

**B.SC CHEMISTRY COURSE PATTERN  
(WITH EFFECT FROM JUNE 2023)**

Sem	Part	Status	Sub. Code	Title of the Paper	Hrs	Cdt
I	I	Lang	23UGTL11	General Tamil – I	6	3
	I	Lang	23UGHL11	Hindi – I		
	I	Lang	23UGFL11	French - I		
	II	Lang	23UGEL11	General English - I	6	3
	III	Core	23UCHC11	General Chemistry I	5	5
	III	Core	23UCHC12	Practical: Inorganic Volumetric Estimation-I	3	3
	III	EC	23UMTE11	Allied Mathematics	6	5
	IV	SEC1	23UCHN11	Role of Chemistry in daily life (NME)	2	2
	IV	FC	23UHER11/ 23UHEE11	Foundation Course - Religion: Catholic Doctrine/Ethics	2	2
					30	23
II	I	Lang	23UGTL21	General Tamil – II	6	3
	I	Lang	23UGHL21	Hindi – II		
	I	Lang	23UGFL21	French – II		
	II	Lang	23UGEL21	General English- II	6	3
	III	Core	23UCHC21	Organic Chemistry - I	5	5
	III	Core	23UCHC22	Practical: Inorganic Volumetric Estimation-I	3	3
	III	EC	23UMTE21	Allied Mathematics - II	6	5
	IV	SEC2	23UCHN21	DaIry Chemistry (NME)	2	2
	IV	SEC3	23UHEI21	Integrated personality development	2	2
					30	23
III	I	Lang	23UGTL31	General Tamil – III	6	3
	I	Lang	23UGHL31	Hindi – III		
	I	Lang	23UGFL31	French - III		
	II	Lang	23UGEL31	General English- III	6	3
	III	Core	23UCHC31	Inorganic Chemistry-I	5	5
	III	Core	23UCHC32	Practical: Inorganic Qualitative Analysis - I	3	3
	III	EC	23UPHE31	Allied Physics - I	4	3
	III	EC	23UPHE32	Practical – Allied Physics I	2	2
	IV	SEC4	23UHEL31	Life Issues and Entrepreneurial skill development	2	2
	IV	SEC5	23UCHN31	Food Chemistry (NME)	2	2
					30	23
IV	I	Lang	23UGTL41	General Tamil – IV	6	3
	I	Lang	23UGHL41	Hindi – IV		
	I	Lang	23UGFL41	French – IV		
	II	Lang	23UGEL41	General English- IV	6	3
	III	Core	23UCHC41	Organic Chemistry - II	4	4
	III	Core	23UCHC42	Practical: Inorganic Qualitative Analysis-II	3	3

	III	EC	23UPHE41	Allied Physics - II	3	3
	III	EC	23UPHE42	Practical – Allied Physics - II	2	2
	IV	SEC6	23UCHN41	Agricultural chemistry (NME)	2	2
	IV	SEC7	23UCHS41	Material Science	2	2
	IV	EVS	23UEVS41	Environmental Studies	2	2
					30	24
V	III	Core	23UCHC51	Organic Chemistry - III	4	4
	III	Core	23UCHC52	Inorganic Chemistry - II	4	3
	III	Core	23UCHC53	Physical Chemistry - I	4	3
	III	Core	23UCHC54	Physical Chemistry - II	4	3
	III	Core	23UCHC55	Biomolecules	4	3
	III	EC	23UCHE51	Inorganic Gravimetric Estimation and preparation of Coordination compounds	4	3
	III	EC	23UCHE52	Estimation of organic compounds and Preparation of organic compounds	4	3
	IV	VE	23UVEH51	Human Rights and Social Analysis	2	2
	IV	Internship	23UCHI51	Internship	-	2
					30	26
VI	III	Core	23UCHC61	Organic Chemistry - IV	4	4
	III	Core	23UCHC62	Inorganic Chemistry - III	4	3
	III	Core	23UCHC63	Physical Chemistry - III	4	3
	III	Core	23UCHC64	Thermodynamics and Solid State	4	2
	III	EC	23UCHE61	Physical Chemistry Practical	4	2
	III	EC	23UCHE62	Qualitative analysis of organic compounds	4	2
	III	Core	23UCHC65	Project with Viva Voce	4	2
	IV	SEC8	23UCHS61	Computer Applications in Chemistry	2	2
	V	Extension Activities		STAND (Student Training and Action for Neighborhood Development)	-	1
					30	21
					180	140
				<b>Additional Compulsory Courses</b>		
I UG	Add-on	23UCHAO1	Experimental techniques in chemistry		2	
II UG	Value added	23UCHVA1	Food chemistry		2	
III UG	ECC (Any one)	23UCHEC1	Cosmetic and Personal Grooming		2	
		23UCHEC2	Leather chemistry			
		23UCHEC3	Forensic chemistry			
		23UCHEC4	Pollution control			
		23UCHEC5	Applied chemistry			
		23UCHEC6	Space chemistry			
				<b>Total</b>	180	146

**LEARNING OBJECTIVES: கற்றலின் நோக்கங்கள்**

1. முதலாமாண்டு பட்ட வகுப்பு மாணவர்களுக்குத் தமிழ்மொழி இலக்கியங்களை அறிமுகம் செய்தல்.
2. தற்கால இலக்கியப் போக்குகளையும் இலக்கணங்களையும் மாணவர் அறியுமாறு செய்து அவர்களின் படைப்பாற்றலைத் தூண்டுதல்.
3. தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்.
4. மொழித்திறன்களை மாணவர்கள் அறிந்துகொள்ள தூண்டுதல்.
5. நவீன இலக்கிய வகைமைகளை அறிமுகம் செய்தல்.
6. சமூகச்சிந்தனைகளை உருவாக்க இலக்கியப்பாடுபொருள் காரணமாய் உள்ளது என்பதை அறியச் செய்தல்.

**அலகு1: மரபுக்கவிதை**

- |                   |  |
|-------------------|--|
| 1. பெ. சுந்தரனார் | - தமிழ்த் தெய்வவணக்கம்                   |
| 2. பாரதிதாசன்     | - சிறுத்தையே வெளியே வா                   |
| 3. கவிமணி         | - புத்தரும் சிறுவனும்                    |
| 4. முடியரசன்      | - மொழி உணர்ச்சி                          |
| 5. கண்ணதாசன்      | - ஆட்டனத்தி ஆதிமந்தி (ஆதிமந்தி புலம்பல்) |
| 6. சுரதா          | - துறைமுகம் (வினாத்தாள்)                 |
| 7. தமிழ் ஒளி      | - கடல்                                   |

**அலகு2: புதுக்கவிதை**

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|-----------------------|--|
| 1. அப்துல் ரகுமான்    | - வீட்டுக்கொரு மரம் வளர்ப்போம்               |
| 2. ஈரோடு தமிழன்பன்    | - சென்றியூ கவிதைகள் (ஏதேனும் ஐந்து கவிதைகள்) |
| 3. வைரமுத்து          | - பிற்சேர்க்கை                               |
| 4. மு.மேத்தா          | - வாழைமரத்தின் சபதம்                         |
| 5. அறிவுமதி           | - வள்ளுவம் பத்து                             |
| 6. நா. முத்துக்குமார் | - ஆனந்த யாழை மீட்டுகிறாய்                    |
| 7. சுகிர்தராணி        | - சபிக்கப்பட்ட முத்தம்                       |
| 8. இளம்பிறை           | - நீ எழுத மறுக்கும் எனது அழகு                |

**அலகு3: சிறுகதைகள்**

- |  |                                      |
|--|--------------------------------------|
| 1. வாய்ச்சொற்கள்   | - ஜெயகாந்தன் (மாலை மயக்கம் தொகுப்பு) |
| 2. கடிதம்  | - புதுமைப்பித்தன்                    |
| 3. கரு   | - உமா மகேஸ்வரி                       |
| 4. முள்முடி  | - தி. ஜானகிராமன்                     |
| 5. சிதறல்கள்   | - விழி. பா. இதயவேந்தன்               |
| 6. காகிதஉறவு   | - சு. சமுத்திரம்                     |
| 7. வீட்டின் மூலையில் சமையலறை- அம்பை  |                                      |
| 8. (மொழிப்பெயர்ப்புக் கதை) நாயக்காரர் சீமாட்டி - ஒரு குறும்புக்காரர் சிறுவன் |                                      |

#### அலகு4: பாடம் சார்ந்த இலக்கிய வரலாறு

#### அலகு5 : மொழித்திறன் போட்டித் தேர்வு

1. பொருள் பொதிந்த சொற்றொடர் அமைத்தல்
2. ஓர் எழுத்து ஒரு மொழி
3. வேற்றுமை உருபுகள்
4. திணை, பால், எண், இடம்
5. கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு

#### COURSE OUTCOMES: பயன்கள்

இப்பாடங்களைக் கற்பதால் மாணவர் பின்வரும் பயன்களைப் பெறுவர்.

CO1- பாரதியார் காலந்தொட்டு தற்காலப் புதுக்கவிதைகள் வரை கவிதையிலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல். (K1,K2)

CO2- புதுக்கவிதை வரலாற்றினை அறிந்துகொள்வர். (K2)

CO3- இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறனைப் பெறுதல். (K4)

CO4- மொழி அறிவோடு சிந்தனைத் திறன் அதிகரித்தல். (K3)

CO5- தமிழ்மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்துகொள்வர். (K4)

CO6- காலந்தோறும் சமூகச் சிந்தனைகள் மாறுவதை இலக்கிய வரலாற்றின் மூலம் அறிந்து கொள்ளுதல். (K6)

#### TEXT BOOKS (பாடநூல்கள்)

1. தமிழ்த்துறை வெளியீடு - தூய சவேரியார் தன்னாட்சிக் கல்லூரி, பாளையங்கோட்டை.
2. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு- எ.பி. பாக்கியமேரி

#### REFERENCE BOOKS (பார்வை நூல்கள்)

- தமிழ் இலக்கிய வரலாறு - சிற்.பி. பாலசுப்பிரமணியன்
- புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு – தமிழண்ணல்
- தமிழ் இலக்கிய வரலாறு – சேதுராமன்

#### WEB SOURCES (இணையதளங்கள்)

- Tamil Heritage Foundation- [www.tamilheritage.org](http://www.tamilheritage.org) <<http://www.tamilheritage.org>>
- Tamil virtual University Library- [www.tamilvu.org/library](http://www.tamilvu.org/library) <http://www.virtualvu.org/library>
- Project Madurai - [www.projectmadurai.org](http://www.projectmadurai.org).
- Chennai Library- [www.chennailibrary.com](http://www.chennailibrary.com) <<http://www.chennailibrary.com>>.
- Tamil Universal Digital Library- [www.ulib.prg](http://www.ulib.prg) <<http://www.ulib.prg>>.
- Tamil E-Books Downloads- [tamilebooksdownloads.blogspot.com](http://tamilebooksdownloads.blogspot.com)
- Tamil Books on line- [books.tamilcube.com](http://books.tamilcube.com)
- Catalogue of the Tamil books in the Library of British Congress [archive.org](http://archive.org)
- Tamil novels on line - [books.tamilcube.com](http://books.tamilcube.com)

பருவம்: 2	தாள்:மொழிப்பாடம்	Hrs: 6	Credits: 3
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**LEARNING OBJECTIVES: கற்றலின் நோக்கங்கள்**

1. சமய இலக்கியங்களையும் சிற்றிலக்கியங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
2. மொழித்திறனையும் சிறுகதை இலக்கிய வடிவத்தையும் மாணவர்களுக்கு உணர்த்துதல்.
3. தமிழ் இலக்கிய வரிசையில் சமய இலக்கியங்களின் முக்கியத்துவத்தை உணர்த்துதல்.
4. தமிழ் இலக்கிய வரிசையில் சிற்றிலக்கியங்களின் முக்கியத்துவத்தை அறிமுகம் செய்தல்.
5. தமிழ் இலக்கிய வளமைக்குப் பல்சமயங்கள் ஆற்றிய பங்கினை உணரச் செய்தல்.
6. சமய, சிற்றிலக்கியங்களின் இடத்தைத் தமிழ் இலக்கிய வரலாற்றின் வழி அறியச் செய்தல்.

**அலகு 1:**

- திருநாவுக்கரசர் - தேவாரம் - நாமார்க்கும் குடியல்லோம் எனத் தொடங்கும் பதிகம் (10 பாடல்கள்)
- ஆண்டாள் - திருப்பாவை (முதல் 20 பாசரம்)

**அலகு 2 :**

- வள்ளலார் - அருள் விளக்கமாலை (முதல் 10 பாடல்கள்)
- எச்.ஏ.கிருட்டிணப்பிள்ளை - இரட்சணியமனோகரம் - பால்ய பிராத்தனை
- குணங்குடி மஸ்தான் சாகிபு – பராபரக்கண்ணி (முதல் 10 கண்ணி)

**அலகு 3:**

- தமிழ் விடுதாது (முதல் 20 கண்ணி)
- திருக்குற்றாலக் குறவஞ்சி – குறத்தி மலைவளம் கூறுதல்
- முக்கூடற்பள்ளு – நாட்டு வளம்

**அலகு 4: பாடம் தழுவிய இலக்கிய வரலாறு**

(பல்லவர் காலம், நாயக்கர் காலம்)

**அலகு 5 : மொழித்திறன் - போட்டித் தேர்வுத்திறன்**

1. தொடர் வகைகள்
2. மரபுத்தொடர், பழமொழிகள்
3. பிறமொழிச் சொற்களைக் களைதல்
4. வழுச்சொற்கள் நீக்குதல்
5. இலக்கணக் குறிப்பு அறிதல்.

## COURSE OUTCOMES - பயன்கள்

- CO1– பக்தி இலக்கியங்களைக் கற்பதன் மூலம் பக்தி நெறியினையும், சமய நல்லிணக்கத்தையும் தெரிந்து பின்பற்றுவர். (K1,K2)
- CO2– சிற்றிலக்கியங்களின் வழி இலக்கியச் சுவையினையும் பண்பாட்டு அறிவினையும் பெறுவர். (K2)
- CO3– பட்டப்படிப்பினைப் படிக்கும்போதே பெரும்பான்மையான தமிழ் இலக்கியங்கள் குறித்த அறிவினைப் பெறுவர். (K4)
- CO4– தமிழ்ச் சமூகப் பண்பாட்டு வரலாற்றினை இலக்கியங்கள் வாயிலாக அறிவர். (K3)
- CO5– போட்டித் தேர்வுகளில் வெற்றிப் பெறுவதற்குத் தமிழ்ப்பாடத்தினை பயன் கொள்ளும் வகையில் ஏற்ற பயிற்சி பெறுவர். (K4)
- CO6– பல்சமய இலக்கியங்களை அறிவதன் மூலம் பல்சமய உரையாடல்களின் முக்கியத்துவத்தை அறிவர். (K3)

## TEXT BOOKS (பாட நூல்கள்)

1. தமிழ்த்துறை வெளியீடு, தூய சவேரியார் தன்னாட்சிக் கல்லூரி, பாளையங்கோட்டை.
2. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு– எ.பி. பாக்கியமேரி

## REFERENCE BOOKS (பார்வை நூல்கள்)

- தமிழ் இலக்கிய வரலாறு - சிற்பி. பாலசுப்பிரமணியன்
- புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு – தமிழண்ணல்
- தமிழ் இலக்கிய வரலாறு – சி.சேதுராமன்

## WEB SOURCES (இணையதளங்கள்)

- Tamil Heritage Foundation- [www.tamilheritage.org](http://www.tamilheritage.org) <<http://www.tamilheritage.org>>
- Tamil virtual University Library- [www.tamilvu.org/ library](http://www.tamilvu.org/library) <http://www.virtualvu.org/library>
- Project Madurai - [www.projectmadurai.org](http://www.projectmadurai.org).
- Chennai Library- [www.chennailibrary.com](http://www.chennailibrary.com) <<http://www.chennailibrary.com>>.
- Tamil Universal Digital Library- [www.ulib.prg](http://www.ulib.prg) <<http://www.ulib.prg>>.
- Tamil E-Books Downloads- [tamilebooksdownloads.blogspot.com](http://tamilebooksdownloads.blogspot.com)
- Tamil Books on line- [books.tamilcube.com](http://books.tamilcube.com)
- Catalogue of the Tamil books in the Library of British Congress [archive.org](http://archive.org)
- Tamil novels on line - [books.tamilcube.com](http://books.tamilcube.com)

பருவம்: 3	தாள்: மொழிப்பாடம்	Hrs: 6	Credits: 3
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**Learning objectives: கற்றலின் நோக்கங்கள்**

1. காலந்தோறும் எழுந்த காப்பியங்களின் போக்கையும், புதினத்தின் இலக்கிய வடிவத்தையும் மாணவர்கள் உணருமாறு செய்தல்
2. காப்பியம், புதினம், ஆகிய படைப்பியல் வகைகளைப் பற்றிய பரந்து பட்டபுலமையைப் பெருக்குதல்.
3. தமிழ் இலக்கியங்களின் உள்ளடக்கம், வெளியீட்டுநெறி, படைப்பியல் கொள்கை ஆகியவற்றை அறியச் செய்தல்.
4. இலக்கியக் கொள்கைகளின் அடிப்படையில் இலக்கியங்களைத் திறனாய்வுச் செய்யப் பயிற்சி அளித்தல்.
5. படைப்புத் துறையிலும் ஊடகத் துறையிலும் கல்விப் புலத்திலும் அயல்நாடுகளிலும் வேலைவாய்ப்பினைப் பெறுதற்குத் துணைசெய்தல்.
6. மதிப்புரை, திறனாய்வு அறிமுகப்படுத்துவதன் மூலம் சிறந்த திறனாய்வுகளை அடையாளம் காணுதல்

**அலகு: 1**

சிலப்பதிகாரம் - வழக்குரைகாதை, மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை, சீவகசிந்தாமணி - பூமகள் இலம்பகம், வளையாபதி

**அலகு: 2**

பெரியபுராணம் - பூசலார் புராணம், கம்பராமாயணம் - மந்தரை சூழ்ச்சிப் படலம், வில்லிபாரதம் - மற்போர் சருக்கம், சீறாப்புராணம் - புலி வசனித்த படலம்.

**அலகு: 3**

வஞ்சிமாநகரம் வரலாற்றுப் புதினம் - நா.பார்த்தசாரதி

**அலகு: 4**

பாடம் தழுவிய இலக்கிய வரலாறு

**அலகு: 5**

மொழித்திறன்

1. நூல் மதிப்புரை
2. திறனாய்வுசெய்தல்
3. கடிதம் வரைதல்
4. விண்ணப்பம் எழுதுதல்

**Course outcomes: பயன்கள்**

- CO1 - காப்பியங்களின் வழி வாழ்வியல் சிந்தனையைப் பெறுதல். (K1,K2)
- CO2 - காப்பியங்கள் அறிமுகப் படுத்தப்படுவதால் தமிழ் மொழியின் உயர்வையும், சிறப்பையும் உணர்தல். (K2)
- CO3 - தமிழ் புதினங்கள் வழி சமகாலப் படைப்புகளின் வாழ்வியல் சிந்தனைகளை அறிதல் (K4)
- CO4 - நாவல் இலக்கியம் அறிமுகப்படுத்தப்படுவதால் சிந்தனை ஆற்றல், படைப்பாற்றல், கற்பனைத் திறன் வளர்தல் (K3)
- CO5 - தமிழ் இலக்கியம் சார்ந்தபோட்டித் தேர்வுகளை எதிர்கொள்ளும் ஆற்றல் பெறுதல் (K4)
- CO6 - கடிதம், விண்ணப்பம் எழுதும் முறைகளை அறிதல் (K6)

பாடநூல்கள் :

தமிழ்த்துறை வெளியீடு  
பார்வை நூல்கள்  
1. தமிழ் இலக்கியவரலாறு- சிற்பிபாலசுப்பிரமணியன்

இணையதளம்

1. Tamil Heritage Foundation – [www.tamilheritage.org](http://www.tamilheritage.org)<<http://www.tamilheritage.org>>.
2. Tamil Virtual University Library – [www.tamilvu.org/library](http://www.tamilvu.org/library)<http://www.virtualvu.org/library>
3. Project Madurai – [www.projectmadurai.org](http://www.projectmadurai.org)
4. Chennai Library – [www.chennailibrary.com](http://www.chennailibrary.com)<<http://www.chennailibrary.com>>
5. Tamil Universal Library- [www.ulib.pig7](http://www.ulib.pig7)<<http://www.ulib.pig7>>
6. Tamil E-books downloads – [tamilbooksdownloads.blogspot.com](http://tamilbooksdownloads.blogspot.com)
7. Tamil Books online – [books.tamilcube.com](http://books.tamilcube.com)
8. Catalogue of the Tamil Books in the library of British congress [archive.org](http://archive.org)
9. Tamil novels.online – [books.tamil.cube.com](http://books.tamil.cube.com)



**Learning objectives: கற்றலின் நோக்கங்கள்**

1. இலக்கியங்களின் சிறப்பினை உணர்த்துதல்
2. சங்க இலக்கியத்தின் மும் வாழ்வியல் நெறிகள் உணர்தல்
3. தமிழ் இலக்கியங்களின் உள்ளடக்கம், வெளியீட்டுநெறி, படைப்பியல் கொள்கை ஆகியவற்றை அறியச் செய்தல்.
4. அகத்திணை, புறத்திணை இலக்கணங்களை மாணவர்கள் அறியச் செய்தல்
5. மொழிபெயர்ப்புத் திறனை வளர்த்தல்
6. நாடக இலக்கியங்களின் அமைப்பு முறையை அறிதல்

**அலகு: 1**

நற்றிணை 10, 14, 16, குறுந்தொகை - 16, 17, 19, 20, 25, 29, 38, 44, கலித்தொகை - 38, 51, அகநானூறு - 15, 33, 55, புறநானூறு - 37, 86, 112, பரிபாடல் - 55

**அலகு: 2**

நெடுநல்வாடை- நக்கீரர்

**அலகு: 3**

சபாபதிநாடகம் - பம்மல் சம்பந்த முதலியார்

**அலகு: 4**

பாடம் தழுவிய இலக்கியவரலாறு

**அலகு: 5**

மொழித்திறன்

1. மொழிபெயர்ப்புகலைச்சொற்கள்
2. கொடுக்கப்பட்டுள்ள ஆங்கிலப் பகுதியைத் தமிழில் மொழிபெயர்த்தல்
3. அலுவலகக் கடிதம்- தமிழில் மொழிபெயர்த்தல்

**Course outcomes: பயன்கள்**

- CO1 – சங்க இலக்கியங்களில் காணப்படும் வாழ்வியல் சிந்தனைகளை அறிதல் (K1,K2)  
CO2 – தமிழின் தொன்மையையும் செம்மொழித் தன்மையையும் உணர்தல் (K2)  
CO3 – நாடக இலக்கியம் மூலம் நடிப்பாற்றலையும் கலைத்தன்மையையும் வளர்த்தல் (K4)  
CO4 – நாடக இலக்கியம் அறிமுகப்படுத்தப்படுவதால் சிந்தனை ஆற்றல், படைப்பாற்றல், கற்பனைத் திறன் வளர்த்தல் (K4)  
CO5 – தமிழிலிருந்து அலுவலகக் கடிதங்களை மொழிபெயர்க்கும் அறிவைபெறுதல் (K3)  
CO6 - மொழி அறிவோடு வேலைவாய்ப்பினையும் பெறுதல். (K4)

பாடநூல்கள் :

தமிழ்த்துறை வெளியீடு

பார்வை நூல்கள்

2. தமிழ் இலக்கிய வரலாறு- சிறப்பிபாலசுப்பிரமணியன்

இணையதளம்:

1. Tamil Heritage Foundation – [www.tamilheritage.org](http://www.tamilheritage.org)<<http://www.tamilheritage.org>>.
2. Tamil Virtual University Library – [www.tamilvu.org/library](http://www.tamilvu.org/library)<http://www.virtualvu.org/library>
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7. Tamil Books online – [books.tamilcube.com](http://books.tamilcube.com)
8. Catalogue of the Tamil Books in the library of British congress [archive.org](http://archive.org)
9. Tamil novels.online – [books.tamil.cube.com](http://books.tamil.cube.com)

DEPARTMENT OF ENGLISH

UG – PART II - GENERAL ENGLISH

(The Seven-Tier Pattern recommended by UGC Curriculum Development Centre and Identified as Best Practice by NAAC)

	<b>Stream A</b> (For learners of high entry level proficiency)	<b>Stream B</b> (For learners of average entry level proficiency)	<b>Stream C</b> (For learners of low entry level proficiency)
<b>Courses in Semester I</b>	<b>IV</b> <b>23UGEL14</b>	<b>III</b> <b>23UGEL13</b>	<b>I</b> <b>23UGEL11</b>
<b>Courses in Semester II</b>	<b>V</b> <b>23UGEL25</b>	<b>IV</b> <b>23UGEL24</b>	<b>II</b> <b>23UGEL22</b>
<b>Courses in Semester III</b>	<b>VI</b> <b>23UGEL36</b>	<b>V</b> <b>23UGEL35</b>	<b>III</b> <b>23UGEL33</b>
<b>Courses in Semester IV</b>	<b>VII</b> <b>23UGEL47</b>	<b>VI</b> <b>23UGEL46</b>	<b>IV</b> <b>23UGEL44</b>

**GENERAL COURSE OUTCOMES**

- CO1 Acquire the four language skills (Listening, Speaking, Reading and Writing)
- CO2 Develop the skill of independent reading and interpreting of graded texts
- CO3 Expand and consolidate active and passive vocabulary
- CO4 Acquire the skills needed to participate in a conversation that builds knowledge collaboratively
- CO5 Acquire a clear understanding of English Grammar to facilitate accuracy of communication
- CO6 Develop the skills of formal written communication to be used in academic and career related contexts

**TEXTS**

- Course I - *Spotlight I*
- Course II - *Spotlight II*
- Course III - *Spotlight III*
- Course IV - *Spotlight IV*
- Course V - *Spotlight V*
- Course VI - *Spotlight VI*
- Course VII - William Shakespeare's *Julius Caesar* & Charles Dickens' *Oliver Twist*
- All Courses - *Active English Grammar and Composition* by the Board of Editors

## EXTERNAL EXAMINATION

- ❖ External Examination has two components.  
1) Written Examination and 2) Viva Voce
- ❖ A three-hour written examination will be conducted for 100 marks for all General English papers and the scores will be converted to 40 marks, with a pass minimum of 16 marks
- ❖ At the end of every semester, **Spoken English Viva Voce** will be conducted for all the students for 100 marks (four components) and the scores will be converted to 10 marks, with a required pass minimum of 4 marks
- ❖ To pass in any General English paper, a student must secure the pass minimum of 40 out of 100

Distribution of marks:	<b>Written Exam</b> (100 marks)	Converted to 40 marks
	<b>Viva voce</b> (100 marks)	Converted to 10 marks
	<b>TOTAL (40+10)</b>	<b>50 marks</b>

## INTERNAL ASSESSMENT

- ❖ Two Internal Examinations shall be conducted for 50 marks each along with the Continuous Internal Assessments for the Core and Allied courses.
- ❖ The internal assessment for the courses may include assignments, seminars, projects, tests, viva (any oral presentation), communication activities etc., focusing on skill development or / and the course content

**GENERAL ENGLISH  
COURSE – I**

**Hours: 6**

**Course Code: 23UGEL11**

**Credits: 3**

**LEARNING OUTCOMES**

- LO1** To provide an ambience to acquire the basic language skills, listening, speaking, reading and writing
- LO2** To make the learners learn the basic elements of grammar
- LO3** To enable them to involve in basic communicative activities
- LO4** To develop basic vocabulary
- LO5** To help the learners comprehend and respond in English
- LO6** To build confidence in using English to communicate

UNIT	TOPICS	
<b>I</b>	<b>POETRY</b> Maya Angelou Hilaire Belloc	“Poor Girl” “The Justice of Peace”
<b>II</b>	<b>PROSE</b> A. P. J. Abdul Kalam Madhavan Kutty	“My Early Days” “I Won’t Let Him Go!”
<b>III</b>	<b>SHORT STORIES</b> Oscar Wilde Mulk Raj Anand	“The Selfish Giant” “The Lost Child”
<b>IV</b>	<b>LANGUAGE COMPETENCY</b> 1. Use of Verbs: Verb Grid (Positive, Negative & Question), Regular Verbs, Irregular Verbs & Modals 2. Tenses: Active Voice Tenses & Passive Voice Tenses 3. Use of Nouns: Forms of Personal Pronouns, Use of Nouns as Subject, Object, Complement and Object of the Preposition 4. Sentence Patterns: SV, SVO, SVC, SVA, SVOA, SVIODO 5. Punctuation and Capitalisation 6. Reading Comprehension (5 Anecdotes and 5 Wisdom Stories)	
<b>V</b>	<b>SPOKEN ENGLISH</b> 1. Reading Aloud (From the text)      2. Introducing oneself 3. Describing a place (With hints)      4. Describing a picture(With hints)	

**COURSE OUTCOMES**

- CO1** Use grammatical structures in meaningful constructions
- CO2** Use oral communication for day-to-day activities
- CO3** Use simple sentences for oral and written communication
- CO4** Use punctuation and capitalisation accurately
- CO5** Comprehend what they listen to, and respond to it at the primary level
- CO6** Read and appreciate simple stories and anecdotes

## TEXTBOOKS

1. Board of Editors. *Spotlight I*. India: Ponnasai Publishers & Distributors, 2015.
2. *Oxford Elementary Learner's Dictionary*. Ed. Angela Crawley. Phonetics Ed. Michael Ashby. United Kingdom: Oxford University Press, 2021.
3. Board of Editors. *Active English Grammar and Composition*. India: Trinity Press, 2022.

