Chemistry, Drug Discovery and Development. Abraham and Rotella. Wiley
5. Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4<sup>th</sup> edition.
6. Medicinal chemistry. V.K. Ahluwalia and Madhu Chopra, CRC Press.
7. Principle of medicinal chemistry. Vol 1 &2 S. S. Kadam, K. R. Mahadik, K. G. Bothara
8. The Art of Drug synthesis. Johnson and Li. Wiley, 2007.
9. The organic chemistry of drug design & drug action. 2<sup>nd</sup> ed. By Richard B Silvermann, Academic Press.
10. The Organic Chemistry of Drug Synthesis. Lednicer and Mitscher, Wiley.

### **SUGGESTED REFERENCE SIUSACDD51 (Dyes)**

1. Chemistry of Synthetic Dyes, Vol I – VIII, Venkatraman K., Academic Press 1972
2. The Chemistry of Synthetic Dyes and Pigments, Lubs H.A., Robert E Krieger Publishing Company, NY ,1995
3. Chemistry of Dyes and Principles of Dyeing, Shenai V.A., Sevak Publications, 1973

**SIUSACDD5P1**  
**APPLIED COMPONENT: DRUGS AND DYES**  
**Credits: 2 Credits (4 Lectures/ week)**

**PRACTICAL COURSE APPLIED COMPONENT**

<b>Course Code: SIUSACDD5P1</b>	
<b>LEARNING OBJECTIVES</b>	
<i>1. To study the synthesis of selective drug.</i>	
<i>2. To develop skills of separation.</i>	
<i>3. To study the concept of dyeing of fabric.</i>	
<i>4. To develop skill of project write-up.</i>	
<b>Course Code: SIUSACDD5P1 (4L/Week)</b>	
<b>1</b>	1) Estimation of Ibuprofen (back titration method) 2) Estimation of Acid neutralizing capacity of a drug 3) Preparation of Aspirin from salicylic acid. 4) Separation of components of natural pigments by paper chromatography (eg chlorophyll).

**PROJECT:**

**Preparation of Orange II dye (semi-microscale 1.0gms) and its use for dyeing different fabrics**

**SUGGESTED REFERENCE SIUSACDD5P1**

1. A. I. Vogel, Practical Organic Chemistry
2. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK.
3. Hakishan, V.K. Kapoor: Medicinal and Pharmaceutical Chemistry, Vallabh, Prakashan, Pitampura, New Delhi.
4. William O. Foye, Thomas L., Lemke, David A. William: Principles of Medicinal, Chemistry, B.I. Waverly Pvt. Ltd. New Delhi.

**APPLIED COMPONENT  
SEMESTER VI  
DRUGS AND DYES**

Course Code	Unit	Topics	Credits	L/Week	
SIUSACDD61	<b>1</b>	<b>Drug Discovery, Design and Development</b>	2	<b>1</b>	
		1.1 Drug Discovery, Design and Development			
		1.2 Drug Metabolism			
		1.3 Chemotherapeutic Agents:			
	<b>2</b>	<b>Chemotherapeutic Agents continued.</b>		2	<b>1</b>
		2.1 Antiamoebic Drugs			
		2.2 Antitubercular and Antileprotic Drugs			
		2.3 Anti-Neoplastic Drugs			
		2.4 Anti-HIV Drugs			
		2.5 Drug Intermediates			
		2.6 Nano particles in Medicinal Chemistry			
		2.7 Drugs and Environmental Aspects			
	<b>3</b>	<b>Classification of Dyes based on Chemical Constitution and Synthesis of Selected Dyes</b>		2	<b>1</b>
3.1 Classification of Dyes based on Chemical Constitution and Synthesis of Selected Dyes					
3.2 Health and Environmental Hazards of Synthetic Dyes and their Remediation Processes					
<b>4</b>	<b>Non-textile uses of dyes</b>	2	<b>1</b>		
	4.1 Non-textile uses of dyes:				
	4.2 Pigments				
	4.3 Dyestuff Industry - Indian Perspective				
SIUSACDD6P1		<b>Drugs and Dyes Practical</b>	<b>2</b>	<b>4</b>	