## REFERENCE

- Bhatnagar, R. P. ,*English for Competitive Examinations*, India: Trinity Press, 2017.
- Joseph K. V. , *A Textbook of English Grammar & Usage*, India: McGraw Hill Education 2015.
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

S. No.	QUESTION PATTERN	Marks
I	3 Short essays (200 words each) out of 6 from Units I, II & III (3X10)	30
II	5 Match the following from Units I, II & III	05
III	5 Stating True or False from Units I, II & III	05
IV	Verb Grid (Positive, Negative & Question)	20
V	Tense Grid (Active & Passive)	10
VI	Noun as subject, object, complement & object of the preposition	10
VII	Sentence pattern	10
VIII	Punctuation & Capitalization	05
IX	Reading comprehension	05
	<b>Total</b>	<b>100</b>

## GENERAL ENGLISH

### COURSE – II

Hours: 6

Course Code: 23UGEL22

Credits: 3

#### LEARNING OUTCOMES

- LO1 To provide an ambience to acquire the basic language skills, listening, speaking, reading and writing
- LO2 To make the learners frame questions and answers
- LO3 To enable them to involve in basic communicative activities
- LO4 To develop a comprehensible use of adjectives and adverbs
- LO5 To help the learners comprehend and respond in English
- LO6 To develop oral communication for day-to-day activities

UNIT	TOPICS	
I	<b>POETRY</b> Rabindranath Tagore Gieve Patel	“Leave this Chanting and Singing” “ On Killing a Tree”
II	<b>PROSE</b> Leslie W. Leavitt Sister Nivedita	“Mahatma Gandhi” “The Judgement Seat of Vikramaditya”
III	<b>SHORT STORIES</b> O. Henry Stephen Leacock	“After Twenty Years” “With the Photographer”
IV	<b>LANGUAGE COMPETENCY</b> 1. Use of Adjectives      2. Use of Adverbs 3. Use of Conditional ‘If’ (Probable & Improbable Conditions) 4. Use of ‘who’, ‘which’, ‘where’ & ‘that’ in combining sentences 5. Framing questions – ‘Wh -’ & ‘Yes’ / ‘No’ Questions 6. Prefixes and Suffixes 7. Developing Hints into a Paragraph	
V	<b>SPOKEN ENGLISH</b> 1. Reading Aloud (from the Prescribed Text)    2. Introducing Others 3. Describing a Personality (from Hints)      4. Narrating a Story(from Hints)	

#### COURSE OUTCOMES

- CO1 Use grammatical structures in meaningful contexts
- CO2 Use oral communication for day-to-day activities
- CO3 Use simple sentences for oral and written communication
- CO4 Use enhanced vocabulary
- CO5 Comprehend and respond to what they listen to at the secondary level
- CO6 Read and appreciate simple pieces of fiction and non-fiction

#### TEXTBOOKS

1. Board of Editors. *Spotlight II*. India: Ponnasai Publishers & Distributors, 2015.

2. *Oxford Elementary Learner's Dictionary*. Ed. Angela Crawley. Phonetics Ed. Michael Ashby. United Kingdom: Oxford University Press, 2021.
3. Board of Editors. *Active English Grammar and Composition*. India: Trinity Press, 2022.

## REFERENCE

- Bhatnagar, R. P., *English for Competitive Examinations*. India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage*, India: McGraw Hill Education, 2015.
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

S. No.	QUESTION PATTERN	Marks
I	3 Short Essays from Unit I, II and III	30
II	5 True or False ( Units I, II and III)	05
III	5 Match the Following (Unit I, II and III)	05
IV	Adding appropriate adjectives	10
V	Adding appropriate adverbs	10
VI	Framing Probable & Improbable Conditional Sentences	10
VII	Combining Sentences with 'who', 'where', 'which' & 'that'	10
VIII	Framing 'Wh' & 'Yes/No' Qns.	10
IX	Prefixes & Suffixes	05
X	Developing Hints to a Paragraph (100 words)	05
	<b>Total</b>	<b>100</b>

## GENERAL ENGLISH

### COURSE - III

**Hours: 6**

**Course Code: 23UGEL13, 23UGEL 33**

**Credits: 3**

#### LEARNING OUTCOMES

- LO1** To involve the learners in reading and interpreting English in poetry and prose (Fiction and Non-fiction)
- LO2** To enable learners to write about prescribed literature
- LO3** To help learners develop vocabulary register
- LO4** To help learners learn the appropriate use of articles, prepositions and adverbs
- LO5** To facilitate in learners, the ability to create a narration based on hints
- LO6** To build confidence in the learners to speak English for specific purposes

UNIT	TOPICS	
<b>I</b>	<b>POETRY</b> William Shakespeare P. B. Shelley Oliver Goldsmith	“All the World’s a Stage” “Ozymandias” “The Village Schoolmaster”
<b>II</b>	<b>SHORT STORIES</b> A. J. Cronin Stephen Leacock Ernest Hemingway	“Two Gentlemen of Verona” “The Conjuror’s Revenge” “A Day’s Wait”
<b>III</b>	<b>PROSE &amp; SHORT STORIES</b> C. L. N. Prakash O. Henry Natsume Soseki	“Rethink Your Thinking” “The Gift of the Magi” “I am a Cat”
<b>IV</b>	<b>LANGUAGE COMPETENCY</b> 1. Homonyms, Homophones, Homographs    2. Articles 3. Prepositions                                    4. Adverbs 5. Constructing a story using hints	
<b>V</b>	<b>SPOKEN ENGLISH</b> 1. Reading aloud                                    3. Describing a picture 2. Describing a process                            4. Personal Conversation (Habits, Hobbies, Future Plan)	

#### COURSE OUTCOMES

- CO1** Read and understand English in poetry and prose (Fiction and Non-Fiction)
- CO2** Write coherent essays about prescribed literature
- CO3** Use words from acquired vocabulary register
- CO4** Use articles, prepositions and adverbs appropriately
- CO5** Create a narration from hints



**CO6** Speak English confidently in a descriptive as well as expository style

**TEXTBOOKS**

1. Board of Editors. *Spotlight III*, India: Ponnasai Publishers & Distributors, 2015.
2. Board of Editors. *Active English Grammar and Composition*. India: Trinity Press, 2022.

**REFERENCE**

- Bhatnagar, R. P. *English for Competitive Examinations*. India: Trinity Press, 2017.
- Joseph. K. V, *A Textbook of English Grammar & Usage*, India:McGraw Hill Education, 2015
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

<b>S. No.</b>	<b>QUESTION PATTERN</b>	<b>Marks</b>
I	1 Short Essay (200 words) out of 2 from Unit I	10
II	1 Essay (300 words) out of 2 from Unit II	15
III	1 Essay (300 words) out of 2 from Unit III	15
IV	5 passages with 2 Qns. each (from Units I,II &III)	10
V	Homonyms, Homophones, Homographs	10
VI	Articles	10
VII	Prepositions	10
VIII	Adverbs	10
IX	Constructing a story	10
	<b>Total</b>	<b>100</b>

## GENERAL ENGLISH

### COURSE - IV

<b>Hours: 6</b>	<b>Course Code: 23UGEL14, 23UGEL24, 23UGEL44</b>	<b>Credits: 3</b>
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#### LEARNING OUTCOMES

- LO1** To make learners read and understand intermediate level poetry and prose
- LO2** To encourage learners to continue building a vocabulary register as the students interpret, speak and write about prescribed literature
- LO3** To enable learners fashion sentences to make paragraphs with unity of sense and structure
- LO4** To enable learners plan, organise ideas and write an essay
- LO5** To help learners learn the different types of letter, their structures and the use of appropriate language
- LO6** To make learners use grammatical structures in meaningful constructions

UNIT	TOPICS
<b>I</b>	<p><b>POETRY</b>                      William Shakespeare                      John Milton                      Lewis Carroll                      Nissim Ezekiel</p> <p>“Shall I Compare Thee”                      “On His Blindness”                      “The Walrus and the Carpenter”                      “The Professor”</p>
<b>II</b>	<p><b>PROSE</b>                      Amitav Ghosh                      Desmond Morris                      Mark McCormack</p> <p>“The Town by the Sea”                      “A Little Bit of What You Fancy”                      “To Know When to Say It’s None of Your Business”</p>
<b>III</b>	<p><b>SHORT STORIES &amp; DRAMA</b>                      Aldous Huxley                      Oscar Wilde                      Fritz Karinthy</p> <p>“The Portrait”                      “The Happy Prince”                      “The Refund”</p>
<b>IV</b>	<p><b>LANGUAGE COMPETENCY</b>                      1. Tenses (with Verb Grid)    2. Concord    3.                      Describing a thing / a place / an event                      4. Spotting Errors (Tenses and Concord)   5. Letter Writing (Personal &amp; Official)</p>
<b>V</b>	<p><b>SPOKEN ENGLISH</b>                      1. Reading Aloud    2. Issue based conversation                      2. Speaking about prescribed literature   4. Speaking on a given topic</p>

#### COURSE OUTCOMES

- CO1** Read, interpret and analyse intermediate level of English in poetry, prose and fiction
- CO2** Write coherent essays on prescribed literature

- CO3** Use the various tense forms accurately with proper subject - verb agreement  
**CO4** Write descriptive paragraphs with unity of sense  
**CO5** Identify common errors in the usage of Tenses and Concord  
**CO6** Speak English fluently with confidence in an expository as well as analytical style

**TEXTBOOKS**

1. Board of Editors. *Spotlight IV*. India: Ponnasai Publishers & Distributors, 2015.
2. Board of Editors. *Active English Grammar and Composition*. India: Trinity Press, 2022.

**REFERENCE**

- Bhatnagar, R. P. *English for Competitive Examinations*. India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage*, India: McGraw Hill Education, 2015
- Sinha, R. P. *Current English Grammar and Usage with Composition*, India: Oxford University Press, 2018.

S. No.	QUESTION PATTERN	Marks
I	1 Short Essay (200 words) out of 2 from Unit I	10
II	1 Essay (300 words) out of 2 from Unit II	15
III	1 Essay (300 words) out of 2 from Unit III	15
IV	5 passages with 2 Qns. each (from Units I, II & III)	10
V	Tenses	10
VI	Concord	10
VII	Describing a thing / a place / an event	10
VIII	Spotting Errors	10
IX	Letter Writing	10
	<b>Total</b>	<b>100</b>

**GENERAL ENGLISH**

**COURSE – V**

<b>Hours: 6</b>	<b>Course Code: 23UGEL25, 23UGEL35</b>	<b>Credits: 3</b>
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**LEARNING OUTCOMES**

- LO1** To introduce learners to intermediate level of English through prescribed literature
- LO2** To make learners read, interpret and write about prescribed pieces of literature
- LO3** To make learners learn complex language structures and appropriate use of conjunctions
- LO4** To help learners become familiar with the accurate use of language with an awareness of common errors in language use
- LO5** To make learners understand the logical sequence of ideas within a paragraph
- LO6** To make learners speak English fluently with confidence and accuracy for specific purposes

UNIT	TOPICS	
<b>I</b>	<b>POETRY</b> William Wordsworth Robert Frost Mina Assadi H.W. Longfellow Philip Larkin	“The Solitary Reaper” “The Road Not Taken” “A Ring to Me Is Bondage” “A Slave’s Dream” “Next Please”
<b>II</b>	<b>PROSE, DRAMA AND SHORT STORY</b>	
<b>II</b>	Dr. Radhakrishnan Collins & Lapiere Oscar Wilde Somerset Maugham A. A. Milne	“Humanities Vs Sciences” “The Second Crucifixion” “The Model Millionaire” “The Ant and the Grasshopper” “The Boy Comes Home”
<b>III</b>	<b>LANGUAGE COMPETENCY (Grammar &amp; Vocabulary)</b> 1. Words often confused 2. Synonyms and Antonyms 3. Synthesis and Transformation of Sentences (Simple, Compound & Complex) 4. Conjunctions 5. Active - Passive Voice	
<b>IV</b>	<b>LANGUAGE COMPETENCY (Composition)</b> 1. Expansion of Ideas / Proverbs 2. Sentence Arrangement 3. Dialogue Writing	
<b>V</b>	<b>SPOKEN ENGLISH</b> 1. Reading and Interpreting 2. Turncoat 3. Expand a Proverb 4. Issue Based Conversation	

## COURSE OUTCOMES

- CO1** Read, interpret and analyse poetic English to understand open possibility of inferences
- CO2** Write logically planned essays to address specific questions concerning prescribed literature
- CO3** Understand the forms and structural differences in different types of sentences and their specific purposes
- CO4** Use complex language structures with appropriate conjunctions
- CO5** Use vocabulary actively with an awareness of homonyms, homophones, synonyms and antonyms
- CO6** Use Spoken English fluently with confidence and accuracy for specific purposes such as analytical, argumentative and expository talks

## TEXT BOOKS

1. Board of Editors. *Spotlight V*, India:Ponnasai Publishers & Distributors, 2015.
2. Board of Editors. *Active English Grammar and Composition*. India:Trinity Press, 2022.

## REFERENCE

- Bhatnagar, R. P. *English for Competitive Examinations*, India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage*, India: McGraw Hill Education, 2015
- Sinha, R. P. *Current English Grammar and Usage with Composition*, India: Oxford University Press, 2018

S. No.	QUESTION PATTERN	Marks
I	1 Short Essay (200 words) out of 2 from Unit I	10
II	1 Essay (300 words) out of 2 from Unit II	15
III	5 passages with 2 Qns. each (from Units I, II & III)	10
IV	Vocabulary	15
V	Synthesis of sentences	10
VI	Transformation of sentences	05
VII	Active - Passive Voice	10
VIII	Conjunction	05
IX	Expansion of Ideas / Proverbs (2x5=10)	10
X	Sentence Arrangement	05
XI	Dialogue Writing	05
	<b>Total</b>	<b>100</b>

# GENERAL ENGLISH

## COURSE - VI

Hours: 6

Course Code: 23UGEL36, 23UGEL46

Credits: 3

### LEARNING OUTCOMES

- LO1** To introduce learners to advanced level of poetic English through representative pieces, to make them understand oblique use of language
- LO2** To make them read and understand modern English prose through samples of biography, autobiography, short story and one act play
- LO3** To familiarise them with advanced language structures and the use of idioms and phrasal verbs
- LO4** To make them understand and use different degrees for comparison and use language for reporting speech
- LO5** To acquaint them with the skills of expanding or developing, and condensing ideas
- LO6** To make them speak English fluently and accurately for specific purposes

UNIT	TOPICS	
I	<b>POETRY</b> Edwin Arnold Sylvia Plath John Keats John Donne Maya Angelou	“Siddhartha” “The Mirror” “La Belle Dame Sans Merci” “Death Be Not Proud” “I Know Why the Caged Bird Sings”
II	<b>PROSE, SHORT STORY &amp; DRAMA</b> Anne Frank C.P. Snow Chinua Achebe Hugh Chesterton	“The Diary of a Young Girl” “Hardy and Ramanujan” “Marriage is a Private Affair” “The Pie and the Tart”
III	<b>LANGUAGE COMPETENCY (Grammar and Vocabulary)</b> 1. Degrees of Comparison                      2. Direct- Indirect Speech 3. Cloze Test.                                      4. Idioms and Phrasal verbs 5. Spotting Errors	
IV	<b>LANGUAGE COMPETENCY (Composition)</b> 1. Précis Writing                      2. Essay Writing	
V	<b>SPOKEN ENGLISH</b> 1. Reading and Interpretation                      2. Issue Based Conversation 3. Public Speaking on subject topic                      4. Extempore	

## COURSE OUTCOMES

- CO1 Read and interpret the oblique language of poetry and write appreciative essays on the prescribed literature
- CO2 Read, interpret and write analytical essays about prescribed prose pieces
- CO3 Use advanced grammar structures to report speech and use the three degrees of comparison for intended emphasis
- CO4 Use advanced nuances of language such as idioms and phrasal verbs
- CO5 Write reflective, descriptive, expository and imaginative essays with appropriate content, and condense material to a précis
- CO6 Use English fluently and accurately for public speaking, extempore and other specific purposes

## TEXT BOOKS

- Board of Editors. *Spotlight VI*, India: Ponnasai Publishers & Distributors, 2016.
- Board of Editors. *Active English Grammar and Composition*, India: Trinity Press, 2022

## REFERENCE

- Bhatnagar, R. P. *English for Competitive Examinations*, India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage*, India: McGraw Hill Education, 2015
- Sinha, R. P. *Current English Grammar and Usage with Composition*. India: Oxford University Press, 2018.

S. No.	QUESTION PATTERN	Marks
I	1 short essay (200 words) out of 2 from Unit I	10
II	1 essay (300 words) out of 2 from Unit II	15
III	5 Passages with 2 Qns. each (from Units I & II)	10
IV	Degrees of Comparison	05
V	Direct Indirect Speech	10
VI	Making sentences – Idioms	05
VII	Phrasal verbs	05
VIII	Spotting errors ( Multiple Choice )	10
IX	Correcting the errors (Rewriting)	05
X	Cloze Test	05
XI	Precis Writing	10
XII	Essay Writing	10
	<b>Total</b>	<b>100</b>

## GENERAL ENGLISH

### COURSE - VII

Hours: 6

Course Code: 23UGEL47

Credits: 3

#### LEARNING OBJECTIVES

- LO1 To facilitate learners' reading advanced English through representative pieces of Literature
- LO2 To help learners infer and interpret prescribed literature and write coherent, Analytical essays
- LO3 To help learners acquire the advanced use of English for professional purposes
- LO4 To help learners prepare resume and CVs for professional use
- LO5 To encourage learners in using English skillfully and creatively to discuss, brainstorm or debate a topic, through active practice
- LO6 To equip learners with the soft skills necessary for employability

<b>I</b>	<b>DRAMA</b> William Shakespeare <i>Julius Caesar</i>
<b>II</b>	<b>FICTION</b> Charles Dickens <i>Oliver Twist</i>
<b>III</b>	<b>SOFT SKILLS 1 (Theory and Practice)</b> 1. Interview skills*                      2. Group Discussion* 3. Debate                                      4. Interpersonal Skills * Included for Spoken English Viva Voce also
<b>IV</b>	<b>SOFT SKILLS 2 (Theory and Practice)</b> 1. Time Management                      2. Problem Solving Techniques 3. Teamwork                                      4. Leadership
<b>V</b>	<b>APPLICATION &amp; RESUME</b> 1. Chronological Resume.              2. Functional Resume 3. Responding to the given advertisement

#### COURSE OUTCOMES

- CO1 Read and understand advanced forms of English in Literature
- CO2 Interpret and write analytical essays on topics concerning prescribed pieces of literature
- CO3 Speak English fluently and accurately in professional contexts
- CO4 Prepare application with appropriate Resume structure for employment
- CO5 Use English effectively and creatively for interview, group discussion etc.,
- CO6 Behave, react and handle situations connected to employability, using the acquired knowledge of soft skills



## TEXT BOOKS

- Shakespeare, William. *Julius Caesar*, United Kingdom: Oxford University Press, 2008.
- Dickens, Charles. *Oliver Twist*, United Kingdom: Penguin Classics, 2003

## REFERENCE

- Bhatnagar, R. P. *English for Competitive Examinations*. India: Trinity Press, 2017.
- Joseph K. V. *A Textbook of English Grammar & Usage*, India: McGraw Hill Education, 2015
- Sinha, R. P. *Current. English Grammar and Usage with Composition*, India: Oxford University Press, 2018.

S. No.	QUESTION PATTERN	Marks
I	5 Multiple Choice Questions from Unit I	05
II	5 Multiple Choice Questions from Unit II	05
III	1 Essay (400 words) out of 3 from Unit I	15
IV	1 Essay (400 words) out of 3 from Unit II	15
V	2 Annotations out of 3 from Unit I	10
VI	2 Paragraphs out of 3 from Unit II	10
VII	1 Essay out of 2 from Unit III	15
VIII	1 Essay out of 2 from Unit IV	15
IX	Responding to the given Advertisement	10
	<b>Total</b>	<b>100</b>

**DEPARTMENT OF HUMAN EXCELLENCE**

**St. Xavier's College (Autonomous), Palayamkottai**

**Courses offered**

Semester	Category	Course Code	Course Title
I	FC	23UHER11/ 23UHEE11	Religion: Catholic Doctrine / Ethics
II	SEC3	23UHEI21	Integrated Personality Development
III	SEC4	23UHEL31	Life Coping and Entrepreneurial Skills Management
IV	EVS	23UEVS41	Environmental Studies
V	VE	23UVEH51	Human Rights and Social Analysis

**NME**

Semester	Category	Course Code	Course Title
I	Library	23ULBN11	Foundations of Library Science
I	XRF	23UXRN11	Traditional Knowledge of Indian Medicinal Systems
II	Library	23ULBN21	Information Resources
II	XRF	23UXRN21	Indian Traditional Medicinal Foods
III	XRF	23UXRN31	Food Microbiology
IV	XRF	23UXRN41	Herbal Resources and Their Conservation
IV	MAX Forum	23UMXN41	Society, Economy and Politics in Contemporary India

**Common Question Pattern**

**Internal Test**

Part A	Answer ALL the questions in one or two lines	5 x 2 = 10
Part B	Answer ALL the questions, each in a paragraph	3 x 5 = 15
Part C	Write an essay on the following	1 x 10 = 10

**Semester Exam**

Part A	Answer ALL the questions in one or two lines	10 x 3 = 30
Part B	Answer ALL the questions, each in a paragraph	5 x 8 = 40
Part C	Write an essay on each the following	2 x 15 = 30

**RELIGION: CATHOLIC DOCTRINE  
(23UHER11)**

<b>SEMESTER:I</b>	<b>VE</b>	<b>HOURS:2</b>	<b>CREDITS: 2</b>	<b>TOTALHOURS:30</b>
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**Course Outcomes:**

Upon completion of the course the students will be able to

1. Recite the Sacraments(K1)
2. Identify the challenges of the present day church(K1)
3. Associate Old and New testaments of the bible(K2)
4. Explain the Church history(K2)
5. Discuss the Marian worship (K2)
6. Summarize the catholic social teachings(K2)

**Unit I: Introduction to Bible (6 Hours)**

Bible as a Word of God, its inspiration, the Canon - Old and New Testaments and their interconnectedness - Traditional and modern interpretations

**Unit II: Introduction to the Church history (6Hours)**

The beginnings of the Church - Medieval period and its challenges - The importance of the Second Vatican Council and their decrees - Synodality

**Unit III: Introduction to the Sacraments (6Hours)**

The origin of the seven sacraments - Their practices and meanings - History of the sacraments

**Unit IV: Introduction to Mariology (6Hours)**

Mary, Mother of God and Jesus - Mary, our Mother and in the Gospels - Mariology in the history of the Church – Mary as a Prophet of revolution

**Unit V: Church in the Contemporary World (6Hours)**

The challenges of the present day Church – Casteism and Same sex marriage – Ecumenical unity and Inter Religious harmony - Catholic Social Teachings

**REFERENCES:**

1. Paul C. Jesuraj, Growing in Your Faith, July 2022.
2. Second Vatican Council Documents

**ETHICS**  
**(23UHEE11)**

<b>SEMESTER: I</b>	<b>VE</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course Outcomes :**

Upon completion of the course the students will be able to

- Describe the Ethical foundations and human history (K1)
- Identify Ethics and its relationship with Religions (K1)
- List the personal ethical codes to be practices in day to day life (K1)
- Associate ethics in family and society (K2)
- Summarize modern ethical issues and problems (k2)
- Discuss bio and environmental ethics (k2)

**Unit I : Introduction to Ethics** **(6 Hours)**

Meaning, Nature and Scope of Ethics - Challenges and Importance of ethics - Basic Ethical Foundations

**Unit II : Ethics in Religions** **(6 Hours)**

Ethical foundations and meanings in big and small traditions - Ethics and its relationship with Religions

**Unit III : Personal Ethics** **(6 Hours)**

Moral precepts - Dynamics of personal morality - Moral Conscience - Ethical aspects of Thirukural – Evils of Corruption – Gandhi's Seven Deadly Sins.

**Unit IV : Family Ethics and Social Ethics** **(6 Hours)**

Role of Family in ethical formulations- Respecting persons - Peace and Justice - Human Duties

**Unit V : Modern Ethical Issues** **(6 Hours)**

Bio Ethics - Media Ethics - Environmental Ethics –Cyber Ethics

**REFERENCES:**

1. Ethics prepared by School of Interdisciplinary and Trans-disciplinary Studies, Indira Gandhi National Open University (MPYE 002)
2. Course material prepared by the Department of Human Excellence.

**INTEGRATED PERSONALITY DEVELOPMENT**  
**(23UHEI21)**

<b>SEMESTER: II</b>	<b>SEC3</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course Outcomes:**

Upon completion of the course the students will be able to

- Identify personal strengths and weaknesses (K1)
- Identify the means of self-esteem (K1)
- Identify the means of improving personal performance(K1)
- Explain the techniques of self-management(K2)
- Describe coping strategies of learning (K2)
- Discuss the traits of personal competence(K2)
- Summarize different dimensions of Personality (K2)

**UNIT I: Self – Knowledge** **(6 Hours)**

Exploring habits, attitudes, preferences and experience –SWOC analysis – Johari Window – Enhancing one’s self image, self-esteem, self confidence

**UNIT II: Self-Management** **(6 Hours)**

Understanding of life story - Focusing on Internal narratives - Managing change, confusion and uncertainty –Goal setting – Personal Vision and Mission statements

**UNIT III: Personal Competence and Maturity** **(6 Hours)**

Motivation - Developing rapport - Giving and receiving constructive criticism - Assertiveness and negotiation skills – Leadership – Type of Leadership – Qualities of a good leader

**Unit IV: Dimensions of Personality Development** **(6 Hours)**

Recognizing the gradual growth in different dimension of one’s personality such as (a) Physical (b) Intellectual (c) Emotional (d) Moral (e) Social and (f) Spiritual - Learning the Development process; Tools and Skills - Helping to maximize one’s potentials

**Unit IV: Academic Learning Strategies** **(6 Hours)**

Memory - Art of generative listening, learning and writing - Note making - Presentation skills - Time management - Receptive skills - Classroom etiquettes - Cyber knowledge

**REFERENCE BOOKS:**

1. Dr. Xavier Alphonse S.J., We Shall Overcome, ICRDEC Publications, Chennai, 2004.
2. Personality Development, Harold R. Wallace and L. Ann Masters, South-Western, Cengage Learning India PL, New Delhi, 2006.
3. Course material prepared by the Department of Human Excellence

**LIFE COPING AND ENTREPRENEURIAL SKILLS MANAGEMENT**  
**(23UHEL31)**

<b>SEMESTER: III</b>	<b>SEC4</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course Outcomes :**

Upon completion of the course, the students will be able to

1. Identify the various challenges faced in adolescence (K1)
2. Tabulate healthy habits and lifestyle (K1)
3. Identify problem solving strategies (K1)
4. Discuss family and professional relationship(K2)
5. Explain cognitive, emotional and behavioural perspectives (K2)
6. Describe evils of addiction and the remedies available (K2)

**Unit I: Physical AND Mental Wellbeing (6 Hours)**

Adolescent Health and Holistic Health - Understand and appreciate physical Self - Personal hygiene and grooming - Balanced diet - Healthy habits and lifestyle - Sound body and mind - Nurturing health at home, in campus –Definition of Health - Women health – various medicine systems

**Unit II: Interpersonal and Social Wellbeing (6 Hours)**

Family Relationship: Values in family relationship, Nuclear, Joint Family, Dependence, Overdependence, Happy family, Broken Family - Caring Elders - Rapport Building with Peers/ Friends, Strangers, Transgenders - Professional Relationship : Officials, Mentors, Staff & Service Personnel- Other centeredness and others point of view and Empathy

**Unit III: Problem-solving and Decision making skills (6 Hours)**

Decision making processes - Lateral Thinking and problem-solving strategies - Select and apply problem-solving strategies to more complex tasks and problems - Gain familiarity with concepts such as performance indicators and benchmarking – Counseling.

**Unit IV: Coping Strategies (6 Hours)**

Conflict/Crisis Management –Stress Management – Emotional Management - Team, Task and Resource Management – Ignatian Discernment Process

**Unit V: Overcoming Addiction (6 Hours)**

Various stages of addiction- Gadgets addiction - Substance abuse - Media addiction – Internet addiction – Impact, prevention and remedies.

**REFERENCE BOOKS:**

1. Dr. Xavier Alphonse S.J., We Shall Overcome, ICRDEC Publications, Chennai, 2004.
2. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
3. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
4. Course Material prepared by the Department of Human Excellence.

**ENVIRONMENTAL STUDIES**  
**(23UEVS41)**

<b>SEMESTER: IV</b>	<b>EVS</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course objective:**

To cater to students from diverse disciplinary backgrounds and to sensitise them about the commitment of our nation towards achieving sustainable development goals and addressing global environmental challenges.

**Course outcomes:**

The student will be able to:

1. Describe various natural resources and the need for sustainable development (K1).
2. Relate biodiversity and its conservation approaches (K2).
3. Solve the environmental issues of concern and discover prevention strategies (K3).
4. Sensitize and categorize the adverse health impacts of pollution (K3).
5. Assess environmental quality and risks for climate change mitigation (K4 & K5).
6. Recognize the major treaties to safeguard Earth's environment and resources (K2).

**Unit I: Natural Resources and Sustainable Development (6 hours)**

Overview of natural resources: definition, classification. Biotic resources: major types, status and challenges. Water resources: types, over-exploitation, issues, challenges, water scarcity, conflicts. Soil and mineral resources: important minerals, problems, soil as a resource. Energy resources: sources, conventional and non-conventional, implications. Introduction to sustainable development: SDGs, targets and indicators, challenges and strategies.

**Unit II: Conservation of Biodiversity and Ecosystems (6 hours)**

Biodiversity and its distribution: Levels and types, India and world, hotspots, threat categories. Ecosystems and ecosystem services: major types in India, basic characteristics, significance. Threats to biodiversity and ecosystems: land use, commercial exploitation of species and invasive species. Major conservation policies: in situ, ex situ, protected areas, traditional knowledge, community based conservation, gender and conservation.

**Unit III: Environmental Pollution and Health (6 hours)**

Understanding disaster and pollution: definitions, natural and man-made, point source and non-point source, kinds. Air and water pollution: criteria pollutants, sources, and adverse effects, quality standards. Soil and noise pollution: sources and health effects. Thermal and radioactive pollution: sources and impact on health and ecosystems.

**Unit IV: Climate Change: Impacts, Adaptation and Mitigation (6 hours)**

Understanding climate change: structure of atmosphere, natural and anthropogenic variations, importance of 1.5 °C and 2.0 °C limits to global warming, projections of climate change in Indian subcontinent. Impacts, vulnerability and adaptation to climate change. Mitigation of climate change: GHG reduction vs. sink enhancement, concept of carbon intensity, energy intensity and carbon neutrality; policy instruments, carbon capture and storage, climate justice.

## **Unit V: Environmental Treaties and Legislation**

**(6 hours)**

Overview of instruments of international cooperation: bilateral, multilateral, conventions and protocols, COPs. Major International Environmental Agreements: CBD, CITES, UNCCD, UNFCCC. Major Indian Environmental Legislations: acts, rules, sites, areas, zones and judgements. Major International organisations and initiatives: UNEP, IUCN, WCED, UNESCO, IPCC, MAB.

### **Reference books**

1. Singh, J.S., Singh, S.P., Gupta, S.R. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications.
2. Harris, Frances (2012). Global Environmental Issues, 2nd Edition. Wiley- Blackwell.
3. Krishnamurthy, K.V. (2003). Textbook of Biodiversity, Science Publishers, Plymouth, UK.
4. Ahluwalia, V. K. (2015). Environmental Pollution, and Health. The Energy and Resources Institute (TERI).
5. Pittock, Barrie (2009). Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge.
6. Ministry of Environment, Forest and Climate Change (2019). A Handbook on International Environment Conventions & Programmes.
7. KanchiKohli, Manju Menon (2021). Development of Environment Laws in India, Cambridge University Press.



**HUMAN RIGHTS AND SOCIAL ANALYSIS**  
**(23UVEH51)**

<b>SEMESTER: V</b>	<b>VE</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course Outcomes :**

Upon completion of the course, the students will be able to

- Describe Indian social scenario (K1)
- List the different kinds of fundamental rights (K1)
- Discuss major social problems in India (K2)
- Analyze critically society and its network of relationships (K4)
- Analyze local and global social problems (K4)
- Describe redressal mechanisms for human rights violations (K6)

**Unit I: World trends today and Indian Scenario** **(6 Hours)**

Some basic data – Globalization - World Social Forum vs World Economic Forum - The North South divide – Democracy - Types of Governance in the world – Demography and Basic Data of India

**Unit II: Indian Social System** **(6 Hours)**

Social Analysis - Social system and its components - Interdependence of human being and society - A land of cultural linguistic and religious diversity - secularism-communalism-fundamentalism-Indian politics and religion-problems of the minority.

**Unit III: Major Social Problems I** **(6 Hours)**

Indian Economic inequality and Poverty; Manifestation and Measurement; Incidence and Magnitude; Causes, problems of poor and pains of poverty; the remedy - Ignorance in Governance and corruption: The Concept; Causes and Impact of Corruption; Combating Corruption - Illiteracy: Magnitude, Causes and Consequences

**Unit IV: Major Social Problems II** **(6 Hours)**

Caste Discrimination: caste discrimination and process of exclusion, Honour Killing, Untouchability, Caste Politics, Reservation policy – Dalit Empowerment - Child abuse, child labour - Effects of Abuse on Children - Violence against women: Harassment; Nature, Extent and Characteristics – Empowerment of Women - LGBTQIA+ – Currently pressing issues.

**Unit V: Human Rights, Indian Constitutions and Empowerment** **(6 Hours)**

Universal Human Rights: The concept – Evolution – Organizations and Recent Developments – Indian Constitutions: Preamble - Political and Civil fundamental rights and duties. Empowerment Models: Communitarian and Local Models – Social Reformers: Ambedkar, Gandhi, Muthulakshmi Reddy and Periyar - Dreams and hopes for better India.

**REFERENCE BOOKS:**

1. P.N. Sharma, “Social problems and issues in India”, Bharat Book Centre, 2014
2. New India, The Reality Reloaded, Gurjot S. Kaler, Chandigarh, India, 2018
3. Course Material Prepared by the Department of Human Excellence

**FOUNDATIONS OF LIBRARY SCIENCE**  
**(23ULBN11)**

<b>SEMESTER: I</b>	<b>NME</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**COURSE Outcomes:** At the end of the course the students will be able to

- CO1. Comprehend the Evolution, Significance, and Fundamental Operations of Libraries. (K2)
- CO2. Develop Effective Reading Strategies and Critical Thinking Skills. (K3)
- CO3. Differentiate and grasp the distinct roles and functions of various types of libraries. (K4)
- CO4. Explore Modern Library Services and the Impact of Digital Resources. (K4)
- CO5. Recognize the potential of VR, AI, and chatbots in enhancing user support within library environments. (K5)

**UNIT 1 (6 Hours)**

**INTRODUCTION TO LIBRARY**

The history and evolution of libraries - Need - Purpose - Functions - Five Laws of Library Science.

**UNIT 2 (6 Hours)**

**TYPES OF LIBRARY**

Public – Academic – Special - National. (Definition, purpose and functions of each type of library.

**UNIT 3 (6 Hours)**

**LIBRARY SERVICES AND COLLECTION DEVELOPMENT**

Reference services and reader advisory- Collection development and Management - E-books - E-journals Database - Bulletin Boards.

**UNIT 4 (6 Hours)**

**EMERGING TECHNOLOGIES IN LIBRARIES**

Virtual reality and augmented reality in libraries - AI and chatbots for user support - Internet of Things (IoT) applications in libraries.

**UNIT 5 (6 Hours)**

**READING CULTURE FOR LIBRARY PRACTITIONERS**

Value of Reading in Professional Development - Exploring Diverse Reading Materials - Effective Reading Techniques - Critical Thinking and Reflection.

**Text Book**

Kumar P S G, Foundations of Library and Information Science B. R. Publishing Corporation

**Reference**

1. Khanna J K, Library and Society, Kurukshetra University, Kurukshetra
2. Kumar P S G, Foundation of Library and Information Science Paper 1 of UGC Model Curriculum, B.R. Publishing Corporation

**TRADITIONAL KNOWLEDGE OF INDIAN MEDICINAL SYSTEMS  
(23UXRN11)**

<b>SEMESTER: I</b>	<b>NME</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course outcomes:** At the end of the course the students will be able to

**CO1:** Understand the concepts of ethno botany and its branches (K1).

**CO2:** Provide a strong foundation in the principles of ethno medicine and its applications (K2 & K4).

**CO3:** Inculcate knowledge and make the students aware of the commercial value of medicinal plants (K2 & K3).

**CO4:** Give an insight into the edible and medicinal plants in tribal medicine (K3).

**CO5:** Comprehend the advances made in the field of plant biotechnology in conservation of medicinal plant resources (K4).

**CO6:** Understand ethno botany of the Western Ghats, their medicinal and commercial values and conservation (K1- K4).

**Unit I: Ethnobotany (6 hours)**

History of Ethnobotany, concept, scope and objectives. The relevance of ethnobotany in the present context. Major ethnic groups in Tamil Nadu.

**Unit II: Traditional medicines (6 hours)**

Medicinal plants used by Tribals. Ethnobotanical formulations; Ethnobotanical uses of selected medicinal plants with a) *Azadirachaindica* b) *Ocimumtenuiflorum* c) *Vitexnegundo*. d) *Gloriosasuperba* e) *Tribulusterrestris* f) *Pongamiapinnata* g) *Senna auriculata* h) *Indigoferatinctoria*. Importance and scope of medicinal plants used by *Paliyans*.

**Unit III: Commercial value of traditional medicinal plants (6 hours)**

Raw drugs from ethnomedicinal plants - Economic potentials of selected ethnomedicinal plants. Ethnobotany as a source of important drugs a) Reserpine b) Artemisin c) Gugulipid d) Cathranthin e) Strychnine. Export of medicinal plants and their products.

**Unit IV: Collection, Utilization and Conservation of Traditional Medicinal Plants (6 hours)**

The significance of wild medicinal plants – Collection and utilization of medicinal plants – Therapeutics uses of wild medicinal plants. Role of ethnic groups in the conservation of plant genetic resources. Participatory forest management.

**Unit V: Conventional and modern aspects of medicinal plant propagation (6 hours)**

Plant Propagation; Methods of propagation – conventional - vegetative cutting, layering grafting etc., Modern methods- Tissue culture; Micropropagation, isolation of secondary metabolites from *in vitro* culture

**Textbooks:**

1. P.C. Trivedi, Dr. Pravin Chandra 2011. Text Book of Ethnobotany, Pointer Publishers.
2. Bir Bahadur, K. V. Krishnamurthy, T. Pullaiah. 2021. Ethnobotany of India, 5-Volume Set. Apple Academic Press
3. Jain, A. and Jain, S.K. 2016. Indian Ethno botany - Bibliography of 21st Century Scientific Publishers (India).
4. Cunningham, A. B. (2001). Applied Ethnobotany. Earthscan publishers Ltd. London & Sterling
5. Indian Medicinal Plants -An Illustrated Dictionary-C.P. Khare (Ed.) 2019, ©Springer Science+Business Media, LLC.

**Reference Books**

1. Paul E. Minnis 2000. Ethnobotany: A Reader. University of Oklahoma Press
2. Gary J. Martin, 2014. Ethnobotany A Methods Manual. Springer US.
3. T. Pullaiah, Bir Bahadur, K. V. Krishnamurthy. 2016. Ethnobotany of India Western Ghats and West Coast of Peninsular India. Apple Academic Press
4. Ministry of Environment and Forests. 1994. Ethno biology in India. A Status Report. All India Coordinated Research Project on Ethno biology. Ministry of Environment and Forests. New Delhi
5. Albuquerque, U.P., Ramos, M.A., Júnior, W.S.F., and De Medeiros, P.M. 2017. Ethnobotany.

**Web Resources**

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2816487/>
- [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_tk\\_6.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_tk_6.pdf)
- <https://main.ayush.gov.in/ayush-systems/ayurveda/faq>
- <https://www.who.int/news>
- <https://www.csir.res.in/documents/tkdl>
- <https://www.meity.gov.in/content/national-digital-library>

**INFORMATION RESOURCES**  
**(23ULBN21)**

<b>SEMESTER: II</b>	<b>NME</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course Outcomes:** Upon completion of the course, the students will be able to

- CO1. learn all kinds of Secondary Sources. (K1)
- CO2. Learn electronic reference materials. (K1)
- CO3. Understand the concept and importance of Primary, Secondary and Tertiary sources (K2)
- CO4. Analyze the different Non Documentary Sources (K4)
- CO5. Assess electronic information sources, including e-books and e-journals. (K4)

**UNIT-I : Introduction to Information Sources (6 Hours)**

Definition, Type, Characteristics - Primary, Secondary, Tertiary –Evaluation of print Reference Sources

**UNIT-II: Secondary Sources (6 Hours)**

Definition, Types- Dictionaries, Encyclopedia, Directories, Manuals and Handbooks, Bibliographic sources

**UNIT-III : Non – Documentary Source (6 Hours)**

Formal and Informal – Human Sources, Institutional Information Sources, Technological Gate Keepers and Invisible Colleges.

**UNIT-IV : Electronic Information Sources (6 Hours)**

Meaning- Characteristics- Research database Open Access Resources-Audio resources

**UNIT-V: Online Publishers (6 Hours)**

Detailed study of E-books (Amazon, Sage Publication), E-journals (Springer, Verlog), Database (PROQUEST, EBSCO), Evaluation of E-Resources.

**Reference Books:**

- Singh, G. (2011).Digital libraries and digitization. EssEss Publications.
- 2. Baby M.D. (2000) Peter Clayton, G. E. Gorman. Managing Information Resources in Libraries. Cambridge Publishers.

**INDIAN TRADITIONAL MEDICINAL FOODS  
(23UXRN21)**

<b>SEMESTER: II</b>	<b>NME</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course outcomes:** At the end of the course the students will be able to

- CO1:** Know the foundational principles of health supplements such as functional foods, nutraceuticals, superfoods, etc., and assess their potential within the market context (K1).
- CO2:** Understand the core principles of nutrition, including carbohydrates, proteins, lipids, vitamins, minerals, health-enhancing phytochemicals, and antinutritional factors (K2).
- CO3:** Get knowledge about the origins, traditional uses, nutritional composition, and health advantages of selected plant-based foods (K1).
- CO4:** Know the scientific rationale underlying the health benefits and potential adverse effects of various food substances (K3).
- CO5:** Identify the indigenous wild edible plants found in the Southern Western Ghats and their role in enhancing food security (K1).
- CO6:** Comprehend the fundamental concepts related to food and its significance in promoting health, specifically addressing contemporary health challenges, and demonstrate the ability to apply this knowledge in daily life (K1-K3).

**Unit I: FOOD CULTURE (6 Hours)**

Concept of food and its medicinal value - Food and health in Indian traditional medicine - Effect of globalization on food culture - Fast foods, Junk foods and their impact on the health of children and youth population - Emerging trends in health supplements

**Unit II: MACRONUTRIENTS (6 Hours)**

Carbohydrates and their role in health - Cereals, Millets, and Pseudo - Cereals - Proteins and their importance on health - Pulses and their health benefits - Lipids and their health impacts - Nuts and oil seeds

**Unit III: MICRONUTRIENTS (6 Hours)**

Vitamins, minerals and their health impacts - Hidden hunger - Greens, Vegetables and Fruits

**Unit IV: PHYTOCHEMICALS (6 Hours)**

Health promoting phytochemicals and antinutritional factors - Spices, and beverages - Lower plants as food sources - Mushrooms and their health benefits

**Unit V: WILD EDIBLES & FOOD SECURITY (6 Hours)**

Tribal knowledge of food plants - Seasonal foods and wild edible plants of *Kanikaran* and *Paliyan* tribes of Tamil Nadu - Sustainability, Food Security, and Health

**Text books:**

1. Begum, R.M. 2008. A Textbook of Foods, Nutrition & Dietetics, Sterling Publishers Pvt. Ltd.
2. Mudambi, S.R., Rajagopal, M.V. 2007. Fundamentals of foods, nutrition and diet therapy. New Age International.

**References:**

1. Gopalan, C., Sastri, B.V.R., Balasubramanian, S.C. 2014. Nutritive Value of Indian Foods, National Institute of Nutrition, Hyderabad
2. Dietary Guidelines for Indians – A Manual (English), National Institute of Nutrition, Hyderabad

**FOOD MICROBIOLOGY**  
**(23UXRN31)**

<b>SEMESTER: III</b>	<b>NME</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course outcomes:** Upon successful completion of this course, students should be able to:

**CO1:** Understand the fundamental principles of food microbiology and its importance in the food industry; Apply laboratory techniques for microbial analysis in food samples (K1).

**CO2:** Identify and characterize common food borne pathogens and their sources (K2).

**CO3:** Evaluate methods for food spoilage prevention and preservation (K2).

**CO4:** Describe the role of fermentation in food production and its health implications (K2).

**CO5:** Analyze emerging trends and ethical considerations in food microbiology; Apply regulatory guidelines and best practices for ensuring food safety and quality (K3).

**CO6:** Communicate effectively about food microbiology topics in both written and oral formats; Demonstrate critical thinking and problem-solving skills in food safety and quality assurance (K1-4).

**Unit 1: Introduction to Food Microbiology (6 hours)**

Overview of Food Microbiology; Historical Perspective; Microbial Classification and Taxonomy; Microbial Growth and Factors Affecting Growth; Laboratory Techniques in Food Microbiology

**Unit 2: Food borne Pathogens (6 hours)**

Common Food borne Pathogens (e.g., *Salmonella*, *Escherichia coli*, *Listeria*, *Campylobacter*); Sources of Food borne Pathogens; Detection and Control Strategies; Food borne Illness Outbreaks and Investigations; Food Safety Regulations

**Unit 3: Food Spoilage Microorganisms (6 hours)**

Types of Food Spoilage Microorganisms; Factors Influencing Food Spoilage; Spoilage Detection and Prevention; Food Preservation Methods; Food Packaging and Shelf-Life Extension

**Unit 4: Food Fermentation (6 hours)**

Fermentation in Food Production; Microorganisms Used in Fermentation; Fermented Food Products (e.g., yogurt, cheese, bread); Health Benefits of Fermented Foods; Quality Control in Fermentation

**Unit 5: Food Safety and Quality Assurance (6 hours)**

Food Safety Management Systems (HACCP); Good Manufacturing Practices (GMPs); Food Testing and Analysis; Risk Assessment and Management; Emerging Trends in Food Safety

**Reference Books:**

1. Food Microbiology: An Introduction by Thomas J. Montville and Karl R. Matthews, 2017
2. Foodborne Pathogens: Microbiology and Molecular Biology by Pina M. Fratamico, Arun K. Bhunia, and James L. Smith, 2005
3. Food Microbiology: Fundamentals and Frontiers by Michael P. Doyle, Robert L. Buchanan, and Vijay K. Juneja, 2019
4. Fermented Foods and Beverages of the World by Jyoti Prakash Tamang, 2010
5. Food Safety Management: A Practical Guide for the Food Industry by Yasmine Motarjemi and Huub Lelieveld, 2014

**HERBAL RESOURCES AND THEIR CONSERVATION**  
**(23UXRN41)**

<b>SEMESTER: IV</b>	<b>NME</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course outcomes:** At the end of the course the students will be able to

- CO1:** Understand the concepts in herbalism, medicinal plant trade and National policies (K2)  
**CO2:** Recognize the threats and importance of conserving the medicinal plant resources (K2)  
**CO3:** Explore the important medicinal plant resources of India, their scientific rationale and applications (K3)  
**CO4:** Learn the good agricultural and collection practices of medicinal plants (K1)  
**CO5:** Know the cultivation and post-harvest processing of selected medicinal plants cultivated Tamil Nadu (K2)  
**CO1:** Understand the role of plant resources in global healthcare and its conservation (K1-K3)

**Unit I: SCENARIO OF HERBALISM (6 Hours)**

History of herbalism - Herbalism across the globe - Trade of herbals in ancient and contemporary India - Global herbal market and India's position

**Unit II: UNSUSTAINABLE USE OF HERBAL RESOURCES (6 Hours)**

Basics of endemism, IUCN categories of threat and CITES - Market demand - Negative impacts of collection from wild resources - Overexploited medicinal plants of India - *In situ* and *ex situ* conservation

**Unit III: HIGHLY USED HERBALS OF INDIA (6 Hours)**

Botany, identification, chemistry and applications of *Aswagandha*, *Seenthil*, *Nilavembu*, *Brahmi*, *Garcinia*, *Glycyrrhiza*, *Amla*, *Vilvam*, *KeelanelliandSatavari*

**Unit IV: CULTIVATION & POST-HARVEST PROCESSING (6 Hours)**

Good agricultural practices - Good collection practices - Storing medicinal plants – Post-harvest methods and value addition

**Unit V: CULTIVATION OF SELECTED MEDICINAL PLANTS (6 Hours)**

Good agricultural and collection practices for *Senkanthal*, *Senna*, *Vinca*, *Tulsi* and *Asogu*- Government schemes for cultivation of medicinal plants - Kitchen and home herbal gardens

**Text book:**

Wallis, T.E. 2018. Textbook of Pharmacognosy (Reprinted edition), CBS Publishers, New Delhi.

**References:**

1. Anonymous, Agro-techniques of selected medicinal plants Vols. I-III. 2014. National Medicinal Plants Board, Government of India.
2. Anonymous, WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants. 2003. WHO, Geneva.
3. Ravikumar, K., Ved, D.K. 2000. Illustrated Field Guide to 100 Red Listed Medicinal Plants of Conservation Concern in southern India, FRLHT, Bangalore.
4. Ved, D.K., Goraya, G.S. 2007. Demand and Supply of Medicinal Plants in India. NMPB, New Delhi & FRLHT, Bangalore.



**SOCIETY, ECONOMY AND POLITICS IN CONTEMPORARY INDIA**  
**(23UMXN41)**

<b>SEMESTER: IV</b>	<b>NME</b>	<b>HOURS: 2</b>	<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
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**Course Outcome:**

On completion of the course, the students will be able to

- CO1: Relate the concept of state and government (K1)
- CO2: Understand and evaluate different types of societies in India (K2 & K5)
- CO3: Identify and compare role of market in different types of economy (K3)
- CO4: Examine and compare ideas of Ambedkar with other social, economic and political reformers (K4 & K5).
- CO5: Analyse and formulate the casteless society in India.

**UNIT I: STATE AND GOVERNMENT (6 Hours)**

State and Government: Meaning and concepts – Features, characteristics and Nature of State and its dynamics in India

**UNIT II: DYNAMICS OF SOCIETY (6 Hours)**

Society: concept, meaning and basic characteristics of society – different types of societies – stratification of societies in India – Rural-Urban Structures and social Institutions.

**UNIT III: ECONOMY AND MARKET (6 Hours)**

Economy and Market: Meaning and concept, basic characteristics and types of economies – dynamics of economy and market in new economic policy era.

**UNIT IV: SOCIAL, ECONOMIC AND POLITICAL THINKERS IN INDIA (6 Hours)**

Jyotirao Phule, Periyar, Gandhi, Ambedkar and Amartya Sen on interaction of society, economy and politics and its dynamics.

**UNIT V: BUILDING CASTELESS SOCIETY (6 Hours)**

Annihilation of Caste: Meaning and concept - Meaning of sati, childhood marriage, endogamous and exogamy of marriage - Status of Dalit and women in Indian society – Dalit and women emancipation.

**References:**

1. Jodhka, S. S. (2002). Nation and village: Images of rural India in Gandhi, Nehru and Ambedkar. *Economic and political weekly*, 3343-3353.
2. Jodhka, S. S. (2010). Dalits in business: Self-employed scheduled castes in North-West India. *Economic and Political Weekly*, 41-48.
3. Jodhka, S. S. (2016). Ascriptive hierarchies: Caste and its reproduction in contemporary India. *Current Sociology*, 64(2), 228-243.
4. Jodhka, S. S., & Fazal, T. (2021). Religion and Politics in South Asia. *Sociological Bulletin*, 70(4), 447–452. <https://doi.org/10.1177/00380229211062752>
5. Mitra, S. K. (1993). Caste, democracy and the politics of community formation in India. *The Sociological Review*, 41(1\_suppl), 49-71.