**APPLIED COMPONENT**  
**SEMESTER VI**  
**DRUGS AND DYES**

**COURSE CODE: SIUSACDD61**

**CREDITS: 2.5**

**LECTURES: 60**

<b>DRUGS</b>		
<b>UNIT- I 1L/week</b>		
<b>SIUSACDD61.1</b>		
<b>LEARNING OBJECTIVES:</b>		
<ol style="list-style-type: none"> <li>1. <i>To study the discovery of drug from different sources.</i></li> <li>2. <i>To know the uses and the side effects of certain drugs for various diseases.</i></li> <li>3. <i>To study the basic concept of drug designing.</i></li> <li>4. <i>To familiarize students with ADME properties of drugs.</i></li> <li>5. <i>To study the different class of Chemotherapeutic Agents.</i></li> </ol>		
<b>1</b>	<b>Drug Discovery, Design and Development</b>	<b>15L</b>
<b>1.1</b>	<b>Drug Discovery, Design and Development</b> <b>1.1.1</b> Discovery of a Lead compound: Screening, drug metabolism studies and clinical observation, Lipinski's rule of 5 <b>1.1.2</b> Medicinal properties of compounds from Natural Sources: Anti-infective and anticancer properties of Turmeric (Curcumin) <b>1.1.3</b> Development of drug: The Pharmacophore identification, modification of structure or functional group, Structure activity relationship (Sulphonamides). <b>1.1.4</b> Structure modification to increase potency: Homologation, Chain branching and Extension of the structure. <b>1.1.5</b> Computer assisted drug design.	<b>6L</b>
<b>1.2</b>	<b>Drug Metabolism:</b> Introduction, Absorption, Distribution, Bio-transformation, Excretion Different types of chemical transformation of drugs with specific examples.	<b>3L</b>

1.3	<p><b>Chemotherapeutic Agents:</b> Study of the following chemotherapeutic agents with respect to their chemical structure, chemical class, therapeutic uses, side effects and introduction to MDR wherever applicable.</p> <p><b>1.3.1 Antibiotics and antivirals:</b> Definition,</p> <ul style="list-style-type: none"> <li>• Amoxicillin (<math>\beta</math>- lactum antibiotics)</li> <li>• Cefpodoxime (Cephalosporins)</li> <li>• Doxycycline (Tetracyclines)</li> <li>• Levofloxacin (Quinolones) (<b>Synthesis from 2,3,4 – Trifluoro -1- nitrobenzene</b>)</li> <li>• Aciclovir/Acyclovir (Purines)</li> </ul> <p><b>1.3.2 Antimalarials:</b> Types of malaria; Symptoms; Pathological detection during window period (Life cycle of the parasites not to be discussed)</p> <ul style="list-style-type: none"> <li>• Chloroquine (3-Amino quinolones)</li> <li>• Artemether(Benzodioxepins)</li> </ul> <p><b>Following combination to be discussed:</b> Atremether-Lumefantrine (no structure)</p> <p><b>1.3.3 Anthelmintics and AntiFungal agents</b></p> <p>Drugs effective in the treatment of Nematodes and Cestodes infestations.</p> <ul style="list-style-type: none"> <li>• Diethyl carbamazine (Piperazines)</li> <li>• Albendazole (Benzimidazoles) (<b>Synthesis from 2- Nitroaniline</b>)</li> <li>• Clotrimazole (Imidazole)</li> <li>• Fluconazole (Triazole) (<b>Synthesis from 1- Bromo – 2,4- difluorobenzene</b>)</li> </ul>	6L
<b>UNIT – II 1L/week</b>		
<b>SIUSACDD61.2</b>		
<b>LEARNING OBJECTIVES:</b>		
<ol style="list-style-type: none"> <li>1. To study the synthesis of drug intermediate.</li> <li>2. To know the uses and the side effects of certain drugs for various diseases.</li> <li>3. To study the different class of Chemotherapeutic Agents.</li> <li>4. To study the importance of nanomaterial in medicinal chemistry.</li> </ol>		
<b>2 Chemotherapeutic Agents continued.</b>		<b>15L</b>
2.1	<p><b>Antiamoebic Drugs</b></p> <p>Types of Amoebiasis</p> <ul style="list-style-type: none"> <li>• Metronidazole, Ornidazole, Tinidazole (Imidazole)</li> </ul> <p>Synthesis of Metronidazole from glyoxal by Debus-Radziszewski imidazole synthesis route</p> <p><b>Following combination therapy to be discussed:</b> Ciprofloxacin-Tinidazole</p>	<b>1L</b>