6. Mosse, D. (2020). The modernity of caste and the market economy. *Modern Asian Studies*, 54(4), 1225-1271.
7. Nayyar, D. (1998). Economic development and political democracy: interaction of economics and politics in independent India. *Economic and Political Weekly*, 3121-3131.
8. Robinson, R. (2014). Planning and economic development: Ambedkar versus Gandhi. *Invoking Ambedkar: Contributions, Receptions, Legacies*, 59-71.
9. Singh, A. (2014). Gandhi and Ambedkar: Irreconcilable Differences? *International Journal of Hindu Studies*, 18(3), 413-449.
10. Stiglitz, J. E. (2016). *The state, the market, and development* (No. 2016/1). WIDER Working Paper.
11. Vikas, R. M., Varman, R., & Belk, R. W. (2015). Status, caste, and market in a changing Indian village. *Journal of Consumer Research*, 42(3), 472-498.

**GENERAL CHEMISTRY I**  
**(Subject code: 23UCHC11)**

<b>Semester: I</b>	<b>Core: T1</b>	<b>Credits: 5</b>	<b>Hours/</b>
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**Course Outcomes:**

**On completion of the course the students should be able to**

- CO 1 :** Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds. (K2)
- CO 2:** Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.(K3)
- CO 3 :** Apply the theories of atomic structure, bonding, to calculate energy of a spectral transition,  $\Delta x$ ,  $\Delta p$  electronegativity, percentage ionic character and bond order.(K4)
- CO 4:** Evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects (K5)
- CO 5 :** Construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms. (K6)

**UNIT I Atomic structure (15 Hrs)**

History of atom (J.J. Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H-spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; - Quantum Numbers. Electronic configuration of atoms and ions - Numerical problems involving the core concepts.

**Self Study:** Hund's rule, Pauli's exclusion principle and Aufbau principle;

**Unit II Periodic trends and Chemical bonding (15 Hrs)**

**Modern Periodic Table** Cause of periodicity; Features of the periodic table; classification of elements - Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity- electronegativity scales,. Mullikan's scale, Allred Rochow's scale. Applications of electronegativity. Problems involving the core concepts

**Ionic bond**

Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation– polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts..

**Self Study:** Pauling's scale, group electronegativity.

**UNIT-III: Structure and bonding – I (15 Hrs)**

**Covalent bond**

Covalent bond. Definition with examples. Conditions for the formation of covalent bond, Properties of covalent molecules. Shapes of orbitals, overlap of orbitals –  $\sigma$  and  $\Pi$  bonds; directed valency - hybridization; VSEPR theory - shapes of molecules of the type  $AB_2$ ,  $AB_3$ ,  $AB_4$ ,  $AB_5$ ,  $AB_6$  and  $AB_7$

Partial ionic character of covalent bond-dipole moment, application to molecules of the type  $A_2$ , AB,  $AB_2$ ,  $AB_3$ ,  $AB_4$ ; percentage ionic character- numerical problems based on calculation of percentage ionic character.

**Self Study:** Structure and bonding in xenon compounds.

**UNIT-IV: Structure and bonding – II (15 Hrs)**

VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species –  $CO_2$ ,  $NO_2$ ,  $CO_3^{2-}$ ,  $NO_3^-$ ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of  $H_2$ ,  $C_2$ ,  $O_2$ ,  $O_2^+$ ,  $O_2^-$ ,  $O_2^{2-}$ ,  $N_2$ , NO, HF, CO; magnetic characteristics, comparison of VB and MO theories.

Coordinate bond: Definition, Formation of  $BF_3$ ,  $NH_3$ ,  $NH_4^+$ ,  $H_3O^+$  properties

Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors  
Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces;

**Self Study:** Hydrogen bonding – Types, stability of DNA; Effects of chemical force, melting and boiling points.

**UNIT-V: Basic concepts in Organic Chemistry (15 Hrs)**

Classification and nomenclature: Nomenclature of alkanes, alkenes, alkynes, cycloalkanes, and mono, poly functional aliphatic compounds and aromatic compounds. Cleavage of bonds: Homolytic and heterolytic cleavages, arrow pushing in organic reactions; Reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; Reaction intermediates, structure and stability of carbanions, carbocations, carbenes, Benzyne and nitrene. Bond energy, bond length and bond angle. Hybridisation; Types -  $sp$ ,  $sp_2$  and  $sp_3$  with reference to methane, ethylene and acetylene.

**Self study:** Classification of organic compounds, Types of organic reaction.

**Text books**

1. Madan, R. D. and Sathya Prakash, *Modern Inorganic Chemistry*, 2<sup>nd</sup> ed.; S.Chand and Company: New Delhi, 2003.
2. Rao, C.N. R. *University General Chemistry*, Macmillan Publication: NewDelhi, 2000.
3. Puri, B. R. and Sharma, L. R. *Principles of Physical Chemistry*, 38<sup>th</sup>ed.; Vishal Publishing Company: Jalandhar, 2002.
4. Bruce, P. Y. and PrasadK. J. R. *Essential Organic Chemistry*, PearsonEducation: New Delhi, 2008.
5. Dash UN, Dharmarha OP, Soni P.L. *Textbook of Physical Chemistry*, Sultan Chand & Sons: New Delhi, 2016

**Reference Books**

1. Maron, S. H. and Prutton C. P. *Principles of Physical Chemistry*, 4<sup>th</sup>ed.; The Macmillan Company: Newyork, 1972.
2. Lee, J. D. *Concise Inorganic Chemistry*, 4th ed.; ELBS WilliamHeinemann: London, 1991.

3. Gurudeep Raj, *Advanced Inorganic Chemistry*, 26<sup>th</sup>ed.; Goel Publishing House: Meerut, 2001.
4. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th ed.; Oxford University Press: New York, 2014.
5. Huheey, J. E. *Inorganic Chemistry: Principles of Structure and Reactivity*, 4<sup>th</sup> ed.; Addison, Wesley Publishing Company: India, 1993.

## Practical: Inorganic Volumetric Estimation-I

(Subject code: 23UCHC12)

Semester: I	Core: P1	Credits: 3	Hours/W - 3
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**On successful completion of the course the students should be able to**

- CO 1:** Explain the basic principles involved in titrimetric analysis and inorganic preparations.(K2)
- CO 2 :** Compare the methodologies of different titrimetric analysis.(K3)
- CO 3 :** Calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.(K4)
- CO 4 :** Assess the yield of different inorganic preparations and identify the end point of Various titrations.(K5)

### Unit I Chemical Laboratory Safety in Academic Institutions

Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.

#### Common Apparatus Used in Quantitative Estimation (Volumetric)

Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.

#### Principle of Quantitative Estimation (Volumetric)

Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.

### Unit II Quantitative Estimation (Volumetric)

Preparation of standard solution, dilution from stock solution

#### Permanganometry

Estimation of sodium oxalate using standard ferrous ammonium sulphate

#### Dichrometry

Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator)

#### Iodometry

Estimation of copper in copper sulphate using standard dichromate

#### Argentometry

Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)

### **Unit III Complexometry**

Estimation of hardness of water using EDTA

Estimation of iron in iron tablets

Estimation of ascorbic acid

Preparation of Inorganic compounds - Potash alum

Tetraammine copper (II) sulphate Hexamminecobalt (III) chloride Mohr's Salt

#### **Text Books**

1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. *Basic Principles of Practical Chemistry*, 2<sup>nd</sup> ed.; Sultan Chand & Sons: New Delhi, 1997.
2. Nad, A. K.; Mahapatra, B.; Ghoshal, A.; *An advanced course in Practical Chemistry*, 3<sup>rd</sup> ed.; New Central Book Agency: Kolkata, 2007.

#### **Reference Book**

1. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; *Vogel's Textbook of Quantitative Chemical Analysis*, 6<sup>th</sup> ed.; Pearson Education Ltd: New Delhi, 2000.

**ALLIED: MATHEMATICS – I**  
**(PHYSICS AND CHEMISTRY)**  
**(Course Code: 23UMTE11)**

**Semester - I EC - 1**

**Hours - 6**

**Credits - 5**

**Course outcomes:** By the end of the course the students will be able to

- CO 1.** Define the rank of matrix.(K1)
- CO 2.** Discuss hyperbolic functions and inverse hyperbolic functions.(K2)
- CO 3.** Explain the relation between the coefficients and the roots of algebraic equation.(K2)
- CO 4.** Solve the system of linear equations.(K3)
- CO 5.** Analyze binomial series, exponential series and logarithmic series.(K4)
- CO 6.** Compare two sets of data using correlation. (K5)

**UNIT I:**

Binomial Series – Exponential Series – The Logarithmic series

**(Text book 1: Chapter 1: Sections 1.2-1.4)**

**UNIT II:**

Nature of roots - Relation between the coefficients and the roots of an algebraic equation -Transformation of equations

**(Text book 1: Chapter 2: Sections 2.1-2.3)**

**UNIT III:**

Rank of a matrix - Simultaneous linear equations - Cayley - Eigen values and Eigen vectors

**(Text book 1: Chapter 3: Sections 3.2 – 3.4)**

**UNIT IV:**

Expansion of  $\sin \theta$  and  $\cos \theta$  in a series of ascending powers of  $\theta$  - Hyperbolic function - Inverse hyperbolic function – Logarithm of complex numbers.

**(Text book 1: Chapter 5: Sections 5.3 – 5.5)**

**UNIT V:**

Correlation – Rank Correlation – Regression

**(Text book 2: Chapter 1)**

**Text books:**

1. S. Narayanan, R. Hanumantha Rao, T.K. Maicavachagom Pillai and P. Kandaswamy, Ancillary Mathematics Volume I, S. Viswanthan (Printers and Publishers) Pvt. Ltd., 2009.
2. S. Arumugam and Issac, Allied Mathematics paper V, New Gamma Publishing House, 2004



**ROLE OF CHEMISTRY IN DAILY LIFE (NME)**  
**(Subject code: 23UCHN11)**  
**(for other major students)**

<b>Semester: I</b>	<b>SEC: 1</b>	<b>Credits: 2</b>	<b>Hours/W - 2</b>
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**On successful completion of the course the students should be able to**

- CO 1 :** Learn about the chemicals used in everyday life as well as air pollution and waterpollution.
- CO 2 :** Get knowledge on building materials cement, ceramics, glass and plastics, polythene,PVC bakelite, polyesters,
- CO 3 :** Acquire information about Food and Nutrition. Carbohydrates, Proteins, Fats Also have an awareness about Cosmetics Tooth pastes, face powder, soaps and detergents.
- CO 4 :** discuss about the fertilizers like urea, NPK fertilizers and super phosphate. Fuel classification solid, liquid and gaseous; nuclear fuel - examples and uses
- CO 5 :** Have an idea about the pharmaceutical drugs analgesics and antipyretics like paracetamol and aspirin and also about pigments and dyes and its applications.

**UNIT-I Air and Water** **(6 Hrs)**

General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution

**Unit-II Materials** **(6 Hrs)**

Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.

**UNIT-III Food and Cosmetics** **(6 Hrs)**

Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.

**UNIT-IV Fertilizers and Fuels** **(6 Hrs)**

Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.

**UNIT-V Drugs and Dyes.** **(6 Hrs)**

Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.

### **Text books**

1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010.
2. A textbook of pharmaceutical chemistry by Jayashree Ghosh, S Chand publishing, 2012.
3. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
4. B. K. Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014. Introduction to forensic chemistry, Kelly M. Elkins, CRC Press Taylor & Francis Group, 2019.
5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.

### **Reference Books**

1. Randolph. Norris Shreve, Chemical Process Industries, McGraw-Hill, Texas, fourth edition, 1977.
2. W.A. Poucher, Joseph A. Brink, Jr. Perfumes, Cosmetics and Soaps, Springer, 2000.
3. A.K. De, Environmental Chemistry, New Age International Public Co., 1990.

**ORGANIC CHEMISTRY- I**  
**(Subject code: 23UCHC21)**

<b>Semester: II</b>	<b>Core: T2</b>	<b>Credits :5</b>	<b>Hours/W - 5</b>
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**On completion of the course the students should be able to**

- CO 1 :** Identify the stereochemical behaviour of molecules (K1)  
**CO 2 :** Explain the fundamental naming of organic compounds (K2)  
**CO 3 :** Determine the 3D structures organic molecules (K3)  
**CO 4 :** Classify the aliphatic systems with reference to organic compounds (K4)  
**CO 5 :** Evaluate the substituent effect in the aromatic reaction systems (K5)  
**CO 6:** Modify the importance and the uses of Organometallic compounds in the field of organic synthesis (K6)

**Unit I Electron displacement effect. (15 hrs)**

Electronic effects: Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects. Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.

Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane.

**Self study.** Polar and non polar covalent bond, Steric effect, field effect

**Unit II Optical Isomerism and Geometrical Isomerism (15 hrs)**

Optical isomerism - Asymmetric carbon atom - Asymmetric, dissymmetric, chiral and achiral molecules - Optical activity - cause of optical activity - optical isomerism exhibited by tartaric acid (erythro, threo, meso and dl forms) - Molecular chirality - biphenyls, allenes and spiranes - Walden inversion - racemisation – resolution - asymmetric synthesis - Stereospecific and stereoselective - examples. Concept of enantiomerism and diastereoisomerism - Determination of configuration of organic compounds - R and S notation - Geometrical isomerism - Geometrical isomerism in compounds containing carbon - carbon double bond and carbon - nitrogen double bond - Designation of geometrical isomers - cis and trans, syn and anti & E and Z notations

**Self study:** Le Bel - van't Hoff theory, Symmetry elements

**Unit III Aliphatic Compounds (15 hrs)**

Alkenes - General methods of preparation by dehydrogenation, dehydrohalogenation, dehydration, Hoffmann and Saytzeff rules, cis and trans eliminations - Mechanism of addition reactions to alkenes - Markownikoff's rule - Peroxide effect - hydroboration and ozonolysis - Classification and stability - isolated, cumulated and conjugated dienes - Conjugated diene - 1,2- and 1,4 - addition reaction - Diels - Alder reaction - Alkynes

Reductions using Lindlar's catalyst and Na/liq.NH<sub>3</sub> and hydrolysis - Internal and terminal alkynes - Acidic nature of alkanes, alkenes and alkynes - a comparison.

**Self study:** Polymerization - addition polymerization, Ziegler Natta catalysed polymerization

#### **UNIT IV Alicyclic Compounds and Conformation (15 hrs)**

Alicyclic compounds - General methods of preparation – Freund's method, Dieckmann condensation, Thrope - Ziegler and Simmon - Smith reactions - Baeyer's strain theory and its modification - Conformation - Rotomers- potential energy diagram - Staggered and eclipsed conformations - Conformational analysis of ethane and n- butane - comparison of the population in gauche form in n - butane and ethylene glycol - Conformations of cyclohexane - chair and boat forms - potential energy diagram - monosubstituted cyclohexanes

**Self study:** Banana bond, Fused ring structures – Prismane, Cubane, adamantane, decalin

#### **UNIT V Aromatic Compounds and Organometallic Compounds (15 hrs)**

Aromatic hydrocarbons - Aromaticity - concept and condition - Huckel rule - benzene, naphthalene, pyrrole, pyridine, cyclopentadienyl anion, cyclopropenylcation and tropyliumcation - Structure of benzene - Orientation (electronic concept) and reactivity in monosubstituted benzene - Mechanism of aromatic electrophilic and aromatic nucleophilic substitution reactions - Introduction - Organo magnesium compounds - Grignard reagent – Preparation - Reactions and synthetic application - Organo lithium compounds – Preparation and reactions

**Self study:** Organo copper compounds

#### **TEXTBOOKS :**

##### **Units I - V**

1. M.K. Jain & S.C. Sharma, Modern Organic chemistry, 3rd edition, 2009, Vishal Publishing Co.
2. B.S. Bahl and ArunBahl, Advanced Organic Chemistry, Reprint-2010, S. Chand & company Ltd.

#### **REFERENCES:**

1. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).
2. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997). [Textbook]
3. Pine S.H, Organic Chemistry, (4th edition) New Delhi, McGraw- Hill, International Book Company. (1986).
4. Mehta, B. and Mehta.M, Organic chemistry, PHI learning Pvt. Ltd., New Delhi (2012). [Textbook]
5. Andrew F Parson, Key Notes in Organic Chemistry, Blackwell Science Publishers, (2003).

## CORE-INORGANIC VOLUMETRIC ESTIMATIONS -II (MICRO LEVEL)

(Subject code: 23UCHC22)

Semester: II	Core: P2	Credit: 3	Hours/W - 3
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**On successful completion of the course the students should be able to**

- CO 1 :** Explain the basic principles involved in cerimetry and dichrometry (K2)
- CO 2 :** Perform the methodologies of different titrimetric analysis.(K3)
- CO 3 :** Calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.(K4)
- CO 4 :** Estimate the amount of contaminants in dairy products.(K5)
- CO 5 :** Evaluate the accuracy of estimation among different methods. (K5)
- CO 6 :** Engineer new methods for the removal ions which are responsible for the hardness of water (K6)

### ESTIMATION OF

1. FAS (Link  $\text{Ce}^{4+}$ )
2.  $\text{NaNO}_2$  (Cerimetry)
3. Potassium permanganate using analar potassium dichromate (link thio)
4. Potassium dichromate using analar potassium dichromate (link thio)
5. Copper sulphatepentahydrate using analar copper sulphatepentahydrate (link thio)
6. Arsenous oxide using analararseneous oxide (link  $\text{I}_2$  solution)
7. Available chlorine in bleaching powder
8. Copper in brass
9. Temporary and permanent hardness of water sample (acidimetry - alkalimetry)
10.  $\text{Mg}^{2+}$  using analar $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  or  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$  (link EDTA)
11.  $\text{Zn}^{2+}$  using analar $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  (link EDTA)
12. Total and permanent hardness of water sample (EDTA method)
13. Mg and Ba in a mixture (Ba removed as  $\text{BaSO}_4$ )
14. Calcium in milk powder

### Reference:

1. J.Mendhem, R.C. Denney, D. Barnes, M.J.k.Thomas, Vogel's Textbook of Quantitative chemical Analysis, 6th edition, 2002, Pearson Education Ltd.

**NOTE:** Laboratory manual will be supplied

## ALLIED: MATHEMATICS – II

(Course Code:23UMTE21)

Semester - II	EC - 2	Hours - 6	Credits - 5
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**Course Outcomes:** By the end of the course the students will be able to

- CO 1. Define group, subgroup, cyclic group and order of an element.(K1)
- CO 2. Recall reduction formulae for trigonometric functions.(K1)
- CO 3. Discuss the relation between order of an element and order of the group using Lagrange's theorem.(K2)
- CO 4. Solve ordinary differential equation and partial differential equation (K3)
- CO 5. Classify the types of partial differential equations.(K4)
- CO 6. Evaluate double and triple integrals. (K5)

**UNIT I: (18 Hours)**

Groups - Subgroups - Cyclic groups - Order of an element - Cosets and Lagrange's theorem.

(Text book 1: Sections 2.5, 2.6, 2.10)

**UNIT II: (18 Hours)**

Linear equations with constant coefficients - Methods of finding complementary functions - Methods of finding particular integrals - Homogeneous linear equations.

(Text book 2: Chapter 5 (Sections 1- 4))

**UNIT III: (18 Hours)**

Formation of partial differential equations - First order partial differential equations - Some standard forms.

(Text book 2: Chapter 6)

**UNIT IV: (18 Hours)**

Definite integrals - Integration by parts - Reduction formulae for  $\sin^n x \, dx$ ,  $\cos^n x \, dx$ , and  $\tan^n x \, dx$  only

(Text book 3: Sections 1.2 and 1.3)

**UNIT V: (18 Hours)**

Double integrals - Triple integrals - Jacobians - Change of variables in double and triple integrals.

(Text book 3: Chapter 6)

**Text books:**

1. S. Arumugam and Issac, Allied Mathematics paper IV, New Gamma Publishing House, 1996
2. S. Arumugam and Issac, Allied Mathematics paper III, New Gamma Publishing House, 2004
3. S. Arumugam and Issac, Allied Mathematics paper II, New Gamma Publishing House, 2003

**DAIRY CHEMISTRY**  
**(Subject code: 23UCHN21)**  
**(for other major)**

<b>Semester: II</b>	<b>SEC: II</b>	<b>Credits: 2</b>	<b>Hours/W - 2</b>
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**On completion of the course the students should be able to**

- CO 1 :** Understand about general composition of milk – constituents and its physical properties.(K2)
- CO 2 :** Acquire knowledge about pasteurization of Milk and various types of pasteurization -Bottle, Batch and HTST Ultra High Temperature Pasteurization. (K1)
- CO 3:** Learn about Cream and Butter their composition and how to estimate fat in Cream and Ghee (K2)
- CO 4 :** Explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk. (K3)
- CO 5 :** Have an idea about how to make milk powder and its drying process - types of dryingprocess (K4)
- CO 6 :** Become entrepreneur in the field of dairy products (K6)

**UNIT I Composition of Milk** **(6 Hrs)**

Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer- examples and their detection- estimation of fat, acidity and total solids in milk.

**UNIT II Processing of Milk** **(6 Hrs)**

Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.

**UNIT III Major Milk Products** **(6 Hrs)**

Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fat in cream. Butter - definition - composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity  
- definition - prevention - antioxidants and synergists - natural and synthetic.

**UNIT IV Special Milk** **(6 Hrs)**

Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk - condensed milk - definition, composition and nutritive value.

## **UNIT V Fermented and other Milk Products**

**(6 Hrs)**

Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarian milk - acidophilous milk – Yoheer Indigeneous products- khoa and chhena definition - Ice cream - definition-percentage composition-types-ingredients-manufacture of ice-cream, stabilizers-emulsifiersandtheirrole-milkpowder-definition-needformakingmilkpowder- drying process-types of drying.

### **Text books**

1. K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition,2006.
2. K. S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia PublishingHouse New Delhi, 1974.
3. Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, Indian Council of Agricultural Research, 1 st edition, 2008.
4. A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1 st edition,2013.
5. Text book of dairy chemistry, P. L. Choudhary, Bio-Green book publishers,2021.

### **Reference books**

1. Robert Jenness and S. Patom, Principles of Dairy Chemistry, S.Wiley, New York, 2005.
2. F.P.Wond, Fundamentals of Dairy Chemistry, Springer, Singapore, 2006.
3. Sukumar De, Outlines of Dairy Technology, Oxford University Press, New Delhi, 1980.
4. P.F.Fox and P.L.H. Mcsweeney, Dairy Chemistry and Biochemistry, Springer, Second edition, 2016.
5. Dairy chemistry and biochemistry, P. F. Fox, T. Uniacke-Lowe, P.L.H.
6. \McSweeney, J.A. OMahony, Springer, Second edition, 2015.



## CORE- INORGANIC CHEMISTRY – I

(Subject code: 23UCHC31)

Semester: III	Core: T3	Credits : 5	Hours/W : 5
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**On completion of the course the students should be able to**

**CO 1 :** Describe the basics of nuclear reactions and its applications in different fields (K1)

**CO 2 :** Interpret the properties of acids, bases and zero group elements (K2)

**CO 3 :** Demonstrate properties of the important compounds of p block elements (K3)

**CO 4 :** Classify the chemistry of compounds of sulphur, nitrogen and phosphorous (K4)

**CO 5 :** Evaluate the efficiency of micro level qualitative analysis of acid and basic radicals (K5)

**CO 6 :** Integrate the properties of different group elements to get new compounds (K6)

### UNIT I Radioactivity and Nuclear Chemistry (15 hrs)

Natural radioactivity: Radioactive emanations - characteristics of  $\alpha$ ,  $\beta$  and  $\gamma$  rays - Detection and measurement of radioactivity – Geiger Muller counter and Wilson cloud Chamber - Radioactive disintegration and half-life period - Average life period - Radioactive equilibrium - Soddy's group displacement law - Radioactive series - Isotopes, isobars, isotones, and K-electron Capture. Mass defect and binding energy–stability of nuclei–numerical calculations. Types of nuclear reactions - Capture, particle-particle, fission, fusion, and spallation reactions. Nuclear fission and atom bomb. Nuclear fusion and hydrogen bomb- Breeder reactor - Stellar energy - Induced radioactivity. Nuclear reactors - Components of a nuclear reactor. Applications of radioactive isotopes as tracers in the fields of medicine, agriculture, industry and study of reaction mechanisms.

**Self-study:** Radiation protection and waste disposal

### UNIT II Concepts of Acids and Bases and Noble Gases (15 hrs)

Concept of acids and bases - Arrhenius concept - Bronsted-Lowry concept – conjugate acids and bases - The Lux-Flood concept - Lewis concept - Hard and soft acids and bases (HSAB) –Pearson concept - HSAB principle and its applications - Effect of solvents and substituents on relative strengths of acids and bases - Superacids and superbases - Classification of solvents and chemical reactions in liquid  $NH_3$  - Noble gases - Position in the periodic table - Isolation, separation and uses. Compounds of xenon-preparations and structures of  $XeF_2$ ,  $XeF_4$ ,  $XeF_6$ ,  $XeOF_2$ ,  $XeOF_4$ ,  $XeO_3$ , and  $XeO_2F_2$ .

**Self-study:** Effect of charge, electronegativity, hydration energy and oxidation on the strength of acids and bases and generalized acid-base concept for cations and anions

### UNIT III p – Block Elements (15 hrs)

General characteristics with reference to configuration, oxidation state, electropositive character and inert pair effect - Hydrides of boron - classification - Types of bonding in boranes. Diborane, carboranes and metallaboranes - preparation, bonding and structure - Wades rule - Structure and bonding in  $B_4H_{10}$  and  $B_4H_9$  Boron – tri halides as Lewis acids – Relative strengths - Compounds of boron and nitrogen – boron nitride and borazine – preparation, structure and properties. Carbon - Graphite and diamond – structure and properties. Silicon - Silica – different forms and structure - Silicates – different types of

silicates - Silicones – preparations, properties and uses - Carborandum - preparation, structure and uses.

**Self-study:** Zeolites as molecular sieves

#### **UNIT IV Nitrogen, Phosphorous, Sulphur and Halogens (15 hrs)**

Nitrogen - Active nitrogen-preparation and properties - Theories of active nitrogen - Structure, bonding and properties of hydrazine, hydrazoic acid and hydroxylamine - Liquid  $NH_3$  as a non-aqueous solvent - Conversion of  $NH_3$  into  $HNO_3$  by Ostwald's process - Action of nitric acid on metals and non- metals - Phosphorus - Structure of oxides and oxyacids of phosphorous – Structure of oxides of oxyacids of phosphorus - Sulphur - Structure of  $S_8$ ,  $SO_2$ ,  $SO_3$  and peracids of sulphur - Preparation and structure of di, tri and tetrathionic acids - Structure of sulphurous acid - Halides of sulphur-  $S_2Cl_2$  &  $S_2Cl_2$  - Halogens - Interhalogen compounds – types and structure - Basic iodine - Pseudohalogens – Preparation and reactions of cyanogens

**Self-study:** Types of phosphazines, preparation of Caro's acid and Marshall's acid

#### **UNIT V Inorganic Qualitative Analysis (15 hrs)**

Salts –reactions of ions- Types of reactions (Addition, decomposition, dissociation, displacement, double decomposition, hydrolysis, redox reactions) - Complex formation reactions- Separation of Cu & Cd in a mixture and Ni&Co in a mixture - Dry heating test- evolution of gases, sublimation, colour change, precipitation and swelling - Charcoal cavity reduction and cobalt nitrate tests - Analysis of anions: Tests (with equations) - Dilute  $H_2SO_4$ , conc.  $H_2SO_4$ ,  $KMnO_4$ , HCl -  $Na_2CO_3$  extract test for certain combination of anions ( $CO_3^{2-}$  and  $SO_3^{2-}$ ,  $CO_3^{2-}$  and  $C_2O_4^{2-}$ , F<sup>-</sup> and  $SO_4^{2-}$ )- nature of interference - Elimination of interfering anions and preparation of original solutions (with equations) - Analysis of cations - Solubility product concept and common ion effect concept, pH and buffer - Group reagents and separation of analytical groups (with equations)

Self-study: One spot test for each of  $Pb^{2+}$ ,  $Cu^{2+}$ ,  $Cd^{2+}$ ,  $Bi^{2+}$ ,  $Sb^{2+}$ ,  $Fe^{2+}$ ,  $Fe^{3+}$ ,  $Al^{3+}$ , Co, Ni, Mn, Zn,  $Ba^{2+}$ ,  $Ca^{2+}$ ,  $Si^{2+}$ ,  $Mg^{2+}$  ions

#### **REFERENCES :**

1. B.R. Puri and L.R. Sharma, Principles of Inorganic chemistry, 33rd Revised Edn, 2016, Vishal Publishing Co.
2. J.D.Lee, Concise Inorganic Chemistry, 5th edition, 1996, Blackwell Science Ltd.
3. J.E. Huheey, Inorganic chemistry, Principle of structure and reactivity, 4thEdn , 1996, Pearson Education.
4. D.E. Shriver, P.W. Atkins, Inorganic chemistry, 5th Edn,2010, Oxford Univ. Press.
5. A.G. Sharpe, Inorganic chemistry, 3rdEdn, 1992, Longman Group Ltd.
6. Albert Cotton, Wilkinson, Basic Inorganic chemistry, 3rdEdn, 2007, John Wiley Pvt.Ltd.
7. G.L. Miessler and D.A. Tarr, Inorganic chemistry, 3rd Edn,2004, Pearson Education.
8. Alan G.Sharpe, Inorganic chemistry, 2nd Edition, 2005, Pearson Education Ltd
9. R.D. Madan, Principles of Inorganic chemistry, Revised Edn, 2011, S.Chand & Co Ltd.
- 10 H.J.Arinikar Essentials of Nuclear Chemistry, 4th edition New Age International, New Delhi, 1995.
11. A. I. Vogel, Textbook of Qualtitative InorganicAnalysis, 1978, ELBS.

## CORE-INORGANIC QUALITATIVE ANALYSIS - I (MICRO LEVEL)

(Subject code: 23UCHC32)

Semester: III	Core :P3	Credit :3	Hours/W: 3
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On completion of the course the students should be able to

**CO 1 :** Explain and demonstrate the techniques of elimination of interfering radicals (K2)

**CO 2 :** Apply the physical and chemical properties of various ions in the identification of unknown samples (K3)

**CO 3:** Categorize the metal ions into different groups. (K3)

**CO 4 :** Identify the presence of inorganic salts in biological samples. . (K4)

**CO 5:** Separate ions using common ion effect and solubility product (K5)

**CO 6 :** Analyze samples using microscale techniques (K4)

**Micro level qualitative analysis of simple salt containing one anion and one cation.**

Anions: Carbonate, Sulphate, Halides, Nitrate, Borate, Chromate, Fluoride, Oxalate, Tartrate, and Phosphate.

Cations: Lead, Bismuth, Copper, Cadmium, Antimony, Iron, Zinc, Cobalt, Nickel, Manganese, Calcium, Strontium, Barium, & Ammonium.

Qualitative examination of chlorine and fluorine in biological sample (Demonstration only)

### References:

1. A. I. Vogel, Textbook of Qualitative Inorganic Analysis, 1978, ELBS.
2. V. V. Ramanujam, Inorganic semi micro Qualitative analysis, 3rd edition, 1974, The National Publishing Company.

**Note : Laboratory manual will be supplied.**

**ALLIED PHYSICS – I**  
**COURSE CODE : 23UPHE31**

<b>SEMESTER - III</b>	<b>EC – T3</b>	<b>HOURS – 4</b>	<b>CREDITS – 3</b>	<b>TOTAL HOURS : 60</b>
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**OBJECTIVES :**

To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

**COURSE OUTCOMES :**

At the end of the course, the student will be able to

- CO 1 :** Students studying allied physics can able to know, various modulus involved in the materials, flow of liquids due to viscous forces, transmission of heat due to process of conduction, convection and radiation
- CO 2 :** Study the various laws involved in heat transformation
- CO 3 :** Classify the various thermodynamic laws and the concept of entropy
- CO 4 :** Understand the phenomenon like interference and diffraction
- CO 5 :** Study the optical activity of liquids and its uses.

**UNIT - I : Elasticity** **(12 Hours)**

Elasticity - Bending of beams - Expression for bending moment - Uniform bending - Theory - Twisting couple on a cylindrical wire - Expression for a couple per unit twist - Work done - Torsional pendulum - Experiment to determine rigidity modulus of the wire using torsional pendulum - Acceleration due to gravity - Compound pendulum - Theory and experiment.

**UNIT - II : Surface Tension** **(12 Hours)**

Surface tension - Excess of pressure over curved surface - Drop weight method - Coefficient of viscosity and its dimension - Stokes formula for viscous drag - Experiment to determine the coefficient of a highly viscous liquid - Flow of a liquid through a uniform capillary tube - Method of dimensions - Poiseuilles method.

**UNIT - III : Specific Heat Capacity** **(12 Hours)**

Specific heat capacity - Callendar and Barnes continuous flow method - Variation of specific heat capacity of solids with temperature - Variation of atomic heat of solids with temperature - Theory of specific heat - Einstein theory - Debye's theory.

**UNIT- 4 : Thermal Conductivity** **(12 Hours)**

Lees disc experiment to determine the thermal conductivity of a bad conductor (cardboard only) - Analogy between heat flow and electric current - Weidemann - Franz law - Newtons law of cooling - Experimental verification - Experiment to determine the specific heat capacity of a liquid - Concept of pressure, volume and temperature of a gas - Mean free path - Expression for mean free path, viscosity, thermal conductivity.

**UNIT - 5: Conventional Energy** **(12 Hours)**

Conventional energy sources - coal, oil and natural gas - Energy released in a nuclear fission and fusion - Nuclear reactor - Non conventional energy sources - Wind energy - Tidal energy - Wave energy - Photo voltaic effect - Solar cell - Solar ponds.

**TEXTBOOKS:**

1. A.Ubald Raj & G. Jose Robin - Properties of Matter and Optics, Indira Publications, 1- Edition.
2. A.Ubald Raj & G. Jose Robin - Allied physics, vol.2 (Thermal Physics and Sound) Indira Publications, 1- Edition.

**REFERENCE BOOKS:**

1. N.Sundararajan, George Thomas, Syed Azeez - College Physics Vol 1, United Publishers , 1- Edition.
2. A.Ubald Raj & G. Jose Robin – Oscillations, Properties of Matter and Energy Physics and Optics and Spectroscopy - Indira Publications, 1- Edition.
3. Brijlal - Heat and Thermodynamics and Statistical Physics, S.Chand & Company - 2010
4. R.Murugesan - Properties of Matter S. Chand and Company - 2010

**ALLIED PHYSICS – I (PRACTICALS)**  
**COURSE CODE : 23 UPHE32**

<b>SEMESTER – III</b>	<b>EC –P3</b>	<b>HOURS – 2</b>	<b>CREDITS – 2</b>	<b>TOTAL HOURS : 30</b>
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1. Young's modulus - Uniform bending - Telescope
2. Young's modulus - Non-uniform bending - Pin & Microscope
3. Coefficient of Viscosity - Constant pressure head method
4. Surface Tension - Drop weight method
5. Acceleration due to gravity - Compound pendulum
6. Conductivity of bad conductor - Lee's disc method
7. Newton's law of cooling - verification
8. Specific heat capacity of a liquid - Newton's law of cooling
9. Torsional Pendulum - Determination of rigidity modulus

**FOOD CHEMISTRY**  
**(For Other Major Students)**  
**(Subject code: 23UCHN31)**

<b>Semester: III</b>	<b>SEC: 5</b>	<b>Credits: 2</b>	<b>Hours/W: 2</b>
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**COURSE OUTCOMES:**

- CO 1 :** Students will quote the importance of food (K1)  
**CO 2 :** They will differentiate different types of food and their biological importance. (K2)  
**CO 3:** They will illustrate the ill effects of contaminated food (K3)  
**CO 4 :** They will infer the relation between biology and chemistry (K4)  
**CO 5 :**They will analyse the additives and preservatives present in food. (K5)  
**CO 6:**They will create awareness towards healthy, balanced food and avoid taking contaminated food. (K6)

**Unit I Food Adulteration and Testing** **(6 hrs)**

Introduction- Legal aspects of Food adulteration and Prevention. Common food adulterants-Analysis of various food adulterants-Pesticide contaminants- Toxicants.

**Unit II Food Allergy** **(6 hrs)**

Food as Allergens-Types of reactions-Symptoms- Diagnosis- Treatment

**Unit III Food Additives** **(6 hrs)**

Food additives –Introduction, types & functions-Categories of food additives- Safety concerns and Legal Regulations of Food additives-Food flavour-Sensation of smell & taste-Flavour of some important foods-Natural Food colours - Carotenoids, Caramel, Tannins, Betalains-Important Artificial colours.

**Unit IV Food Processing and Preservation** **(6 hrs)**

Introduction-Aims of food processing-Food preservation -introduction-Means of Preservation-Types of spoilage-Various methods of food preservation

**Unit V Edible Oils** **(6 hrs)**

Fats and Oils-Production of refined vegetable oils-Saturated and unsaturated fatty acids- Role of MUFA and PUFA in preventing heart diseases-Estimation of I2 value & RM value -Estimation of saponification value and their significance

**TEXT BOOKS :**

1. Alex V Ramani, Food Chemistry, MJP publishers
2. H. K. Chopra & P. S. Panesar, Food Chemistry, Narosa Publishing House
3. B. Srilakshmi, Dietetics, New age international (P) Ltd. Publishers
4. Swaminathan M., Food Science and Experimental methods, Ganesh and Company.
5. S. A. Joshi, Nutrition and dietetics, tata McGraw-Hill publishing companies

## CORE – ORGANIC CHEMISTRY – II (THEORY)

(Subject code: 23UCHC41)

Semester: IV

Core: T4

Credits: 4

Hours/W - 4

**On completion of the course the students should be able to**

**CO1:** Explain the nucleophilic and electrophilic mechanistic approach in aliphatic halogen compounds (K2)

**CO 2 :** Apply the physical and chemical properties of aryl halogen compounds in synthetic use. (K3)

**CO 3 :** Infer the chemical reactivity hydroxyl and carbonyl compounds in industrial and synthetic part (K3)

**CO 4:** Outline usage of synthetically important aryl halogen compounds in synthetic chemistry. (K4)

**CO 5:** Design new reactions with reference to the available naming reactions. (K6)

**CO 6 :** Decide the importance of various synthetically active compounds for making new compounds (K5)

### UNIT I Halogen Compounds

(12 hrs)

Aliphatic halogen compounds -General methods of preparation and reactions of monohalogen compounds- Mechanisms of  $SN_1$ ,  $SN_2$ ,  $SN_i$ ,  $E_1$ ,  $E_2$  and  $E_1cB$  reactions - Aromatic halogen compounds - General methods of preparation and reactions of aryl halides - Preparation and reactions of benzyl chloride - Nuclear and side chain halogen compounds – distinction - Preparation, structures and uses of DDT and BHC -Unsaturated halogen compounds – reactions of vinyl chloride and allyl chloride- Comparison of the reactivity of the above halides

**Self study:** Impact of Fluorocarbons on environment, comparison between aryl and alkyl halides

### UNIT II Hydroxy Compounds and Their Derivatives

(12 hrs)

Aliphatic alcohols - Classification –  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols, mono, di- and trihydric alcohols - Reactions of monohydric alcohols - Acidic nature and hydrogen bonding in alcohols-Phenols - Classification-mono, di, and trihydric phenols and examples - General methods of preparation and reactions of monohydric phenols - Influence of nature and position of substituents on acidity of phenols- Thio alcohols - General methods of preparation and reactions - Comparison of acidic nature of alcohols, thio alcohols and phenols

**Self study:** Reactions of analytical importance of phenols

### UNIT III Carbonyl Compounds

(12 hrs)

Aliphatic aldehydes and ketones - Relative reactivity of their carbonyl groups - General reactions of aldehydes and ketones - General mechanism of addition and condensation reactions - Aromatic aldehydes and ketones - General methods of preparation, reactions and tests - Mechanisms of aldol condensation, benzoin condensation, Cannizzaro



reaction, Claisen –Schmidt condensation, Knoevenagel reaction, Perkin reaction and iodoform reaction

**Self study:** Comparative properties of aliphatic and aromatic aldehydes

#### **Unit IV Carboxylic Acids and Their Derivatives (12 hrs)**

Aliphatic monocarboxylic acids - Acidic nature and factors influencing the acid strength of carboxylic acids - Aliphatic dicarboxylic acids - Action of heat – Blanc's rule - Action of heat on hydroxy and amino acids, and saturated dicarboxylic acids, Addition to maleic and fumaric acids -Conversion into carboxylic derivatives – acid chloride, amide, ester, anhydride, Hundsdicker reaction and Hell VolhardZelinsky reaction - Ascent and descent of fatty acids - Trans esterification - Arndt - Eistert synthesis, Aromatic mono carboxylic acids - General methods of preparations - Acidity – effect of substituents in benzene ring

**Self study:** Aromatic dicarboxylic acids, Tests for carboxylic acids

#### **Unit V Synthetically Important Compounds (12 hrs)**

Preparation, synthetic applications and structure of acetoacetic ester - Preparation and synthetic applications of malonic ester- Preparation and reactions of benzene sulphonic acid- Preparations and uses of saccharin and chloramine-T

**Self study:** Tautomerism – keto – enol, Nitro and acinitro form, amide –imide, imine – enamine preliminary ideas

**TEXTBOOK:**M.K. Jain & S.C. Sharma, Modern Organic chemistry, 3rd edition, 2009, Vishal Publishing Co.

#### **REFERENCES:**

1. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn& Bacon Ltd., (1976).
2. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997). [Textbook]
3. Pine S.H, Organic Chemistry, (4th edition) New Delhi, McGraw- Hill, International Book Company. (1986).
4. Mehta, B. and Mehta.M, Organic chemistry, PHI learning Pvt. Ltd., New Delhi (2012). [Textbook]

**CORE - INORGANIC QUALITATIVE ANALYSIS-II (Micro Level)**

**Subject code: 23UCHC42**

<b>Semester: IV</b>	<b>Core :P 4</b>	<b>Credit : 3</b>	<b>Hours/W – 3</b>
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**On completion of the course the students should be able to**

**CO 1 :** Explain and demonstrate the techniques of elimination of interfering radicals (K2)

**CO 2 :** Apply the physical and chemical properties of various ions in the identification of unknown samples (K3)

**CO 3:** Categorize the metal ions into different groups. (K3)

**CO 4 :** Identify the presence of inorganic salts in biological samples. . (K4)

**CO 5:** Design new applications of the available metal ions in the field of fireworks etc. (K6)

**CO 6:** Decide the techniques for the identification of various ions in a mixture of salts (K5)

Micro level qualitative analysis of mixture of salts containing **two anions** and **two cations**.

**Anions:** Carbonate, sulphate, halides, nitrate, borate, chromate, fluoride, oxalate, tartrate, and phosphate.

**Cations:** Lead, bismuth, copper, cadmium, antimony, iron, zinc, cobalt, nickel, manganese, calcium, strontium, barium, & ammonium.

Qualitative examination of Iron, calcium and Magnesium in biological sample (Demonstration only)

**References:**

1. Vogel A. I., Textbook of Qualitative Inorganic Analysis, 1978, ELBS.
2. V. V. Ramanujam, Inorganic semi micro Qualitative analysis, 3rd edition, 1974, The National Publishing Company.

**Note :** Laboratory manual will be supplied.

**ALLIED PHYSICS – II**  
**COURSE CODE : 23UPHE41**

<b>SEMESTER – IV</b>	<b>EC- T4</b>	<b>HOURS – 3</b>	<b>CREDITS – 3</b>	<b>TOTAL HOURS : 45</b>
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**COURSE OUTCOMES :**

**CO1 :** Makes the learner understand the basic principles of electricity.

**CO2 :** Understand the applications of optics in everyday life.

**CO3 :** Inculcate the knowledge in electronics circuits.

**CO4:** To learn the basic concepts of relativity.

**CO 5:** To understand the principles amplifiers and oscillators.

**UNIT - I** **(9 Hours)**

Coulomb's law – electric field – electric field due to a point charge – electric dipole – electric flux – Gauss law – applications – electric field due to a charged conducting sphere (point inside and outside) – uniformly charged cylinder (line charge) – electric potential – potential difference – relation connecting electric field and electric potential at a point – equipotential surface.

**UNIT - II** **(9 Hours)**

Self induction of a coil – calculation of self inductance of a long solenoid – alternating current – phase difference between current and voltage in alternating circuits with resistance only, capacitance only and inductance only – LR circuit – LCR series resonance circuit – LCR parallel resonance circuit(characteristics only).

**UNIT - III** **(9 Hours)**

Junction diode – biasing – pn diode equation – V-I characteristics – Zener diode – VI characteristics – applications – Junction transistor – voltage-divider biasing – transistor amplifier – CE configuration – feedback principle - Barkhausen criterion for oscillations.

**UNIT - IV** **(9 Hours)**

Interference – air wedge – Newton's rings – diffraction – experiment to determine the wavelength of monochromatic light using plane transmission grating - polarization – double refraction

**UNIT - V** **(9 Hours)**

Frame of reference – Galilean transformation – special theory of relativity – Lorentz transformation equation – velocity transformation equations - relativistic velocity addition – length contraction – time dilation – variation of mass with velocity – Einstein's mass energy relation.

**TEXT BOOK :**

1. A. Ubald Raj and G. Jose Robin – Allied Physics Vol.I – Indra Publication 1<sup>st</sup> Edition.

**REFERENCE BOOKS :**

1. N. Sundararajan, George Thomas and Syed Azeez – College Physics Vol. II, United Publishers, 1st Edition 2009.
2. N. Sundararajan, George Thomas and Syed Azeez – College Physics Vol. III, United Publishers, 1st Edition 2009.
3. Ubald Raj and G. Jose Robin – Relativity, Wave Mechanics and Nuclear Physics, Indra Publication 1<sup>st</sup> Edition 2009.
4. N.Subramanyam , Brijlal and M.N.Avadhanulu – A text book of optics – S.Chand & Company Ltd., 23<sup>rd</sup> Edition 2006.

**ALLIED PHYSICS – II (PRACTICALS)**  
**COURSE CODE : 23UPHE42**

<b>SEMESTER – IV</b>	<b>EC– P4</b>	<b>HOURS – 2</b>	<b>CREDITS – 2</b>	<b>TOTAL HOURS : 30</b>
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1. Grating - Oblique incidence
2. Air wedge - Thickness of wire
3. LCR series resonance
4. LCR parallel resonance
5. Newton's rings
6. Zener diode characteristics
7. Diode rectifier
8. Spectrometer grating normal incidence method
9. spectrometer – prism - determination of refractive index of glass
10. Focal length of convex lenses in contact and out of contact

## AGRICULTURAL CHEMISTRY

(for other major students)

Subject code: 23UCHN41

Semester: IV

SEC: 6

Credits :2

Hours/W - 2

**On completion of the course the students should be able to**

**CO 1 :** Define the soil quality parameters (K1)

**CO 2 :** Differentiate and select a suitable manure for a specific crop (K2)

**CO 3 :** Demonstrate the functioning mechanism of different fertilizers (K3)

**CO 4 :** Prepare organic manures (K4)

**CO 5 :** Recommend natural pesticides and insecticides for different plants (K5)

**CO 6 :** Analyze and recommend water for various purposes. (K6)

### UNIT I Soil Chemistry

(6 hrs)

Introduction - Soil classification - Properties of soil – soil texture, soil water, soil temperature, soil colloids, soil minerals - Soil pH - Soil acidity and alkalinity - Soil formation

### UNIT II Manures, Compost and Saw Dust

(6 hrs)

Farmyard manure - Compost - Reinforcing manure - Green manure crops - Saw dust, night soil - Sewage and sludge - Biogas production and manure

### UNIT III Fertilizers

(6 hrs)

Introduction - Plant nutrients - Micro and macro nutrients and their role - Fertilizer types- Need for fertilizers - Essential requirements - Classification of fertilizers - Natural inorganic and organic fertilizers - Artificial fertilizers - Nitrogenous fertilizers - Urea – manufacture and properties - Phosphate Fertilizers – super phosphate, triple super phosphate – preparation and Properties - Potassium fertilizers – NPK Fertilizers

### UNIT IV Pesticides

(6 hrs)

Introduction: Classification of pesticides - Insecticides - Classification - Inorganic insecticides – the arsenic compounds, mercury compounds - Natural insecticides – nicotine, rotenone. Organic insecticides – DDT, BHC – preparation and properties - Gammexane, Chlorodane, aldrin – Fungicides – Bordeaux mixture.

### UNIT V Water and Soil Pollution

(6 hrs)

Introduction: Classification of water pollutants –Total Dissolved Solids (TDS) Chemical Oxygen Demand (COD) and Biological oxygen demand (BOD)- Industrial waste and pesticide pollution - Soil pollution – industrial contaminants - Heavy metals and its toxicity - Organic contaminants – soil erosion in India – soil conservations

### TEXTBOOKS :

1. Jayashree Ghosh, Fundamental concepts of applied chemistry, S. Chand & Co
2. B.K. Sharma, Industrial chemistry, Goel publishing House

**MATERIALS SCIENCE**  
**For chemistry major students only**  
**Subject Code: 23UCHS41**

<b>Semester: IV</b>	<b>SEC: 7</b>	<b>Credits: 2</b>	<b>Hours/W - 2</b>
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**On completion of the course the students should be able to**

- CO 1 : Tabulate the chemistry of materials using fundamental theories (K1)  
CO 2 : Explain the superconducting behavior and magnetism in molecular and atomic level (K2)  
CO 3 : Demonstrate and familiarize with semiconductor devices and energy efficient light emitting diodes (K3)  
CO 4 : Classify semiconducting materials based on their functions.(K4)  
CO 5 : Categorise different materials in the advancement of energy harvesting system with new materials (K5)  
CO 6 : Develop new devices for energy energy harvesting and storage. (K6)

**Unit I INTRODUCTION TO MATERIALS (6 hrs)**

Classical free electron theory – Fermi energy - Band theory - Zone theory - Differences – conductors, semiconductors and insulators. Concept of hole

**Unit II SEMICONDUCTING MATERIALS (6 hrs)**

Intrinsic and extrinsic semiconductors - P-N junction. Working principle of LED and QLED. Forward and reverse biasing of P-N junction diodes. Variation of Fermi level with temperature and distribution of atoms. Semiconductor quantum dots- advantages and applications.

**Unit III SUPERCONDUCTING AND MAGNETIC MATERIALS (6 hrs)**

Mechanism and properties of superconductors. Types and applications of superconductors. Magnetism. Para, dia, ferro & antiferromagnetic materials. Molecular magnetism - hysteresis. Applications of magnetic materials

**Unit IV ENERGY HARVESTING/GENERATING MATERIALS (6 hrs)**

Photovoltaic effect- principle of solar energy conversion into electricity. Dye sensitized solar cells. Thin film polymer and Si material for solar energy. Hydrogen production methods. Fuel cells. Elementary ideas about materials used in fuel cell

**Unit V ENERGY STORAGE MATERIALS (6 hrs)**

Rechargeable batteries. Materials used – applications - Li-ion battery - Lithium-air and Li-S batteries - Ni-MH battery - Differences between fuel cells – storage batteries. Super-capacitor materials - Similarities and differences between batteries and supercapacitors. Hydrogen storage materials

**TEXTBOOKS:**

1. Dr. M. Arumugam, Material Sciences, Anuradha Publications.
2. P.K.Palanisamy, Material Sciences, Scitech Publications.
3. Ryan P.O Hayre, Suk-Won Cha and Whitney Colella, Fuel cell fundamentals, John Wiley & Sons (2006)
4. B. Viswanathan, Nano Materials, Narosa Publications (2009)
5. Fuel cells, Bruce E Logan.

## CORE – ORGANIC CHEMISTRY – III (THEORY)

Subject Code : 23UCHC51

Semester : V	Core : T5	Credits : 4	Hours/W - 4
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**On completion of the course the students should be able to**

- CO 1:** Tabulate the importance of nitrogen compounds (K1)  
**CO 2:** Explain the preliminary ideas in fused cyclic systems (K2)  
**CO 3:** Illustrate the fundamental concepts of pericyclic reactions (K3)  
**CO 4 :** Summarize the importance of redox reagents in organic synthesis (K5)  
**CO 5 :** Classify different spectral techniques based on the source they use. (K4)  
**CO 6:** Find and apply suitable techniques for the quantitative and qualitative analysis of chemicals in laboratories and in industries. (K6)

### UNIT I Nitrogen Compounds (12 hrs)

Aliphatic nitro compounds -General reactions-acidic nature of  $\alpha$ - hydrogen atom, reduction. Aromatic nitro compounds - General methods of preparation and reactions. Aliphatic amines - Classification – 1<sup>o</sup>, 2<sup>o</sup> and 3<sup>o</sup> amines - General methods of preparation and reactions of 1oamines. Aromatic amines -General methods of preparation and reactions. Comparison of basic strength of aliphatic and aromatic amines. Preparation and reactions of diazomethane. Reactions of benzene diazonium salt.

*Self study: Commercial* methods of preparation, structure and estimation of urea

### Unit II Pericyclic Reactions (12 hrs)

Fundamental concepts of concerted reactions. Classification of pericyclic reactions. Woodward-Hoffmann rules. FMO and MO correlation diagram methods to electrocyclic (1,3 - butadiene) and cycloaddition reactions (2+2 additions). Sigmatropic rearrangements – Cope rearrangement

*Self study: Electrocyclic* and Cycloaddition reactions of 4n+2 system

### Unit III Condensed Systems (12 hrs)

Polynuclear compounds. Binuclear compounds -Synthesis, reactions and structure of naphthalene -Structural elucidation of naphthalene -Preparations and reactions of naphthols and naphthoquinones. Trinuclear compounds - Reactions of anthracene - Preparations and reactions of anthraquinone - Preparation and reactions of anthracene. Comparison of benzene, naphthalene and anthracene based on their resonance energy

*Self study:* Isolation of naphthalene and anthracene from petroleum products

### Unit IV Redox Reagents (12 hrs)

Periodic acid (HIO<sub>4</sub>).Ozone (O<sub>3</sub>).Lead Tetra Acetate (LTA).Selenium Dioxide (SeO<sub>2</sub>). Osmium Tetroxide (OsO<sub>4</sub>). Lithium Aluminium Hydride (LAH).SodiumBoroHydride (NaBH<sub>4</sub>).Stannous Chloride (SnCl<sub>2</sub>). Phase transfer catalyst. N- Bromo Succinimide (NBS)



**Self study:** Preparation of above listed reagents

**Unit V UV – Visible and Infrared Spectroscopy (12 hrs)**

Ultra violet – visible spectroscopy - Chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect and hypochromic effect - Various types of electronic transitions and their relative energies – allowed and forbidden transitions with respect to carbonyl group and olefinic bond - Effect of solvent polarity on max - Woodward-Fieser empirical rules – calculation of  $\lambda$  max for conjugated dienes and unsaturated ketones. Infrared spectroscopy - Hooke's law - Vibrational frequency of a bond and bond strength- Modes of vibrations and their relative energies - Sampling techniques for solids, liquids and gases - Positions of IR absorption frequencies for functional groups like aldehyde, ketone, alcohol, acid and amide - Factors affecting the frequency of absorption – conjugation (resonance effect), inductive effect and hydrogen bond - Finger print region.