2.2	<p><b>Antitubercular and Antileprotic Drugs</b></p> <p>Types of Tuberculosis; Symptoms and diagnosis of Tuberculosis. Types of Leprosy. General idea of Antibiotics used in their treatment.</p> <ul style="list-style-type: none"> <li>• PAS (Amino salicylates)</li> <li>• Isoniazide (Hydrazides)</li> <li>• Pyrazinamide (Pyrazines)</li> <li>• (+) Ethambutol (Aliphatic diamines) (<b>Synthesis from 1- Nitropropane</b>)</li> <li>• Dapsone(Sulphonamides) (<b>Synthesis from 4- Chloronitrobenzene</b>)</li> <li>• Clofazimine (Phenazines)</li> <li>• Bedaquiline (Quinoline)</li> </ul> <p><b>Following combination therapy to be discussed:</b></p> <p>(i) Rifampin + Ethambutol + Pyrazinamide (ii) Rifampin + Isoniazide + Pyrazinamide</p>	3L
2.3	<p><b>Anti-Neoplastic Drugs</b></p> <p>Idea of malignancy; Causes of cancer, Brief idea of Immuno Stimulants &amp;Immuno depressants.</p> <ul style="list-style-type: none"> <li>• Lomoustine (Nitrosoureas)</li> <li>• Anastrozole(Triazoles) (<b>Synthesis from 3,5-bis (bromo methyl) toluene</b>)</li> <li>• Cisplatin (Chloro Platinum)</li> <li>• Vincristine, Vinblastine, Vindesine) (Vinca alkaloids) (structure not expected)</li> </ul>	2L
2.4	<p><b>Anti-HIV Drugs</b></p> <p>Idea of HIV pathogenicity, Symptoms of AIDS</p> <ul style="list-style-type: none"> <li>• AZT/Zidovudine, Lamivudine,DDI (Purines)</li> </ul>	1L
2.5	<p><b>Drug Intermediates: Synthesis and uses</b></p> <ol style="list-style-type: none"> <li>1. 2,3,6-Triamino-6- hydroxypyrimidine from Guanidine</li> <li>2. p-[2'-(5-Chloro-2-methoxy benzamido) ethyl]- benzenesulphonamide from Methyl-5-chloro-2- methoxybenzene</li> <li>3. 3-(p-Chlorophenyl)-3- hydroxypiperidine from 3- Chloroacetophenone</li> <li>4. p-Acetyl amino benzenesulphonyl chloride from Aniline</li> <li>5. Epichlorohydrine from propene</li> </ol>	2L