**Self study:** Instrumentation of UV – Visible and IR spectroscopy

**TEXTBOOKS :**

**Units I & III**

M.K. Jain & S.C. Sharma, Modern Organic chemistry, 3rd edition, 2009, Vishal Publishing Co.

**Unit II**

1. Depuy C H and Chapmann, Molecular reactions and Photochemistry, Prentice-Hall of India, New Delhi, 1988
2. Ian Fleming, Pericyclic Reactions, Oxford Science Publications, Cambridge, 1999

**Unit IV** -V.K.Ahluwalia, Organic Reaction Mechanisms, 3rd edition, 2007,Narosa Publishing House

**Unit V** - Y. R. Sharma, Elementary organic spectroscopy, S.Chand& company Ltd.

**REFERENCES**

1. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn& Bacon Ltd., (1976).
2. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997). [Textbook]
3. Pine S.H, Organic Chemistry, (4th edition) New Delhi, McGraw- Hill, International Book Company. (1986).
4. Mehta, B. and Mehta.M, Organic chemistry, PHI learning Pvt. Ltd., New Delhi (2012). [Textbook]

## INORGANIC CHEMISTRY – II

Subject code: 23UCHC52

Semester : V	Core : T6	Credits : 3	Hours/W – 4
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On completion of the course the students should be able to

- CO 1:** Define the theories, list the nomenclature and explain the isomerism of coordination compounds (K1)
- CO 2:** Gain the ability to explain the structure and nature of bonding of inorganic compounds (K2)
- CO 3 :** Demonstrate the importance of transition and inner transition elements (K3)
- CO4 :** Get aware of applications of nanomaterials and fundamentals of supramolecular chemistry to solve many problems. (K4)
- CO 5:** Recommend nano materials for the energy conserving process. (K5)
- CO 6 :** Apply their skills in the estimation of metal ions by gravimetric method. (K6)

### Unit I Coordination Chemistry-I (12 hrs)

Introduction – molecular or addition compounds. Double salts and co-ordination compounds – comparison. Coordination compounds-acceptors and donors (ligands), types of ligands. Werner's co-ordination theory-postulates and limitations. Chelation and its application. Stereochemistry of coordination compounds with respect to coordination number 2 to 6. Nomenclature of co-ordination compounds. Isomerism in co-ordination compounds - Ionization and hydrate isomerism - Coordination isomerism, linkage isomerism and co-ordination position isomerism - Polymerization isomerism - Geometrical and optical isomerism – four and six co-ordination - Sidgwick concept, limitations and EAN rule.

**Self-study:**Jorgenson's chain theory for coordination complexes

### Unit II Chemical Bonding – II (12 hrs)

Wave mechanical principles involved in the treatment of VBT and MOT -The valence bond theory - Formation of  $H_2$  molecule - VSEPR theory and geometry of  $H_2O$ ,  $NH_3$ ,  $CH_4$ ,  $BF_3$ ,  $PCl_5$ ,  $SF_4$ ,  $SF_6$ ,  $IF_5$ ,  $IF_5$ ,  $ClF_3$ ,  $ICl_2^-$  Geometry of  $CO_3^{2-}$ ,  $SO_4^{2-}$  and  $NO_3^-$ . Molecular orbital theory - Linear combination of atomic orbital method (LCAO) as applied to  $H_2$  molecule - BMO and ABMO - MO diagrams for diatomic homo-nuclear species –  $H_2$ ,  $H_2^+$ ,  $He_2$ ,  $He_2^+$ ,  $Li_2$ ,  $Be_2$ ,  $B_2$ ,  $C_2$ ,  $N_2$ ,  $O_2$ ,  $O_2^+$ ,  $O_2^-$ ,  $O_2^+$ ,  $O_2^{2-}$  and  $F_2^-$  Bond order – Prediction of their existence and its correlation with stability - MO diagrams for hetero nuclear molecules – CO, NO, CN and HF - MO diagram for  $BeH_2$  and  $NH_3$ . Comparison of VBT and MOT

**Self-study:**Octet rule, resonance, formal charge and hybridization

### Unit III d-Block and f-Block Elements (12 hrs)

Name and electronic configurations – first series of transition elements, lanthanides and actinides. Vanadium - Extraction of vanadium and uses - Polyvalency of vanadium. Titanium - Extraction of titanium and uses. Lanthanides - Oxidation state, colour, magnetic properties and stability - Separation of lanthanides - Lanthanide contraction – causes and consequences - Uses of lanthanides and their compounds – shift reagents. Actinides – Actinide series - Oxidation state and their relative stabilities - Comparison of lanthanides and actinides. Transuranic elements.

**Self-study:**The position of lanthanides and actinides in the periodic table. The minerals of lanthanides and actinides and their occurrences in India.

**Unit IV Nanoscience and Supramolecular Chemistry (12 hrs)**

Introduction to nanomaterials–Aspect ratio- Dimensions of nanomaterials: 0D, 1D and 2D - Carbon nanostructures–Fullerenes, CNTs and graphene. Synthesis of nanomaterials -sol-gel, solvo/hydro thermal, chemical vapour deposition and electrochemical deposition, sonochemical and coprecipitation method - Metal and Metal oxide nanoparticles – Ag, Au, Fe<sub>2</sub>O<sub>3</sub>, ZnO and TiO<sub>2</sub>. Characterization technique – SEM and TEM. Properties of nanomaterials- optical, electrical, magnetic, mechanical and electrochemical. Applications of nanomaterials in various fields. Supramolecular chemistry – Definition, various types of non-covalent interactions. Host-guest chemistry – Types of guests. Molecular hosts, self-assembly and supramolecular devices

**Self-study:**Bulk vs nanomaterials, high surface to volume ratio, quantum structures and quantum confinement

**Unit V Gravimetric Methods of Analysis (12 hrs)**

Fundamental requirements of precipitation. Mechanism of precipitation-supersaturation, nucleation and crystal growth. Factors influencing particle size. Organic and inorganic precipitants - Specific and selective precipitants. Co-precipitation – surface adsorption and occlusion - Errors due to coprecipitation. Precipitation from homogeneous solution. Post precipitation. Digestion of the precipitate. Filtration and washing. Drying and weighing.

**Self-study:**Ostwald ripening, common ion effect, super saturation and relative supersaturation.

**References:**

1. B.R. Puri and L.R. Sharma, Principles of Inorganic chemistry, 2006, Milestone Publications.
2. Albert Cotton, Wilkinson, Basic Inorganic chemistry, 3rd Edn, 2007, John Wiley Pvt.Ltd.
3. J.E. Huheey, Inorganic chemistry, Principle of structure and reactivity. 4th Edn ,1996, Pearson Education.
4. J.D.Lee, Concise Inorganic Chemistry, 5th Edn,1996, Blackwell Pub.Com.
5. D.E. Shriver, P.W. Atkins, Inorganic chemistry, 5th Edn,2010, Oxford Univ. Press.
6. R.D. Madan, Principles of Inorganic chemistry, Revised Edn, 2011, S.Chand& Co Ltd.
7. Vogel A. I., Textbook of Quantitative Inorganic Analysis, ELBS,1978
8. M.A.Shah Tokeer Ahmed, Principles of nanoscience and nanotechnology, 2011, Narosa publications.
9. B.Viswanathan, Nano Materials, 2011, Narosa publications.
10. T.Pradeep, “Nano: The essential”, 2007, Mc-Graw-Hill education.
11. J.M.Lehn, Supramolecular Chemistry, Concepts and Perspectives, 1995, VCH; Weinhein.
12. J.W.Steed, J.L.Atwood, Supramolecular Chemistry 2000, John Wiley & Sons Ltd, New York.

## PHYSICAL CHEMISTRY – I

Subject code: 23UCHC53

Semester: V	Core : T7	Hours:4	Credits : 3
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### On completion of the course the students should be able to

- CO 1 :** Describe the distribution of velocities for the particles in a gas sample and what factors affect this distribution. (K1)
- CO 2 :** List and explain several technological applications of colloids. (K2)
- CO 3 :** Identify the types of intermolecular forces experienced by specific molecules based on their structures (K3)
- CO 4 :** Constructs phase diagrams for single and multi-component systems (K5)
- CO 5:** Infer how changing the concentration, volume, or temperature of a system at equilibrium affects the equilibrium position (K4)
- CO 6:** formulate phase diagram for any system with the knowledge of phase transformation with temperature (K6)

### Unit I: Gaseous State

(12 hrs)

Kinetic molecular gas model. Assumptions made to describe an ideal gas. Maxwell – Boltzmann distribution of molecular velocities (a qualitative discussion only) – its graphical representation and salient features – effect of temperature – most probable, mean and r.m.s velocities and their calculation – experimental verification of the distribution law. Kinetic equation for gases ( $PV = nmc^2/3$ ) (derivation not required). Collision properties – collision diameter, collision frequency, collision number, mean free path ( $\lambda$ ). Viscosity of gases – relation between  $\eta$  and  $\lambda$ . Principle of equipartition of energy – Average translational kinetic energy per degree of freedom. Deviation of gases from ideal behaviour – compressibility factor as a function of P - van der Waals equation.

**Self Study:** Boyle's law, Charles's law, Avogadro's law, ideal gas equation, Graham's law of diffusion, Dalton's law of partial pressures.

### Unit II: Liquid State and Colloidal State

(12 hrs)

Liquid state - Structural differences among solids, liquids and gases - Liquid crystals – Smectic, nematic and cholesteric liquid crystals – swarm theory – applications of liquid crystals. Colloidal state-Distinguishing characteristics of colloids, suspensions and solutions - Types of colloidal dispersions - (i) Optical properties of suspensions – Tyndall effect, explanation and theory due to Gustav Mie – Determination of diameter by minimum intensity method, transmission method (ii) Kinetic properties – Brownian motion & Einstein's mathematical consideration – sedimentation and determination of radius.(iii) Electrical properties – Helmholtz and diffuse double layers – electro kinetic or zeta potential – electrophoresis and its applications – stability of suspensions - Coagulation – methods of coagulation – Hardy Schulz law – Hofmeister series - Protective colloids – protective action – gold number – applications - Emulsions – classification, preparation, identification - Gels – preparation – properties (thixotropy, syneresis and imbibition) - Donnan membrane equilibrium.

**Self Study:** Different states of matter, isotropic and anisotropic properties of solids, dispersed phase, dispersed medium, different colloidal systems with examples.

### Unit III : Molecular properties & Surface Chemistry (12 hrs)

Molecular forces - Polar and non-polar molecules - dipole moment Dipole – dipole, dipole – induced dipole, induced dipole – induced dipole forces - Hydrogen bond – conditions for formation – intermolecular and intramolecular hydrogen bonding – effect of hydrogen bonding on melting point, solubility, physical state – unique properties of water. Molecular properties -Electrical properties: electrical polarization of dielectrics and polarisability – Clausius-Mossotti equation – orientation of dipoles in an electric field and Debye equation Dipole moment - Applications of dipole moment studies - estimation of ionic character, calculation of bond moments, distinguishing geometrical isomers and o-, m-, p- isomers, study of shapes of simple triatomic molecules. Influence of resonance on dipole moment Surface Chemistry-adsorption on solids-types of adsorption-differences between physisorption and chemisorption -Adsorption isotherms- Freundlich Adsorption isotherms- Langmuir Adsorption isotherms.

**Self Study:** Pure covalent bond, polar molecules, dipole moment, adsorbent, adsorbate with examples.

### Unit IV: Phase Equilibria (12 hrs)

Phase equilibrium -Basic concepts – phase, number of components, degrees of freedom - Gibbs phase rule - Phase diagram and discussion - (i) water system (ii) sulphur system (iii) Pb-Ag system (iv) Sn-Mg system (v) NaCl- $H_2O$  (freezing mixture) (vi)  $FeCl_3-H_2O$  (System with congruent melting compounds) (vii)  $Na_2SO_4 - H_2O$  (System with incongruently melting hydrates i.e peritectic change)

**Self Study:** Homogeneous system and heterogeneous system with examples.

### Unit V: Chemical Equilibria (12 hrs)

Chemical equilibrium . Equilibrium constant and need for its knowledge. The thermodynamic equilibrium constant.  $K_p$  and  $K_c$  for gaseous reactions. Properties of equilibrium constant. Equilibria in gaseous systems and Le Chatlier principle (i ) Decomposition of HI,  $PCl_5$  and ammonia (ii) the phosgene equilibrium – relation between formation constant and dissociation constant – effect of inert gas on equilibrium. Equilibrium constant for heterogeneous reactions (i) dissociation of cupric oxide (ii) carbon disulphide equilibrium – Effect of pressure. Variation of  $K_a$ ,  $K_p$  and  $K_c$  with temperature.

**Self Study:** reversible and irreversible reactions, equilibrium, forward and backward reactions, extent of a reaction.

#### TEXTBOOKS:

1. P.L Soni and D.P. Dharmarha, Textbook of Physical Chemistry, 1980 ed, Sultan Chand & sons.
2. S.H. Maron and C.F. Prutton, Principles of Physical Chemistry, Oxford & IBH Publishing Co. Pvt. Ltd.
3. Puri, Sharma and Pathania, Principles of Physical chemistry, 2001, ShobanLalNagin& Co., Vishal
4. Philip Matthews, Advanced chemistry, Low price ed. 1996, Cambridge University press.

## Core - PHYSICAL CHEMISTRY – II

Subject code: 23UCHC54

Semester : V	Core : T8	Credits : 3	Hours/W - 4
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**On completion of the course the students should be able to**

**CO 1 :** Identify different types of electronic excitations in a molecule (K1)

**CO 2 :** Predict the applications and buffer actions of various solutions (K3)

**CO 3 :** Assign the point group of any molecules (K5)

**CO 4 :** Explain the basic principles of wave mechanics (K2)

**CO 5 :** Calculate the stability of molecules. (K5)

**CO 6:** Collect, accurately record, organise, interpret and draw conclusions from spectral data. (K6)

### **Unit I: Biophysical Chemistry of Acids & Bases (12 hrs)**

Strength of acids and bases – Basic strength of solvent – Dielectric constant of the solvent – effect of structure on the strength of acids – meaning of strength of acid – titration does not reflect the strength of an acid. Acid – base equilibria in water – LMA – The ionization of water – The equilibrium constant and ionization constant of water. The concept of pH – place of various materials in the pH scale – pOH. Ionisation of weak acids and weak bases – dissociation constants – pKa & pKb. Hydrolysis of salts ( $CH_3COONa$ ,  $NH_4Cl$ ,  $NaCl$ ). Effect of salts upon the dissociation of acids. Buffers – The Henderson – Hasselbalch equation – buffer capacity – The good buffers. Titration curves of weak acids, strong acids and polybasic acids with a strong base. pH dependent function and structure of biomolecules (ionization of amino acids, ionization of proteins, biological activity of proteins). Biologically important buffers.

**Self Study:** pH, pH scale, acid base concepts

### **Unit II: Group Theory (12 hrs)**

Symmetry and importance of symmetry aspects. Geometry of different types of molecules with and without lone pair of electrons. Symmetry elements and associated symmetry operations. Definitions and examples - Axis of rotation ( $C_n$ ) – order of C - Plane of reflection ( $\sigma$ ) –  $\sigma_v$ ,  $\sigma_h$  and  $\sigma_d$  - Centre of inversion (i) - Rotation – reflection axis ( $S_n$ ) – examples - Identity (E) - Knowledge of polarity and chirality from symmetry elements. Successive  $C_n$ ,  $\sigma$  and  $S_n$  operations. Mathematical group – Characteristics of a group – construction of group multiplication table (GMT) for  $H_2O$  and  $NH_3$  – Abelian and non - Abelian groups. Point groups – Schoenflies notations and subscripts – systematic procedure for identification of molecular point groups.

**Self Study:** Draw the structure simple molecules like water, ammonia, carbon di oxide, benzene, boron tri fluoride, Hydrogen peroxide (cis and trans). Xenon tetra fluoride, etc.

### **Unit III: Quantum Chemistry (12 hrs)**

Dynamic variables- postulates of classical mechanics-conservation laws-coordinate systems-Newtonian equation of motion- Inadequacy of classical physics - Blackbody radiation – Wein's equation – Rayleigh - Jeans equation – Planck's equation - Photoelectric effect – Einstein equation and the quantization of energy, work function, threshold energy – Dual theory of radiation. The foundations of Quantum Mechanics - The wave nature of

electrons – Prince de Broglie concept and wavelength - Heisenberg uncertainty principle in different forms - Development of Schrodinger wave mechanics by analogy with wave theory of electromagnetic radiation – equation for a wave traveling in one direction – eigen function or wave function –Hamiltonian time independent Schrodinger equations (Derivations not expected) – Eigen equation - Born interpretation of  $\Psi$  – Probability and probability density of electron - Normalisation and normalized eigen functions - Q.M. postulates – linear operators, commuting operators, Hermitian operators, orthogonality of wave functions - Q.M. of a simple system – The free particle.

**Self Study:** Quantum theory, electromagnetic wave

**Unit IV: Spectroscopy-I** (12 hrs)

Electromagnetic radiation- quantization of energies in molecules ( translational, rotational, vibrational and electronic). Microwave spectroscopy- condition- theory- selection rule- effect of isotopic substitution- application - Calculation of  $\mu$  and bond length of diatomic molecules. UV visible spectroscopy-conditions- theory of electronic spectroscopy - Types of electronic transitions-Frank-condon principle-predissociation - Dissociation energy –Applications of electronic spectra

**Self Study:** Electromagnetic radiations

**Unit V: Spectroscopy-II** (12 hrs)

Infra red spectroscopy-condition-molecular vibration-modes of vibration of linear and non-linear molecules - Diatomic- $\text{CO}_2, \text{H}_2\text{O}$ - stretching and bending vibrations-selection rules - Calculation of force constant-isotope effect - Applications of IR spectra-group frequencies, finger printing and hydrogen bonding. Raman spectroscopy-condition- Rayleigh and Raman scattering - Stokes and Antistokes –difference between Raman and IR spectroscopy - Rotational Raman spectra-application to covalent compounds-mutual exclusion.

**Self Study:** atomic weight, Isotopes, center of symmetry, conditions to form hydrogen bonding.

**TEXT BOOKS :**

1. P.L Soni and O.P. Dharmarha, U.N.Dash, Textbook of Physical Chemistry, Sultan Chand & sons, 23rd revised edition 2010 reprint .
2. S.H. Maron and C.F. Prutton, Principles of Physical Chemistry, Oxford & IBH Publishing Co. Pvt. Ltd.
3. Puri, Sharma and Pathania, Principles of Physical chemistry, 2001, ShobanLalNagin& Co., Vishal
4. AvinashUpadgyay, KakoliUpadhyay and NirmalenduNath, Biophysical chemistry, Himalaya Publishing House.
5. Philip Matthews, Advanced chemistry, Low price ed. 1996, Cambridge University press.
6. K.J.Laidler and J.H. Meiser, Physical chemistry, First Indian edition, reprint 2006
7. Skoog, Holler and Nieman, Principles of instrumental analysis, 5th edition First reprint 2006. Thomson.
8. C.N. Banwell and E.M. McCash, Fundamentals of molecular spectroscopy, 4th ed. Tata McGraw Hill Publishing 2002 Reprint. Co. Ltd.,

**ELECTIVE - BIOMOLECULES**  
**Subject code: 23UCHC55**

<b>Semester: V</b>	<b>Core : E1</b>	<b>Credits : 3</b>	<b>Hours/W - 4</b>
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**On completion of the course the students should be able to**

- CO 1 :** Understand the functions of carbohydrates & proteins (K1 & K2)
- CO 2 :** Interpret the structures and analyse the properties of different biomolecules and natural products (K3)
- CO 3 :** Understand the basic idea of Drug Chemistry (K2)
- CO 4 :** Develop fundamental aspects of common diseases.(K1 & K2)
- CO 5 :** Understand the principle behind the estimation of glucose and lipids (K2)
- CO 6 :** Understand the causes and treatment of common infectious diseases (K2)
- CO 7 :** Interpret the data from biochemistry laboratory (K4 & K5)

**Unit 1 Carbohydrates** **(12 hrs)**

Introduction and classification - Epimers and epimerization, anomers, reducing and nonreducing sugars- Reactions of glucose and fructose- Structures of glucose and fructose – open chain structure, limitations, configuration, mutarotation and ring structure- Interconversion of glucose and fructose and vice-versa- Ascending the series – Kiliani synthesis. Descending the series – Wohl's synthesis- Properties, reactions and structure of sucrose- Structure of maltose and lactose (elucidation not included)- Starch – bonding – amylase – amylopectin – reactions- Structural differences between starch and cellulose- Cellulose derivatives – preparation and uses of cellulose nitrate and cellulose acetate.

**Unit II Heterocyclic Compounds and Amino Acids** **(12 hrs)**

Introduction - Preparations and reactions of furan and thiophene, aromaticity and resonance- Preparations and reactions of pyridine - Preparations and reactions of quinoline. Amino Acids -Introduction and classification– dipolar ion and isoelectric point - General methods of preparation and reactions of amino acids – test for amino acids - Peptide – peptide linkage, nomenclature, variations and polypeptides, End group analysis C - terminal and N - terminal analysis.

**Unit III Alkaloids and Terpenoids** **(12 hrs)**

Alkaloids - Definition, classification, occurrence and extraction - General methods of identification – functional nature of oxygen, functional nature of nitrogen, unsaturation, oxidation and Hofmann exhaustive methylation - Structure and synthesis of coniine, piperine and nicotine - Terpenoids - Introduction, classification and isolation of terpenoids – isoprene rule - Structure and synthesis of citral, geraniol, camphor and menthol

**Unit IV Drugs, Action of Mechanism and Metabolism of Drugs** **(12 hrs)**

Introduction, Sources of drugs - Pharmacodynamics, Pharmacokinetics & molecular pharmacology - Pharmacophore, chemotherapy - Mechanism of action- drug-receptor complex- - Chemistry Drug-receptor binding - metabolism of drugs- Absorption of drugs- Routes of Administration.

**UNIT V Clinical Chemistry and Common Diseases** **(12 hrs)**

Determination of sugar in serum - Folin and Wu's method - o-toluidine method. Sackett's method of determination of total cholesterol. Detection of Diabetes and



Anaemia. Infective and hereditary diseases - Insect borne diseases and their treatment - Airborne diseases and their treatment - Water borne diseases.  
Self study: First Aid for Accidents

**TEXTBOOKS:**

1. M.K. Jain & S.C. Sharma, Modern Organic chemistry, 3rd edition, 2009, Vishal Publishing Co.
2. B.S. Bahl and Arul Bahl, Advanced Organic Chemistry, Reprint 2010, S. Chand & Company Ltd.,
3. Jayashree Ghosh, Fundamental concepts of Applied chemistry, Reprint –2008, S. Chand & Company Ltd.,
4. Dr. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, Reprint 2010. S.Chand & company Ltd.
5. L. Finar, Organic Chemistry, Vol.2, 5 th ed., Pearson education, London, 1975.
6. U. Satyanarayana and U. Chakrapani, Essentials of Biochemistry, Reprint 2013, Books and Allied (P) Ltd.,

**INORGANIC GRAVIMETRIC ESTIMATIONS AND PREPARATION OF  
COORDINATION COMPOUNDS (Practical)**

**Subject Code : 23UCHE51**

<b>Semester : V</b>	<b>EC :P6</b>	<b>Credit : 3</b>	<b>Hours/W - 4</b>
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**Gravimetric Estimation of**

1. Barium as barium chromate
2. Barium as barium sulphate
3. Lead as lead chromate
4. Calcium as calcium oxalate monohydrate
5. Nickel as nickel dimethylglyoxime
6. Copper as copper thiocyanate
7. Nickel by gravimetric and copper by volumetric method (mixture)
8. Copper and iron by colorimetric method

**For demonstration only**

1. Sulphate as Barium sulphate
2. Iron as oxide

**Preparation of**

1. Tetramminecopper (II) sulphate
2. Tris(thiourea)copper(I) sulphate
3. Potassium trioxalatochromate(III)
4. Hexamminenickel(II) chloride
5. Hexamminecobalt(III) chloride
6. Hexaaquochromium(III)chloride
7. Tetramminecarbanatocobalt(III)nitrate
8. Sodium trioxalato ferrate (III) hydrate

**Applied Experiments** (demonstration only)

1. UV-visible spectral studies of metal nanoparticles and coordination compounds
2. Cyclic Voltammetric studies of nanomaterials and coordination compounds
3. Differential Pulse Voltametry (DPV) and Linear Sweep Voltametry (LSV) studies of nanomaterials.

**REFERENCES :**

1. R. Gopalan, P.S. Subramanian, K. Rangarajan, Elements of Analytical chemistry, Third edition, 2003, Sultan Chand and sons, Educational publishers, New Delhi.
2. R. Gopalan, V. Ramalingam, Concise Coordination Chemistry, 2001, Vikaspublishing House pvt.Ltd.
3. J. Mendhem, R.c. Denney, D. Barnes, M.J.k.Thomas, Vogel's Text Book of Quantitativechemical Analysis, 6th edition, 2002, Pearson education Ltd.

**Note:** Laboratory Manual will be supplied.

**ESTIMATION OF ORGANIC COMPOUNDS & PREPARATION OF  
ORGANIC COMPOUNDS (PRACTICAL)  
(Subject code: 23UCHE52)**

<b>Semester : V</b>	<b>EC-P6</b>	<b>Credit : 3</b>	<b>Hours/W - 4</b>
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**Estimation of**

1. Phenol
2. Aniline
3. Amino Acid

**Demonstration experiments**

1. Estimation of glucose by Bertrend's method
2. Estimation of citric Acid

**Single stage preparations**

1. Oxidation of an aldehyde
2. Hydrolysis of (i) an ester and (ii) an amide
3. Acetylation of an amine or a phenol
4. Benzoylation of an amine or a phenol
5. Bromination of (i) phenol and (ii) an anilide
6. Nitration of (i) nitrobenzene and (ii) phenol
7. Osazone from glucose

**NOTE:**

Laboratory manual will be supplied

## INTERNSHIP

**Semester : IV**

**Sub. Code: 23UCHI51**

**Credits: 2**

- All UG students will undergo internship during the summer holidays of the second year after completing IV semester.
- Two credits will be given for internship.
- Minimum Days: 21
- Minimum working time per day: 3 Hrs. & Maximum working Time: 5 Hrs.
- The places of internship can be government offices, Panchayats, MP, MLA offices, private institutions, companies, production units etc.
- The HoD of the departments will give a letter of introduction to each student.
- The students will identify the company / institution for internship.
- The students will be divided equally based on the number of professors available in the departments. Each professor will serve as a guide to the assigned students.
- The students will finalize the institutions / companies for the internship in consultation with the guides.
- The students shall maintain a Work Diary which will be countersigned by the managers / authorities of the company in which the students do the internship on daily basis.
- The Work Diary, Work Completion Certificate obtained from the company and a comprehensive report on the learning outcomes will be submitted to the guides at the end of the internship.
- Viva will be conducted based on the experience of the internship in the month of August. The guide will be the internal examiner and another faculty from the same department will serve as the external examiner.