2.6	<b>Nano particles in Medicinal Chemistry</b> Introduction; Carbon nano particles (structures) and Carbon nano tubes: <ul style="list-style-type: none"> <li>• Functionalization for Pharmaceutical applications</li> <li>• Targeted drug delivery</li> <li>• In vaccine (Foot and mouth disease)</li> <li>• Use in Bio-physical treatment.</li> </ul> Gold nano particles in treatment of: Cancer; Parkinsonism; Alzheimer. Silver nano particles: Antimicrobial activity.	4L
2.7	<b>Drugs and Environmental Aspects</b> <ul style="list-style-type: none"> <li>• Impact of Pharma-industry on environment,</li> <li>• International regulation for human experimentation with reference to: “The Nuremberg Code” and “The Helsinki Declaration”.</li> </ul>	2L
<b>DYES</b>		
<b>UNIT – III 1L/week</b>		
<b>SIUSACDD61.3</b> <b>LEARNING OBJECTIVES:</b> <ol style="list-style-type: none"> <li>1. To study the classification of dyes based on chemical constitution, its synthesis and applications.</li> <li>2. To familiarize the students with the syntheses of some representative dyes.</li> <li>3. To create an awareness of the current concern about the toxicity of dyes and their effect on ecology.</li> </ol>		
<b>3 Classification of Dyes based on Chemical Constitution and Synthesis of Selected Dyes</b>		<b>15L</b>
3.1	<b>Classification of Dyes based on Chemical Constitution and Synthesis of Selected Dyes</b> (Synthesis of the dyes marked with * is expected) <ol style="list-style-type: none"> <li>i) <b>Nitro Dye:</b> Naphthol Yellow S</li> <li>ii) <b>Nitroso Dye:</b> Gambine Y</li> <li>iii) <b>Azo dyes:</b> <ol style="list-style-type: none"> <li>a) Monoazo dyes: Orange IV *(from sulphanilic acid) &amp; Eriochrome Black T* (from <math>\beta</math>- naphthol)</li> <li>b) Bisazo dyes: Congo Red* (from nitrobenzene)</li> <li>c) Trisazo Dye: Direct Deep Black EW* (from benzidine)</li> </ol> </li> <li>iv) <b>Diphenylmethane dye:</b> Auramine O* (from N,N-dimethyl aniline)</li> <li>v) <b>Triphenylmethane dye:</b></li> </ol>	12L



	<p>a) Diamine series: Malachite Green* (from benzaldehyde)</p> <p>b) Triamine series: Acid Magenta</p> <p>c) Phenol series: Rosolic acid</p> <p><b>vi) Heterocyclic Dyes:</b></p> <p>a) Thiazine dyes: Methylene Blue</p> <p>b) Azine dyes: Safranin T* (from o-toluidine)</p> <p>c) Xanthene Dyes: Eosin* (from phthalic anhydride)</p> <p>d) Oxazine Dyes: Capri Blue</p> <p>e) Acridine Dyes: Acriflavine</p> <p><b>vii) Quinone Dyes:</b></p> <p>a) Naphthaquinone: Naphthazarin</p> <p>b) Anthraquinone Dyes: Indanthrene Blue* (from anthraquinone)</p> <p><b>viii) Indigoid Dyes:</b> Indigo* (from aniline + monochloroacetic acid)</p> <p><b>ix) Phthalocyanine Dyes:</b> Monastral Fast Blue B</p>	
<p><b>3.2</b></p>	<p><b>Health and Environmental Hazards of Synthetic Dyes and their Remediation Processes</b></p> <p><b>3.2.1 Impact of the textile and leather dye Industry on the environment</b> with special emphasis on water pollution</p> <p><b>3.2.2 Health Hazards:</b> Toxicity of dyes w.r.t food colours.</p> <p><b>3.2.3 Effluent Treatment Strategies:</b></p> <p>Brief introduction to effluent treatment plants (ETP)</p> <p>Primary Remediation processes: (Physical Processes) Sedimentation, Aeration, Sorption (activated charcoal, fly ash etc).</p> <p>Secondary Remediation processes: Biological Remediation – Biosorption, bioremediation and biodegradation.</p> <p>Chemical Remediation: Oxidation Processes (chlorination), Coagulation-flocculation-Precipitation.</p>	<p><b>3L</b></p>
<p><b>UNIT – IV 1L/week</b></p>		
<p><b>SIUSACDD61.4</b></p> <p><b>LEARNING OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li><i>To study the non- textile use of dyes.</i></li> <li><i>To familiarize the students with the application of dyes in medical field.</i></li> <li><i>To study the concept of pigments.</i></li> </ol>		