## ORGANIC CHEMISTRY – IV

Subject Code: 23UCHC61

Semester : VI

Core : T9

Credits:4

Hours/W – 12

**On completion of the course the students should be able to**

**CO 1 :** Assess the chemistry of polymers, dyes and their industrial needs (K5)

**CO 2 :** Predict the typical approach of molecules in rearrangements (K2)

**CO 3 :** Describe how to write mechanisms of some name reactions (K1)

**CO 4 :** Apply different analytical tools in predicting molecules (K5)

**CO 5 :** Have an exposure in environmental benign chemistry (K4)

**CO 6 :** Create new polymer composite materials (K6)

### **Unit I Polymers and Dyes (12 hrs)**

Basic definitions – monomer – polymer – degree of polymerization. Classification of polymers – thermosetting and thermoplastics. Chemistry of commercial polymers - General methods of preparation, properties and uses of the following – PVC, Orion, Teflon, polystyrene, Nylon-6,6, Nylon-6, PVC, Bakelite, neoprene rubbers, SBR, butyl rubber. Dyes -Theory of colour and constitution - Classification – preparation and uses of Methyl orange, Malachite green, Phenolphthalein, Alizarin and Indigo

*Self study:* Introduction to biopolymers and biomaterials

### **Unit II Molecular Rearrangements (12 hrs)**

Wolff rearrangement. Pinacol – pinacolone rearrangement. Dienone- phenol rearrangement. Beckmann rearrangement. Lossen rearrangement. Favorski rearrangement. Stevens rearrangement. Neber rearrangement. Fries rearrangement. Benzidine rearrangement

*Self study:* Classification of molecular rearrangement reactions

### **Unit III Name Reactions and Their Mechanisms (12 hrs)**

Birch reduction. Kolbe's Schmidt reaction. Bayer-Villiger oxidation. Mannich reaction. Etard reaction. Dakin reaction. Bouveault – Blanc reaction. Kolbe electrolytic reduction. Michael addition. Chichibabin reaction

*Self study:* Isotopic labelling studies

### **Unit IV $H^1$ NMR Spectroscopy and Mass Spectrometry (12 hrs)**

Principle - solvent. Equivalent and non-equivalent protons. Shielded and deshielded protons – anisotropy. Chemical shift and internal reference – TMS and scales. Peak area and proton counting. Splitting of signals – spin-spin coupling. Factors affecting Chemical shift

Mass spectrometry. Principle of mass spectrometry - Fragmentation pattern - m/z values of various fragments - Nitrogen rule - McLafferty rearrangement - Interpreting the mass spectra of Pentane, Pentan-3-one and 2-methyl butane.

*Self study:* Instrumentation of NMR spectroscopy and Mass spectrometry

#### **Unit V Photochemistry and Green Chemistry (12 hrs)**

Introduction. Thermal and photochemical reactions - comparison. Naturally occurring photochemical process - examples. Allowed and forbidden transitions. Jablonski Diagram. Photochemical process- photoreduction, photodimerization, photoisomerization and photochemical rearrangements - Definition and example. Norrish type – I & II reactions and mechanism. Introduction - Need for green chemistry - Twelve principles of green chemistry - Selection of appropriate solvents – supercritical carbon dioxide, ionic liquids and water - Solvent free reactions – Deacetylation and saponification

*Self study:* Microwave Assisted Organic Synthesis

#### **TEXTBOOKS:**

**Unit I** M.S. Bhatnagar, A Textbook of polymers Vol 1, First edition, 2004, S. Chand & Company Ltd,

#### **Unit II & III**

V.K. Ahluwalia & P.K. Parashar, Organic Reaction Mechanism, 2nd Edition, 2005, Narosa Publishing House.

#### **Unit IV**

1. Y. R. Sharma, Elementary organic spectroscopy, S.Chand& company Ltd.
2. Jagdambasingh, Jaya singh, Photochemistry and pericyclic reactions, Revised second edition, New Age International publishers.

#### **Unit-V**

V. Kumar, An introduction to Green chemistry, First edition, 2007, Vishal publishers.

#### **REFERENCES:**

1. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn& Bacon Ltd., (1976).
2. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997). [Textbook]
3. Pine S.H, Organic Chemistry, (4th edition) New Delhi, McGraw- Hill, International Book Company. (1986).
4. Mehta, B. and Mehta.M, Organic chemistry, PHI learning Pvt. Ltd., New Delhi (2012). [Textbook]

## Core- INORGANIC CHEMISTRY –III

Subject code: 23UCHC62

Semester: VI	Core :T10	Credits : 4	Hours/W – 4
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**On completion of the course the students should be able to**

- CO 1 :** Ambulate metal-ligand bonding in organometallic compounds and their applications in catalysis and industry (K1)
- CO 2 :** Demonstrate the coordination theories and nature of chemical bonding in coordination compounds (K3)
- CO 3:** Explain the kinetics and reaction mechanism involved in the formation of coordination compounds (K2)
- CO 4 :** Select suitable spectral methods for the analysis of metal complexes (K4)
- CO5:** Decide the biological functions of coordination complexes, toxicity, excess and deficiency problems of metals in biological systems.(K5)
- CO 6:** Evaluate the functions of different catalysts in biologically important reactions. (K6)

### **Unit I Coordination Chemistry-II (12 hrs)**

Valence bond theory (VBT) - Assumptions - Applied to octahedral, tetrahedral and square planar complexes - Limitations - Crystal field theory(CFT) - Assumptions - Splitting of d-orbitals in octahedral and tetrahedral complexes - Crystal field splitting, pairing and crystal field stabilization energies -  $\Delta_o$  &  $\Delta_t$  - comparison - Factors affecting the magnitude of crystal field splitting - High spin and low spin complexes - Consequences of crystal field splitting - Applications of CFT to octahedral, tetrahedral and square planar complexes - Limitations of CFT. Comparison of VBT and CFT

**Self-study:** Colour and magnetic properties of metal complexes (CFT)

### **Unit- II Coordination Chemistry-III (12 hrs)**

MO theory-sigma bonding in octahedral complexes. Sigma bonding in octahedral complexes  $[\text{CoF}_6]^{3-}$  and  $[\text{Co}(\text{NH}_3)_6]^{3+}$ . Jahn Teller distortion. Labile and inert coordination compounds. Stability and factors affecting the stability of metal complexes.  $\text{S}_{\text{N}}1$  – Dissociative mechanism.  $\text{S}_{\text{N}}2$  – Associative mechanism.  $\text{S}_{\text{N}}1\text{C}_{\text{B}}$  – mechanism. Substitution reactions. Square planar substitution reaction. Factors affecting reactivity of square planar complexes. Trans effect and its series - Theories of trans effect.

**Self-study:** Thermodynamic and kinetic stability of metal complexes

### **Unit III Organometallic Chemistry and Catalysts (12 hrs)**

Organometallic compounds. Types of organometallic compounds. Hapticity - Ligands in organometallic compounds. 18-Electron rule-applications and limitations. Nature of bonding in metal carbonyls.  $\sigma$  and  $\pi$  back donation. Zeise's salt. Bonding and structure of mono and poly nuclear – Fe, Co and Ni carbonyls. Organometallic compounds-catalysts - Oxidative

addition - Reductive elimination -Hydrogen abstraction - Insertion reaction - Hydrogenation of olefins-Wilkinson's catalyst - Ziegler-Natta catalyst

**Self-study:** Synthesis and properties of metal carbonyls, bridging and terminal carbonyls

#### **Unit IV Physical Methods in Inorganic Chemistry (12 hrs)**

Electronic spectra - Types of electronic transitions -Spin and Laporte selection rules - Spectroscopic ground state term symbol - Microstates -Combined Orgel-energy diagram for  $d^1$  and  $d^2$  states - Electronic spectrum of  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$  and  $[\text{V}((\text{H}_2\text{O})_6)]^{3+}$  complex ions - Electronic spectrum of Co(II), Ni(II) and Cu(II) complexes. Spectra of the lanthanides and actinides. Electron paramagnetic spectra - Hyperfine splitting and g-factor - Zero field splitting and Kramer's degeneracy - Applications of ESR spectra to Cu (II) and Mn (II) complexes

**Self-study:** Charge transfer spectra – Ligand to metal and metal to ligand

#### **Unit V Bio-Inorganic Chemistry and Coordination Polymers (12 hrs)**

Essential and trace elements in living system. Haemoglobin -Structural features and functions of Haemoglobin. Cyanide poison.-Carbon monoxide poison. Electrontransfer-Cytochromes. Rubredoxin. Ferredoxin. Photosynthesis-Chlorophyll. Vitamin B12. Iron Inventory and storage in human body. Porous coordination polymers – Metal organic framework (MOF). Synthesis methods – conventional and unconventional. Self-assembly. Application of MOF materials – Catalysis, absorption of gas, storage and sensors

**Self-study:** Biological functions and toxicity of metal ions and role of myoglobin in biological system

#### **REFERENCES :**

1. B.R. Puri and L.R. Sharma, Principles of Inorganic chemistry, Revised Edn, 2006, Milestone Publications. Albert Cotton, Wilkinson, Basic Inorganic chemistry, 3rd Edn, 2007, John Wiley Pvt.Ltd.
2. J.D.Lee, Concise Inorganic Chemistry, 5th Edn, 1996, Blackwell Pub.Com.
3. D.E. Shriver, P.W. Atkins, Inorganic chemistry, 5th Edn, 2010, Oxford Univ.Press.
4. J.E. Huheey, Inorganic chemistry, Principle of structure and reactivity. 4th Edn, 1996, Pearson Education.
5. R.S.Drago, Physical methods in chemistry, 1st edition, Philadelphia, W.B. Saunders Company.
6. E.A.V.Ebsworth – Structural methods in Inorganic chemistry, 1<sup>st</sup> edition, Blackwell scientific publications
7. Bertini, H.B. Lippard and J.S. Valentine, Bioinorganic Chemistry, University Science Books
8. R.D. Madan, Principles of Inorganic chemistry, Revised Edn, 2011, S.Chand & Co Ltd.
9. R.Gopalan, V.Ramalingam, Concise Coordination chemistry, Vikas Publishing House Pvt Ltd.
10. Asim K. Das, Bioinorganic chemistry, Books and Allied (P) Ltd.



**PHYSICAL CHEMISTRY – III**  
**Subject code: 23UCHC63**

<b>Semester : VI</b>	<b>Core :T 11</b>	<b>Credits : 4</b>	<b>Hours/W - 4</b>
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**On completion of the course the students should be able to**

**CO 1 :** Discuss the factors that affect the rate of chemical reactions and determine the rate of a reaction(K1)

**CO 2 :** Predict the quantum yield and types of reaction (K3)

**CO 3 :** Compare the variation of conductance with different factors (K5)

**CO 4 :** Explain thermodynamically the operation of a concentration cell, and be able to predict the concentration in the cell based on the cell potential.(K2)

**CO 5 :** Identify the differences and similarities of the different types of batteries.(K4)

**CO 6 :** They can design and fabricate a series of batteries. (K6).

**Unit I Chemical Kinetics – I** **(12 hrs)**

Thermodynamic feasibility and kinetic feasibility. Fundamental concepts – rate of formation, rate of consumption, extent of reaction and rate of reaction – initial rate and average rate. Conventional methods of measuring rates. Qualitative idea of the factors affecting rate. Empirical rate equations – partial order, overall order – examples of first order, second order, third order, zero order and fractional order reactions – pseudo first order reactions – units of rate constant. Isolation method and initial rate method of determination of kinetic order and rate constant. Integrated rate laws for first order and second order reactions – derivation and discussion – half-life time. Elementary reactions and molecularity. Kinetic study - First order reactions – dehydration of oxalic acid, inversion of cane sugar, decomposition of aqueous  $H_2O_2$ , hydrolysis of methyl acetate in aqueous solution, thermal decomposition of azoisopropane - Second order reactions – saponification of an ester by an alkali - Zero order reaction – iodination of acetone in presence of mineral acid.

**Self Study:** Order, molecularity, half life, activation energy.

**Unit II Chemical Kinetics –II and Photochemistry** **(12 hrs)**

Theories of rates of homogeneous reactions - Effect of temperature on reaction rate – Arrhenius rate equation – activation energy – significance and determination of Arrhenius parameters - Collision theory of bimolecular reactions – Lindemann’s theory of unimolecular reactions - Simple version of transition state theory of bimolecular reactions - Catalysis – homogeneous and heterogeneous catalysis – auto catalysis – negative catalysis – catalytic poisoning – intermediate compound formation theory and adsorption theory – Biological or enzyme catalysis and discussion of its mechanism characteristics of enzyme catalysis. Photochemistry - Difference between thermal and photochemical reactions - Photon energy – Einstein energy – Intensity - Lambert’s law – Beer’s law – Beer-Lambert’s law and its limitations - Grotthus and Draper law – Stark & Einstein’s law -Quantum yield – low and high quantum yields – experimental determination using uranyl oxalate actinometer - Free radicals and chain reactions –  $H_2 + Cl_2$  and  $CH_4 + Cl_2$  (derivation of rate laws not expected) -

Qualitative description of fluorescence and phosphorescence and their mechanism -  
Chemiluminescence and bioluminescence – Photography

**Self Study:** Homogeneous reactions, heterogeneous reactions with examples

### **Unit III Electrolytic Conductance**

**(12 hrs)**

Electrical conductance, cell constant and electrolytic conductivity -  $\kappa$  and its determination. Molar

conductivity ( $\lambda$ ) and its variation with concentration of strong electrolytes and Kohlrausch's empirical relation. Weak electrolytes – Arrhenius theory – degree of dissociation and its relation to  $\lambda$  – evidence in favour of the theory of electrolytic dissociation – Kohlrausch law of independent migration of ions and Ostwald's dilution law and their applications – experimental verification of Ostwald's law. Drawbacks of Arrhenius theory. Theory of strong electrolytes – relaxation effect – electrophoretic effect – Onsager conductivity equation (derivation not expected). Influence of temperature, solvent and viscosity on conductance. Contribution of individual ions to  $\lambda_0$  – transport number ( $t$ ) and ionic mobility ( $u$ ) – relation between them – determination of  $t$  by Hittorf method and by moving boundary method – Applications of  $t$  and  $u$ . Conductometric titrations. Applications of conductivity measurement

**Self-Study:** Electrolytes, conductance, conductivity, specific conductance, equivalent conductance,

molar conductance.

### **Unit IV Electromotive Force (EMF) – I**

**(12 hrs)**

Requirements of an electrochemical change. Distinction between electrolytic and galvanic cells. Origin of potential – standard electrode potential – electrochemical series. Conventions in electrode / half cell representation – half cell reactions - cell representation – cell reaction. Types of electrodes – metal and metal ion, metal amalgam, metal – insoluble metal salt and metal – salt ion electrodes – redox, gas and membrane electrodes – description of hydrogen gas electrode, calomel electrode and glass electrode.

Reversible cells and cell reactions. Weston standard cell – measurement of emf – calculation of single electrode potentials. Nernst emf equation and calculation of cell emf. Calculation of  $\Delta G^\circ$ ,  $\Delta H^\circ$ ,  $\Delta S^\circ$  and  $K$  from emf data.

**Self-Study: Electrode- Cell-emf**

### **Unit V EMF – II**

**(12 hrs)**

Activity, activity coefficients, mean activity, mean molal and mean molar ionic activity coefficients with regard to solutions. Chemical cell without transference – calculation of activity and mean activity. Chemical cell with transference – liquid junction potential (LJP) – salt bridge. Concentration cell without transference – calculation of emf. Concentration cell with transference – calculation of LJP and transport number. Potentiometric titrations. Determination of pH using hydrogen electrode, quinhydrone electrode and glass

electrode. Primary and secondary cells. Fuel cells. Commercial cells – Dry cells (Zn,  $MnO_2$ , alkaline cell, Ni-Cd cell) – Storage batteries (lead storage battery, Edison storage battery). Corrosion – electrochemistry of corrosion. Corrosion inhibitors – corrosion control – use of corrosion inhibitors - sacrificial anode – cathodic protection. Applications of electrolysis: Purification of metals and Electroplating

**Self study:** Electrochemistry, anode, cathode, electrode reactions

**TEXTBOOKS:**

1. P.L. Soni and D.P. Dharmarha, Textbook of Physical Chemistry, 1980 ed, Sultan Chand & sons.
2. S.H. Maron and C.F. Prutton, Principles of Physical Chemistry, Oxford & IBH Publishing Co. Pvt. Ltd.
3. Puri, Sharma and Pathania, Principles of Physical chemistry, 2001, ShobanLalNagin & Co., Vishal
4. Philip Matthews, Advanced chemistry, Low price ed. 1996, Cambridge University press.
5. K.J. Laidler and J.H. Meiser, Physical chemistry, CBS

## THERMODYNAMICS AND SOLID STATE

Subject code : 23UCHC64

Semester: VI

Core: E2

Credits: 2

Hours/W - 4

**On completion of the course the students should be able to**

**CO 1 :** Identify the principles of heat movement in any natural process (K1)

**CO 2 :** Examine the structure of unknown solid crystals and suggest their regularity.(K3)

**CO 3 :** Classify and explain the principles of thermodynamics (K4)

**CO 4 :** Explain spontaneity and non spontaneity of processes (K2)

**CO 5 :** Analyse a given solid crystal using X-ray diffraction data (K5)

**CO 6:** Design new solid crystals with desired physical and chemical properties (K6)

### Unit I Thermodynamics – I

(12 hrs)

Introduction – various forms of energy – scope of equilibrium thermodynamics - Thermodynamic systems, surroundings and walls - Thermodynamic properties – extensive and intensive properties - Thermodynamic state – state variables or functions - Thermodynamic processes -Zeroeth law and concept of temperature - Thermodynamic work (w) – general expression for w – free expansion – expansion against constant pressure – reversible expansion- Thermodynamic heat (q) – w and q as path functions – exact and inexact differentials - First law of thermodynamics (i) as law of conservation of energy (ii) in terms of change in internal energy (U) – U as a state function – w in reversible and irreversible evaporation and condensation -Heat capacity – Cp and Cv of gases – variation with temperature – molar heat capacities – relation between Cp and Cv for ideal gas – Cp and Cv as state functions - Enthalpy (H) – DH in physical and chemical processes – Bomb calorimetry – calculation of DH using Hess law – bond energy – variation of H with temperature (Kirchoff equation)

### Unit II Thermodynamics – II

(12 hrs)

Application of First law to an ideal gas - Calculation of w, q and DU in isothermal and adiabatic processes -Joule – Thomson (J.T) effect –  $\mu_{JT}$  of ideal gases and real gases – inversion temperature for van der Waals gases and its significance - Second law - Conversion of heat into work – Clapeyron’s restatement of Carnot’s ideas for ideal gases – thermodynamic efficiency – Carnot theorem – thermodynamic scale of temperature - Spontaneous processes – need for II law – Kelvin-Planck statement and Clausius statement of II law - Concept of entropy (S) – S as state function – “isolated system” – Clausius inequality for systems other than “isolated system” - S and spontaneity - Calculation of DS for ideal gases and for physical changes - S as a measure of (i) randomness (ii) probability.

### Unit III Thermodynamics – III

(12 hrs)

Conditions for material equilibrium - At constant T and P – Gibbs energy (G) – G as state function - At constant T and V – Helmholtz energy (A) – A as state function - Change in A and G - A as a maximum work for a reversible isothermal process - G as non-PV work for reversible isothermal process at constant P – relation between A and G - A and G as criteria

for spontaneity - Variation of G with P at constant T for a pure substance in one phase – evaluation of G for ideal gases - Concept of fugacity, activity and activity coefficient with respect to gases - Variation of G with T at constant P – Gibbs-Helmholtz equation and its application - Clapeyron equation, Clausius – Clapeyron equation and applications - G in chemical changes - Reaction isotherm – thermodynamic equilibrium constant and its significance.- Standard Gibbs energy change – prediction of reaction yield and reaction feasibility - van't Hoff equation for gas phase reactions- An elementary idea of partial molar quantities and chemical potential - Third law – Nernst heat theorem leading to III law – III law entropies – calculation of S of chemical reactions.

#### **Unit IV Solid state – I**

**(12 hrs)**

Characteristics of solids - Crystals, crystallography, unit cell, space lattice - Crystal forms and crystal lattices - First law of crystallography (Steno's law) - Lengths and axes required to define unit cell -Seven crystal systems and their conventional cell axes and angles - Cube – Simple cubic, f.c.c and b.c.c lattices- Naming of crystal planes – law of rationality of indices (Hauy's law) – Weiss coefficients and procedure for finding Miller indices - Spacing between lattice planes from X-ray diffraction -Diffraction pattern - Two approaches of viewing the origin of observed diffraction pattern – Laue equations & illustration using primitive cubic unit cell – Bragg equation - Total scattering intensity related to the periodic structure of electron density in the crystal -Experimental methods – Powder method – Rotating crystal method - Internal structure analysis of NaCl and KCl crystals - Determination of Avogadro number from crystal studies.

#### **Unit V Solid state – II**

**(12 hrs)**

Binding energy of ionic crystals - Cohesive energy and lattice energy - Theoretical calculations of the lattice energy – The Born – Mayer potential, Madelung energy and Madelung constant – The Born Lande (BL) equation - The Born Haber (BH) cycle – BH cycle for NaCl and calculation of the lattice energy. The structure of metals: The closest packing spheres (CCP, HCP, BCC). Heat capacity of solids. Imperfections in solids – Stoichiometric (Schottky and Frenkel defects) and non-stoichiometric (metal excess and metal deficiency) defects. Line and plane defects.

#### **TEXT BOOKS :**

1. J. Brockington, Peter Stamper and David Browning, Physical chemistry for higher education, Longmann, 1985
2. Peter Atkins and Julio de Paula, Atkin's Physical chemistry, Oxford University Press.
3. K.J.Laidler and J.H. Meiser, Physical chemistry, CBS.
4. CNR Rao, University general chemistry, Macmillan, 1986 print
5. S.H. Maron and C.F. Prutton, Principles of Physical Chemistry, Oxford & IBH Publishing Co. Pvt. Ltd.
6. Puri, Sharma and Pathania, Principles of Physical chemistry, 2001, ShobanLalNagin& Co., Vishal.

## PHYSICAL CHEMISTRY PRACTICAL

Subject code: 23UCHE61

Semester : VI

Core : P8

Credits : 2

Hours/W – 4

On completion of the course the students should be able to

**CO 1 :** Understand the concept of critical solution temperature (K1)

**CO 2 :** Correlate a relationship between solubility versus temperature (K4)

**CO 3 :** Describe the changes in conductivity with different conditions (K3)

**CO 4 :** Estimate the amount of substrate using potentiometric and conductivity methods (K3)

### Electrical and Non – electrical experiments

1. Determination of Molal depression constant ( $K_f$ ) of naphthalene and molecular weight of a solid solute (Rast Method)
2. Determination of Integral heat of saturated solution of oxalic acid (solubility method)
3. Determination of Solubility product of calcium hydroxide using common ion effect at low temperatures
4. Determination of Critical solution temperature (C.S.T) and composition at C.S.T of phenol – water system
5. Determination of Transition temperature of a salt hydrate (thermometric method)
6. Determination of Rate constant of hydrolysis of ethyl acetate catalysed by dilHCl.
7. Determination of Partition coefficient of iodine between  $CCl_4$  and  $H_2O$  and stability constant of the complex  $KI_3$
8. Determination of Eutectic temperature and eutectic composition from the experimentally constructed phase diagram of a system involving one eutectic.
9. Determination of Strength of HCl solution using standard NaOH solution (conductometry)
10. Determination of Strength of HCl solution using standard NaOH solution (potentiometry)
11. Determination of Strength of ferrous ammonium sulphate (FAS) solution using standard  $KMnO_4$  solution (potentiometry)
12. Verification of Onsager conductivity equation using KCl and determination of the strength of a test KCl solution.
13. Verification of Beer – Lambert's law of  $KMnO_4$  and determination of molar absorptivity ( $\epsilon$ ) at wave length of maximum absorption ( $\lambda_{max}$ ) (for demonstration only)

**NOTE :** Laboratory manual will be supplied.

## QUALITATIVE ANALYSIS OF ORGANIC COMPOUNDS (PRACTICAL)

Subject code: 23UCHE62

Semester : VI	Core: P9	Credits : 2	Hours/W – 4
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**On completion of the course the students should be able to**

**CO 1 :** Carry out the analysis of organic compounds using green method (K3)

**CO 2 :** Differentiate different functional groups using chemical test (K2)

**CO 3 :** Write different organic compounds with different functionalities.  
(K1)

**CO 4 :** Prepare derivatives for confirming certain functional groups (K4)  
Systematic analysis of monofunctional organic compounds for

1. Aliphatic/aromatic nature
2. Saturated/unsaturated nature
3. Elements present and absent (N,S and halogens)
4. Functional group present
5. Confirmation of the functional group by preparing a solid derivative or a colour reaction.

**NOTE:**

Laboratory manual will be supplied.

## PROJECT

**Semester: VI**

**Hrs: 6**

**Sub. Code: 23UCHC65**

**Credits: 4**

### **Structure of the Project Report**

1. Cover Page
2. Certificate
3. Declaration
4. Acknowledgement
5. Chapter-I Introduction
6. Chapter-II
7. Chapter-III
8. Chapter-IV
9. Chapter-V Conclusion and Scope for further research

### **Assessment**

**Internal** : 100 Marks

**External** : 100 Marks



## COMPUTER APPLICATIONS IN CHEMISTRY

Subject code: 23UCHS61

Semester: VI

SEC: 8

Credits: 2

Hours/W: 2

**On completion of the course the students should be able to**

**CO 1 :** Use C language to solve chemistry problems (K5)

**CO 2 :** Gain the ability to apply chemdraw (K4)

**CO 3 :** Ability to use chromatography techniques in research (K4)

**CO 4 :** Describe easy way to solve problems using computer languages (K2)

**CO 5 :** Recite the important terms related with computer and analytical techniques. (K1)

**CO 6 :** Familiarized in analyzing thermoanalytical data and using Chemistry softwares.(K5)

### UNIT I Introduction to C

(6 Hours)

Development of C – High level language – Importance of C – A simple C program, -  
Layout of a C program – Compiling C programs – Shortcut Keywords in C program -  
Character set – Keywords and identifiers – Formal variables, Local variables and Global  
variables– Consonants of different Data types, Special back slash consonants- Declarations -  
Exercises

### UNIT II Operators used in C

(6 Hours)

Arithmetic operators – Increment and Decrement operators – Relational operators –  
Logical operators – Assigned operators – Bit Wise operator – Ternary operator – Cast  
operator – Coma operator –Size of operator - Exercises

### UNIT III Statements in C

(6 Hours)

Input and Output statements - Getchar () function - Putchar () function – Gets ()  
function – Puts () function – Formatted Input function – Formatted our put statement –  
GOTO statement – Looping – If statement, If – else statement , Loop in C, Do-While Loop

### UNIT IV Applications in Chemistry

(6 Hours)

Program to compute molarity & Normality of a solution – program to convert  
Farenhite to Centigrade - Determination of /Calculation of (1) Bohr radius (2) Energy of  
electromagnetic radiations (given: Wavelength or frequency) (3) Enthalpy change using  
Clapeyron-Clausius Equation (4) Rate constant for a first order reaction (5) pH of a buffer  
solution (using Henderson's equation)

### UNIT V Chemwares

(6 Hours)

Introduction to chemware - Drawing chemical structures using chemdraw/KingDraw  
chemical structure editor - Drawing 3-dimensional chemical structures - Analysing structural  
data - Prediction of properties of compounds- Interpretation of  $^1\text{H}$  and  $^{13}\text{C}$  NMR details of  
simple compounds - SMILES coding - Chemical database - Full structure search

## Experimental techniques in chemistry

(Add-On course for I UG)

(Subject code: 23UCHAO1)

(Only Internal)

<b>Semester: I</b>	<b>Add-On</b>	<b>Credits: 2</b>	<b>Hours/W: 2</b>
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**On completion of the course the students should be able to**

**CO 1 :** Understand the basic and special apparatus used in chemistry lab (K1)

**CO 2 :** Handle special apparatus and reagents for analysis (K4)

**CO 3 :** Gain fundamental knowledge on basic units (K2)

**CO 4 :** Calculate and work with unit conversions (K3)

**CO 5 :** Practice laboratory safety measures during their stay in chemistry labs (K4)

**CO 6 :** Handle purification and separation processes effectively (K4)

### **Unit I Basic Laboratory Apparatus**

**6 hours**

Flasks – conical – round bottom – beakers – tubes – test, boiling and transition – wire gauze – funnels – china dish – condensers – filter paper – desiccators – separating funnel – crucibles – silica and sintered – burette – pipette – measured cylinders – standard measuring flasks – Bunsen burner – flames – oxidizing and reducing.