	<b>4 Non-textile uses of dyes:</b>	<b>15L</b>
<b>4.1</b>	<p><b>Non-textile uses of dyes:</b></p> <p><b>4.1.1 Biomedical uses of dyes</b></p> <p>i) Dyes used in formulations (Tablets, capsules, syrups etc) Indigo carmine, Sunset yellow, Tartrazine</p> <p>ii) Biological staining agents Methylene blue, Crystal violet and Safranin T</p> <p>iii) DNA markers Bromophenol blue, Orange G, Cresol red</p> <p>iv) Dyes as therapeutics Mercurochrome, Acriflavine, Crystal Violet, Prontosil</p> <p><b>4.1.2 Dyes used in food and cosmetics:</b></p> <p>i) Properties of dyes used in food and cosmetics</p> <p>ii) Introduction to FDA and FSSAI</p> <p>iii) Commonly used food colours and their limits</p> <p><b>4.1.3 Paper and leather dyes</b></p> <p>i) Structural features of paper and leather</p> <p>ii) Dyes applicable to paper and leather</p> <p><b>4.1.4 Miscellaneous dyes</b></p> <p>i) Hair dyes</p> <p>ii) Laser dyes</p> <p>iii) Indicators</p> <p>iv) Security inks</p> <p>iv) Coloured smokes and camouflage colours</p>	<b>8L</b>
<b>4.2</b>	<p><b>Pigments</b></p> <p>Definition of pigments, examples, properties of pigments, difference between dyes and pigments.</p> <p>Definition of Lakes and Toners</p>	<b>3L</b>
<b>4.3</b>	<p><b>Dyestuff Industry - Indian Perspective</b></p> <p><b>4.3.1</b> Growth and development of the Indian Dyestuff Industry</p> <p><b>4.3.2</b> Strengths, Weaknesses, Opportunities and Challenges of the Dyestuff industry in India</p> <p><b>4.3.3</b> Make in India - Future Prospects of the Dye Industry</p>	<b>4L</b>

### **Suggested References (for Drugs):**

1. Foye's principles of medicinal chemistry. 6th Edition, Edited by Davis William & Thomas Lemke, Indian edition by B I Publication Pvt Ltd, Lippincott Williams & Wilkins.
2. Text book of organic medicinal & pharmaceutical chemistry. Wilson & Gisovolds, 11th Edition by John H Block, John M Beale Jr.
3. Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4<sup>th</sup> edition.
4. Burger's Medicinal Chemistry, Drug Discovery & Development. Abraham & Rotella. Wiley.
5. Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4<sup>th</sup> edition.
6. Medicinal chemistry. V.K. Ahluwalia and Madhu Chopra, CRC Press.
7. Principle of medicinal chemistry. Vol 1 & 2 S. S. Kadam, K. R. Mahadik, K. G. Bothara
8. The Art of Drug synthesis. Johnson and Li. Wiley, 2007.
9. The organic chemistry of drug design & drug action. 2<sup>nd</sup> ed. By Richard B Silvermann, Academic Press.
10. The Organic Chemistry of Drug Synthesis. Lednicer and Mitscher, Wiley.
11. Text book of drug design and discovery. Povl-Krog-Sgaard-Larsen, Tommy Liljefors and ULF Madsen, 3rd Edition Taylor & Francis.
12. Bio-applications of nanoparticles. Edited by Warren C.W. Chan, Springer Publication.
13. Nanoparticle and technology for drug delivery (Drugs and pharmaceutical sciences). Ram B.Gupta & Uday B. Kompella Pub. Informa Healthcare.
14. Nano forms of carbon and its applications. Edited by Maheshwar Sharon and Madhuri Sharon. Monad Nanotech Pvt. Ltd.
15. Environmental Chemistry. A. K. De
16. Text Book on Law and Medicine. Chokhani and Ghormade. 2<sup>nd</sup> Edition. Hind Law House, Pune.
17. Essentials of Medical Pharmacology. K D Tripathi, Jaypee Brothers Medical publishers Pvt. Ltd.  
Practical organic chemistry, Vogel.

### **Suggested References (for Dyes):**

1. Chemistry of Synthetic Dyes, Vol I – IV, Venkatraman K., Academic Press 1972  
SIES CHEMISTRY (AC: Drugs & Dyes)/SEMESTER – V & VI

2. The Chemistry of Synthetic Dyes and Pigments, Lubs H.A., Robert E Krieger Publishing Company, NY ,1995
3. Chemistry of Dyes and Principles of Dyeing, Shenai V.A., Sevak Publications, 1973
4. Environmental Studies, Joseph Benny, Tata McGraw Hill Education, 2005
5. Fundamental Concepts of Environmental Chemistry, Sodhi. G. S., Alpha Science International, 2009
6. Planning Commission, NitiAayog, FSSAI and FDA websites
7. Green Chemistry for Dyes Removal from Waste Water- Research Trends and Applications, Ed. Sharma S.K., Wiley, 2015.
8. Environmental Pollution- Monitoring and Control, Khopkar S.M., New Age International (P) Ltd, New Delhi, 1982.

**SIUSACDD6P1**  
**APPLIED COMPONENT: DRUGS AND DYES**  
**Credits: 2 Credits (4 Lectures/ week)**

**PRACTICAL COURSE APPLIED COMPONENT**

<b>Course Code: SIUSACDD6P1</b>	
<b>LEARNING OBJECTIVES</b>	
1. <i>To study the synthesis of selective dye intermediates.</i>	
2. <i>To study the synthesis of selective drug.</i>	
3. <i>To study the concept of TLC.</i>	
4. <i>To develop skill of Monograph write-up of drugs.</i>	
<b>Course Code: SIUSACDD6P1 (4L/Week)</b>	
<b>1</b>	1) o-Methylation of $\beta$ -naphthol. 2) Preparation of Paracetamol from p-aminophenol. 3) Preparation of Fluorescein 4) TLC of a mixture of dyes (safranin-T, Indigo carmine, methylene blue)

**PROJECT:**

**Preparation of monograph of any one drug from syllabus by I.P. method.**

**OR**

**Industrial visit Report.**

**SUGGESTED REFERENCE SIUSACDD6P1**

1. A. I. Vogel, Practical Organic Chemistry
2. K. Venkataraman, Chemistry of synthetic dyes, Vol. I to VI.

## MODALITY OF ASSESSMENT

### THEORY EXAMINATION PATTERN:

#### (A) Internal Assessment – 40 Marks

Internal Assessment	Marks
Class test	20
Assignment / Case Study / Project / Presentation/ etc.)	15
Active participation and overall conduct in class	05
<b>Total Marks</b>	<b>40</b>

#### (B) Semester End Theory Assessment - 60 Marks (Duration - Semester End Theory examinations shall be of 2 hours duration).

#### Theory question paper pattern:

1. There shall be **four** questions.
2. Each unit there will be one question with **15** Marks each.
3. All questions shall be **compulsory** with internal choices within the questions.  
Question 1 (Unit-1),  
Question 2 (Unit-2),  
Question 3 (Unit-3) &  
Question 4 (Unit-4)
4. All Questions may be sub divided into sub questions of **five** marks each.
5. Please ensure that the allocation of marks depends on the number of lectures allotted for each topic.

#### Marks distribution pattern for theory examination

Sr. No.	Theory Examination	Total
1.	Theory Internal Assessment	40
2.	Theory	60
	<b>Total</b>	<b>100</b>

### II] PRACTICAL EXAMINATION PATTERN:

SIES CHEMISTRY (AC: Drugs & Dyes)/SEMESTER – V & VI

**Scheme of examination: There will be no internal assessment for practical.**

A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a **certified journal** at the time of practical examination or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of that semester of T.Y.B.Sc. Applied component as per the minimum requirement.

The duration of the practical examination will be **three and half hours** per experiment. The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for its skill and understanding of chemistry.

**Note: Minimum 75% experiments of prescribed syllabus should be completed in the 5<sup>th</sup> and 6<sup>th</sup> semester. Certified journal is a must to be eligible to appear for the semester end practical examination, failing which they will not be allowed to appear for the examination.**

#### Marks distribution pattern for practical examination

Sr. No.	Distribution	Marks
1.	Experimental work	80
2.	Journal	10
3.	Viva – Voce	10
Total		100

#### Overall Examination and Marks Distribution Pattern

Sr. No.	Semester end examination	Total
1.	Theory Internal Assessment	40
2.	Theory	60
3.	Practical	100
Total		200