### **Unit II Measurements and Units**

**6 hours**

Accuracy – precision – weighing – physical and chemical balances – digital balance – volume measurements – meniscus – concordance – thermometers – barometers – stop watches – tabulation of data – graphs.

### **Unit III Basic concepts in experiments**

**6 hours**

Solubility – density – concentration – collection of gases – upper and lower displacement – solubility of gases – NH<sub>3</sub>, CO<sub>2</sub>, Cl<sub>2</sub>, H<sub>2</sub>, HCl, O<sub>2</sub> and SO<sub>2</sub> – drying of gases – passing through concentrated H<sub>2</sub>SO<sub>4</sub> and fused CaO.

### **Unit IV Separation and Purification**

**6 hours**

Importance of pure substance – medicinal and food materials – pure substances and mixtures – effects of impurity – miscibility temperature, transition temperature, boiling point, melting point and vapour pressure – measurement of boiling point and melting point – decantation – filtration – crystallization – preparation of saturated solution – distillation – fractional distillation – drying – water bath – sand bath – sublimation.

### **Unit V Lab safety**

**6 hours**

Code of conduct in laboratories – symbols on chemicals – accidents – intoxications – acid burns – alkali burns – cuts – safety measures.

Food chemistry  
(Value added course for II UG)  
(Subject code: 23UCHVA1)  
(Only Internal)

<b>Semester: III</b>	<b>Value added</b>	<b>Credits: 2</b>	<b>Hours/W: 2</b>
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On completion of the course the students should be able to

- CO 1 : Identify food adulterants in food stuffs (K2)
- CO 2 : Know the types of food additives and their importance in preservation (K1)
- CO 3 : Estimate the food value of various food items (K4)
- CO 4 : Prepare natural food based on the nutritional requirements (K3)
- CO 5 : Recommend people to use natural preservative techniques to common people (K5)
- CO 6 : Trace out the food allergy symptoms on living organisms (K3)

**Unit I Food Adulteration and Testing** **6 hrs**

Introduction- Legal aspects of Food adulteration and Prevention. Common food adulterants-Analysis of various food adulterants-Pesticide contaminants- Toxicants.

**Unit II Food Allergy** **6 hrs**

Food as Allergens-Types of reactions-Symptoms- Diagnosis- Treatment

**Unit III Food Additives** **6 hrs**

Food additives –Introduction, types & functions-Categories of food additives- Safety concerns and Legal Regulations of Food additives-Food flavour-Sensation of smell & taste- Flavour of some important foods-Natural Food colours - Carotenoids, Caramel, Tannins, Betalains-Important Artificial colours.

**Unit IV Food Processing and Preservation** **6 hrs**

Introduction-Aims of food processing-Food preservation -introduction-Means of Preservation-Types of spoilage-Variou methods of food preservation

**Unit V Edible Oils** **6 hrs**

Fats and Oils-Production of refined vegetable oils-Saturated and unsaturated fatty acids- Role of MUFA and PUFA in preventing heart diseases-Estimation of I2 value & RM value -Estimation of saponification value and their significance

**TEXTBOOKS :**

1. Alex V Ramani, Food Chemistry, MJP publishers
2. H. K. Chopra & P. S. Panesar, Food Chemistry, Narosa Publishing House
3. B. Srilakshmi, Dietetics, New age international (P) Ltd. Publishers
4. Swaminathan M., Food Science and Experimental methods, Ganesh and Company.
5. S. A. Joshi, Nutrition and dietetics, tata McGraw-Hill publishing companies

**EXTRA CREDIT COURSES**  
**For U. G.**  
**Offered By**  
**DEPARTMENT OF CHEMISTRY**  
**ECC- COSMETICS AND PERSONAL GROOMING**  
**(SUB CODE: 23UCHEC1)**

<b>Semester: I</b>	<b>ECC-I</b>	<b>Credits: 2</b>
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**On completion of the course the students should be able to**

CO 1 : Understand the various ingredients in cosmetics and their effect in human health (K2)

CO 2 : Prepare and use harmless makes up items at home (K5)

CO 3 : Identify skin allergy due to skin care materials (K4)

CO 4 : Expertise themselves in makeup preparations and personal grooming (K4)

CO 5 : Explain the importance of key ingredients of cosmetics (K2)

CO 6 : Pay more attention on dental care activities. (K4)

**Unit I Skin care**

Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.

**Unit II Hair care**

Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner – types – ingredients

Dental care

Tooth pastes – ingredients – mouth wash

**Unit III Make up** Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge

**Unit IV Perfumes**

Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – esters – alcohols – aldehydes – ketones

**Unit V Beauty treatments**

Facials - types – advantages – disadvantages; face masks – types; bleach - types – advantages– disadvantages; shaping the brows; eyelash tinting; perming – types; hair colouring and dyeing ; permanent waving – hair straightening; wax – types – waxing; pedicure, manicure - advantages – disadvantages

**ECC- LEATHER CHEMISTRY**  
**(SUB CODE:23UCHEC2)**  
**(For self study only)**

**SEMESTER-II**

**ECC -2**

**CREDITS -2**

**On completion of the course the students should be able to**

- CO 1 : Students will gain the ability to formulate and solve problems (K5)
- CO 2 : Design their own life oriented application of chemistry (K5)
- CO 3 : Classify the applications of leather in different segments. (K4)
- CO 4 : Assess the impact of leather making on society (K5)
- CO 5 : Define the properties of leather and leather products (K1)
- CO 6 : Explain the composition, types, preservation and uses of milk and milk products (K1)

**UNIT I Introduction to Leather Chemistry**

Importance of leather industry-Scope of leather chemistry-Distinction between hides, skins and leather – a detailed study of the structure and composition of hides and skins. Proteins and their characteristics-Anatomy and histology of protein constituents of leather.

**UNIT II Tanning Processes**

Basic principles involved in pre-tanning, soaking, liming, deliming, bating, pickling and depickling-Types of tanning – vegetable and mineral tanning- Different types of vegetable tanning- Materials – classification and chemistry of vegetable tanning-Factors and physico-chemical principles involved in vegetable tanning- Fixation of vegetable tanning- Synthetic tanning – classification – general methods.

**UNIT III Chemistry of Tanning**

The preparation and chemistry of chrome tanning liquids-Olation, oxolation and hydrolysis of chrome liquids-Effects of adding tanning agents- Role of pH in the reaction of chromium complexes with hide proteins. Factors governing chrome tanning-Chemistry of neutralization process. A brief survey of chemistry of other tanning agents like Al, Zr and Te salts and their relative merit in contrast with chrome tanning.

**UNIT IV Preservation and Processing of Leather**

Chemical methods of curing and preservation of hides and skins in acid and alkaline solutions. Principle of methods employed in curing, liming, deliming, bating and pickling - Process of dyeing leather – use of mordants. Dyeing auxiliaries such as leveling, wetting and dispersing agents – Dye fixation

**UNIT V Environmental Impact of Tannery Industries**

Tannery effluent and treatment – Types of water pollution-Different types of tannery effluents and wastes – solid waste – Origin and disposal-A small group project on collecting tannery effluents from various sources and their chemical analysis.

**TEXTBOOK:** Woodroffe, Fundamentals of leather science, John Wiley

**ECC- FORENSIC SCIENCE**  
**(SUB CODE: 23UCHEC3)**  
**(For self-study only)**

<b>SEMESTER-III</b>	<b>ECC -3</b>	<b>CREDITS -2</b>
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**On completion of the course the students should be able to**

- CO 1 : Develop Critical thinking and analysis abilities. (K5)
- CO 2 : Understand the different techniques in crime detection (K2)
- CO 3 : Generate laboratory skills to exacting standards of precision and care (K6)
- CO 4 : Ability of problem-solving skills (K4).
- CO 5 : Ability to apply diverse information to solve a real problem (K5)
- CO 6 : Conceptual understanding of the criminal justice system (K3)
- CO 7 : Create awareness among people on food adulteration (K6)

**UNIT I Food Adulteration**

Contamination of wheat, rice, dhal, milk, butter, etc. with clay, sand, stone, water and toxic chemicals (e.g. Kesari dhal with mentanil yellow, Ground nut with aflatoxins). Food poisons: natural poisons (alkaloids, nephrotoxins), pesticides (DDT, BHC, Follidol),

Chemical poisons (KCN). First aid and Antidotes for poisoned persons. Heavy metal (Hg, Pb, Cd) contamination of Seafood. Use of neutron activation analysis in detecting poisoning (e.g., As in human hair)

**UNIT II Transportation**

Drunken driving: breathalyzer for ethanol. Incendiary and time bombs in road and railway tracks. Defusing live bombs. Hit -and-go traffic accidents: paint analysis by AAS. Soil, toxic and corrosive chemicals (e.g., conc. acids) from tankers.

**UNIT III Crime Detection**

Accidental explosions during manufacture of matches and fire-works (as in Sivakasi). Human bombs, possible explosives (gelatin sticks, RDX). Metal detector devices and other security measures for VVIP. Composition of bullets and detection of powder burns. Scene of crime: finger prints and their matching using computer records. Smell tracks and police dogs. Analysis of blood and other body fluids in crimes. Typing of blood. DNA finger printing for tissue identification in dismembered bodies. Blood stains on clothing. Cranial analysis (head and teeth).

**UNIT IV Forgery and Counterfeiting**

Detecting forgery in bank cheques / drafts and educational records (mark lists, certificates), using UV-light. Alloy analysis using AAS to detect counterfeit coins. Checking silver linewater mark in currency notes. Jewellery: detection of gold purity in 22 carat ornaments, detecting gold plated jewels, authenticity of diamonds (natural, synthetic, glassy).

### **UNIT V Medical Aspects**

AIDS: Cause and prevention. Misuse of scheduled drugs. Burns and their treatment by plastic surgery. Metabolite analysis, using mass spectrum - gas chromatography. Detecting steroid consumption among athletes and race horses.

#### **Text book:**

1. K. S. Narayan Reddy, The Essentials of Forensic Medicine and Toxicology, 12<sup>th</sup> ed., Sri Lakshmi Art Printers, Hyderabad, 1990.

**ECC- POLLUTION CONTROL**  
**SUB CODE: 23UCHEC4**  
**(For self study only)**

<b>SEMESTER IV</b>	<b>ECC - 4</b>	<b>CREDITS – 2</b>	<b>H/W: 2</b>
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**On completion of the course the students should be able to**

- CO 1 : Solve the current forms of environmental pollution (K4)
- CO 2 : Label an overview of causes and consequences of natural systems' problems (K1)
- CO 3 : Summarize the fundamental principles governing interaction between men and environment (K5)
- CO 4 : Exposition to good practice of technologies (K4)
- CO 5 : Formulate remedies to environmental problems (K6)
- CO 6 : Predict the radiation hazardous materials. (K3)

**UNIT I Chemical Toxicology**

Toxic chemicals in the environment-Impact of toxic chemicals on enzymes-Sources and biochemical effects of lead, mercury, carbon monoxide and sulphur dioxide-Biochemical effects of pesticides-Carcinogens.

**UNIT II Air Pollution**

Air Pollutants-Air quality standards-Sampling and monitoring- Air pollution control – use of automobiles

**UNIT III Water Pollution**

Aquatic environment-Water pollutants-Trace elements in water-Water quality parameters and standards-Sampling – Preservation -Sewage treatment – Factory effluent treatment .

**UNIT IV Radiation Hazards**

Radiation sources-Cosmic radiation -Effects of Radiation-Prevention measures-Radiation safety methods

**UNIT V Energy Conservation**

Forestation-Wood, a major renewable resource-World energy resources – consumption and conservation- Wind energy and tidal power-Environmental management

**TEXTBOOKS:**

1. A.K. De, Environmental chemistry, Wiley Eastern Limited
2. S.S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S.Chand



**ECC- APPLIED CHEMISTRY**  
**SUB CODE: 23UCHEC5**  
**(For self-study only)**

**SEMESTER - V**

**ECC - 5**

**CREDITS – 2**

**On completion of the course the students should be able to**

- CO 1 : Identify the application of chemistry in industries (K1)
- CO 2 : Identify some important compounds and processes of industrial application (K3)
- CO 3 : Describe the relation between theoretical knowledge and the application in industries (K2)
- CO 4 : Know the importance of industrial revolution (K3)
- CO 5 : Apply the knowledge in all wants of life (K4)
- CO 6 : Construct water treatment vessels for purification of water (K6)

**UNIT I Water Treatment**

Impurities in water-Temporary and permanent hardness-Softening methods-Lime soda process-Zeolite or Permutit process-Treatment of Brackish water -Treatment of domestic water.

**UNIT II Cement**

Lime- Classification of lime-Manufacture of lime- Cement - definition-Classifications of cement-Portland cement-Manufacture of Portland cement- Setting of cement.

**UNIT III Polymers**

Polymers and Polymerisation-Degree of polymerization-Functionality of polymers-Types of polymers-Homopolymer-Copolymer – Homochain polymer – Heterochain polymer-stereo specific polymer-Types of polymerization and mechanism-Chain-growth polymerization- Condensation polymerization-Copolymerisation.

**UNIT IV Plastic and Rubbers**

Plastics and resins-Thermoplastics and thermosetting plastics-Preparations, properties and uses of Polyethylene – Polystyrene – PVC – Bakelite-Advantages and disadvantages of plastics- Natural and artificial rubbers- Vulcanization.

**UNIT V Lubricants**

Definition of lubricants-Functions of lubricants-Requirements of a lubricant-Mechanism of lubrication-Hydrodynamic lubrication-Boundary lubrication-Extreme pressure lubrication- Classification of lubricants-Vegetable and animal oils-Mineral or Petroleum oil-Blended oils- Synthetic lubricating oils,Semi- solid lubricants or Greases

**TEXTBOOKS:**

1. N.Ravisankar, B. Narayanansamy, K. Ilangovan, Applied Chemistry, National Pathippaham
2. N. Krishnamurthy, P.Vallinayagam, K.Jeyasubramanian, Applied Chemistry, Tata McGraw Hill.

## ECC- SPACE CHEMISTRY

(SUB CODE: 23UCHEC6)

(For self-study only)

<b>SEMESTER-VI</b>	<b>ECC - 6</b>	<b>CREDITS – 2</b>
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**On completion of the course the students should be able to**

- CO 1 : Identify the theory and mechanism of forces governing the universe (K1)
- CO 2 : Ability to make observations regarding earth or space and infer conclusions from them (K4)
- CO 3 : Explain chemical nature of different planets (K2)
- CO 4 : Gaining idea about the fusion reactions taking place in sun and stars (K2)
- CO 5: Understanding laws of the universe.(K2)
- CO 6 : Interpret the light rays and study the composition of the sources (K3).

### **UNIT I Research Methods Used in Space Chemistry**

Electromagnetic radiation-Interaction of light radiation with matter-Light rays and chemical composition-Optical specifications of an atom-Cosmic matter on earth.

### **UNIT II Chemical Composition of Celestial Bodies**

Meteorites-Abundance of certain elements in meteorites - Chemistry of the solar system-The planets in the solar system-Elements present in the earth crust -Composition of lunar soil and lunar rock.

### **UNIT III: Chemistry of Matter**

Effect of pressure on matter-Effect of temperature on matter-Plasma state of matter-Optical pyrometry.

### **UNIT IV Stars**

Brightness and luminosity of stars-The Hertzsprung-Russell diagram and stellar evolution-Chemical composition of stars-Stellar atmosphere – light and gravitation, Novae – Super Novae – Comets.

### **UNIT V Nuclear Reactions and Sources of Stellar Energy**

Constituents of the atomic nucleus-Properties of elementary particles of atom-Nuclear reactions – Types of nuclear reactions-Nuclear energy sources – sources of solar energy

### **TEXTBOOK:**

L. Nikolaev, Space Chemistry, Mir Publishers, Moscow

**CHEMISTRY FOR BIOLOGICAL SCIENCES I**  
**(For Botany and Zoology students)**  
**(SUB CODE: 23UCHE11)**

<b>SEMESTER I</b>	<b>EC- T1</b>	<b>CREDITS – 2</b>	<b>H/W : 4</b>
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**On completion of the course the students should be able to**

**CO 1 :** State the theories of chemical bonding, nuclear reactions and its applications. (K1)

**CO 2 :** Evaluate the efficiencies and uses of various fuels and fertilizers. (K3)

**CO 3 :** Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions. (K2)

**CO 4:** Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars. (K4)

**CO 5 :** Analyse various methods to identify an appropriate method for the separation of chemical components. (K5)

**CO 6 :** Evaluate the efficiency of different fuels. (K3)

**UNIT I Chemical Bonding** **(12 hrs)**

Valency and valence electrons, electronic theory of valency, Electrovalency- conditions favouring electrovalency-illustrations, electrovalent compounds and their properties, Covalency-conditions favouring covalency-illustration, covalent compounds and their properties, coordinate covalency-conditions favouring it-illustration. Fajan's Rule.

Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.

**Unit II Industrial Chemistry** **(12 hrs)**

Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).

Silicones: Synthesis, properties and uses of silicones.

Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.

**UNIT III Fundamental Concepts in Organic Chemistry** **(12 hrs)**

Hybridization: Orbital overlap hybridization and geometry of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>. Polar effects: Inductive effect, electromeric and Mesomeric effect.

Chromatography: principle and application of column, paper and thin layer chromatography

**UNIT IV Drugs and Speciality Chemicals** **(12 hrs)**

Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether;

Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.

### **UNIT V: Analytical Chemistry-I**

**(12 hrs)**

Principles of volumetric analysis. Methods of expressing concentration of solution. Normality, Molarity, Molality, Mole fraction, Equivalent weights of acids bases, oxidizing agents and reducing agents. Primary standard, secondary standard, preparation of standard solution. Principles of Acid-base titrations-theory of indicators, permanganometry, Dichrometry, Iodometry, Indimetry.

#### **Text books**

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chandand Company, New Delhi, twenty third edition,2012.
4. P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry;Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.

#### **Reference Books**

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. B.K, Sharma, Industrial Chemistry; GOEL publishing house,Meerut, sixteenth edition, 2014.
3. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.

## CHEMISTRY PRACTICAL FOR BIOLOGICAL SCIENCES

(for Botany and Zoology students)

(SUB CODE: 23UCHE12)

SEMESTER I	EC- P1	CREDITS – 2	H/W=2
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### On completion of the course the students should be able to

CO 1 : Gain an understanding of the use of standard flask and volumetric pipettes, burette (K2)

CO 2 : Design, carry out, record and interpret the results of volumetric titration. (K3)

CO 3 : Apply their skill in the analysis of water/hardness. (K4)

CO 4 : Analyze the chemical constituents in allied chemical products (K5)

### VOLUMETRIC ANALYSIS

1. Estimation of sodium hydroxide using standard sodium carbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standard sodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator.

### Reference Book

1. V.Venkateswaran, R.Veerasingam, A.R.Kulandaiavelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

## Allied Chemistry II

(Subject code: 23UCHE21)

<b>SEMESTER II</b>	<b>EC- T2</b>	<b>CREDITS – 2</b>	<b>H/W=4</b>
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**On completion of the course the students should be able to**

- CO 1 : Explain fundamental thermodynamic properties (K1)  
CO 2: List and explain several technological applications of colloids (K2)  
CO 3: Summarize the roles carbohydrates, alkaloids and terpenoids play in biological systems.(K3)  
CO 4: Figure out how many stereoisomers a compound has, and synthesis of a few heterocyclic molecules.(K4)  
CO 5 : Prepare and standard solutions and standardize an unknown solution.(K5)

### **Unit I Thermodynamics**

**12 hrs**

Introduction - Basic terminology and functional concepts- System, boundary and surrounding- Types of systems: open, closed and isolated- Properties of a system: extensive and intensive - State of a system and state variables (or state functions)-Thermodynamic equilibrium - Process and types: Isothermal, adiabatic, isochoric, isobaric, cyclic, reversible, and irreversible- comparison between isothermal and adiabatic processes, reversible and irreversible processes - Internal energy as a state function- components of internal energy- Work: Thermodynamic concept-types of work - Heat : Thermodynamic concept- Heat and work as path functions - First law of thermodynamics- Statement of the law of conservation of energy- Mathematical expression of the law- Application of the law- Heat capacity, specific heat capacity and molar heat capacity of a system- Relation between molar heat capacities of gases- Enthalpy and enthalpy change- Enthalpy as a state function- Relation between  $\Delta H$  and  $\Delta E$ - Enthalpies of reaction, formation and combustion-Definition and illustration- standard state- Calculation of enthalpy change using Hess law- Bond enthalpies and bond dissociation enthalpies-Definition and illustration using  $C H_4$  as example (Numerical problems not expected)- Spontaneous (natural) process- Entropy-it's meaning of disorder- Gibb's free energy-its meaning as available energy- Criteria for spontaneity

**Self study:** ideal gas, ideal gas equation, homogeneous reactions and heterogeneous reactions, heat.

### **UNIT II Surface Chemistry and Colloidal Chemistry**

**12 hrs**

Adsorption chemistry-introduction-definition-distinction from adsorption- Adsorption and adsorbate-definition and explanation- Types of colloidal systems- Classification of colloids-Lyophilic and lyophobic sols-a comparison- Stability of colloids-origin of charge-electrical double layer-salvation- Electrical properties-electrophoresis and electro-osmosis-Gels- gelation-classification-properties of gels-hydration, swelling or inhibition, syneresis and thixotropy- Emulsions-types of emulsion-identification of emulsion-dilution test, dye test, spreading test, viscosity and electrical conductivity-de-emulsification- Application of colloid

in food, medicine, industry, purification of water, artificial rain, blue colour of the sky and cleaning action of soap.

**Self study:** Adsorbent, adsorbate, molecular interactions.

### **UNIT III Carbohydrates, Alkaloids and Terpenoids**

**12 hrs**

Introduction- Monosaccharide- Reaction of glucose- Open chain structure and ring structure of glucose (elucidation not expected)- Epimers, mutarotation- Interconversion of glucose into fructose and vice versa- Disaccharides- Reactions and structure of sucrose (elucidation nor expected)- Structure of maltose and lactose (elucidation not expcted)- Polysaccharide- Starch- amylase and amyl pectin-type of glycosidic linkage- Reaction of starch-action of heat-, hydrolysis and with iodine- Alkaloids- Definition, classification, (based on structure) occurrence and extraction- General methods of identification-functional nature of oxygen-functional nature of nitrogen-unsaturation-exhaustive methylation- Structure of conine- Terpenoids- Introduction, classification of terpenoids-Isoprene rule- Structure of citral (synthesis not included)

**Self study:** Examples for food contains carbohydrates

### **UNIT IV Stereoisomerism and Heterocyclic Compounds**

**12 hrs**

Optical isomerism- Plane polarized light - Optical activity - Asymmetric carbon-chirality - Elements of symmetry-plane of symmetry- axis of symmetry-centre of symmetry-dissymmetric- Van't Hoff-le Bel theory- Optical isomerism of tartaric acid- Racemization - Resolution of racemic-mixture-biochemical method, chemical method and chromatographic method- Geometrical isomerism- Cause for geometrical isomerism- Illustration of compounds containing C-C double bond - Heterocyclic compounds- Pyrrole- Introduction-aromatic character- Basic and acidic character of pyrrole- Pyridine- Electronic interpretation of electron-rich centers- Reaction of pyridine- Quinoline- Skaraup synthesis - Reactions of quinoline

**Self study:** Isomers, cyclic compounds, practice to draw the structure of simple molecules like H<sub>2</sub>O, NH<sub>3</sub> etc.

### **UNIT V Analytical Chemistry-II**

**12 hrs**

Types of reactions relevant to qualitative analysis - Displacement reaction – Decomposition - Double decomposition- Hydrolysis- redox reaction- Complex formation- Interfering anions and their elimination- Group reagents and analytical group classification- Explanation and application of the following principles in qualitative analysis- Solubility and solubility product- Common ion effect- pH- Buffer.

**Self study:** Anions , cations, saturated solution, unsaturated solution, acids and bases.

**Note:** Course materials will be supplied to the students.

**ALLIED CHEMISTRY PRACTICAL-II (For BOT and ZOO)**

**Inorganic qualitative analysis**

**Subject code: 23UCHE22**

<b>SEMESTER II</b>	<b>EC- P2</b>	<b>CREDITS – 2</b>	<b>H/W=2</b>
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**On completion of the course the students should be able to**

CO 1 : Explain and demonstrate the techniques of elimination of interfering radicals (K2)

CO 2: Apply the physical and chemical properties of various ions in the identification if unknown samples (K3)

CO 3 : Categorize the metal ions into different groups. (K3)

CO 4: Identify the presence of inorganic salts in biological samples. . (K4)

CO 5 : Separate ions using common ion effect and solubility product (K5)

CO 6 : Analyze samples using microscale techniques (K4)

Qualitative analysis of a simple salt containing one anion and one cation

**Anions** : Carbonate, Borate, Fluoride, Oxalate and Phosphate

**Cations** : Lead, Bismuth, Copper, Cadmium, Cobalt, Nickel, Manganese, Zinc, Barium, Strontium and Ammonium

**Note:** Laboratory manual will be supplied.



## ALLIED CHEMISTRY- I (FOR PHYSICS)

SUBJECT CODE: 23UCHE31

Semester: III

EC-T3

Credits : 3

Hours / W : 4

**On completion of the course the students should be able to**

CO 1 : Understand the atomic structure and periodicity(K1)

CO 2 : Appreciate the mystery of existence of atoms together in molecular form(K2)

CO 3 : Enjoy the regularity in solids(K3)

CO 4 : Use different acids and bases for biological applications and evaluate redox processes.(K5)

CO 5 : Use practical knowledge for Industrial backgrounds. (K4)

### UNIT I Atomic Structure and Periodic Table

12 Hrs

Bohr model of atom- Atomic spectrum of hydrogen and Bohr theory - Refinement of the Bohr theory- Dual nature of electrons particles or waves- Quantum numbers and its significance- Uncertainty principle- Paul's exclusion principle, Hund's rule- Periodic table- Modern periodic table- Long form of periodic table- Division of elements into s,p,d and f blocks-Bohr's aufbau principle electronic configuration of ground state of atoms up to K(Z=19)-Trends in atomic properties Ionization energy, successive ionization energy , electron affinity, electro negativity Pauling, Mulliken and Allred Rochow's scale

Self study: Fundamentals of atomic structure, atomic number, mass number

### UNIT II Structural and Chemical Bonding

12 hrs

Types of chemical bond - Electrovalent bond (conditions for formation and associated properties)- Covalent bond (conditions for formation and associated properties)- Coordinate covalent bond- Orbital overlap ss, sp, pp overlap- Sigma and pi bond formation of N<sub>2</sub> and O<sub>2</sub> properties- Polar and non-polar molecules- Dipole moment and its applications- VSPER theory application to CH<sub>4</sub> , NH<sub>3</sub> and H<sub>2</sub>O - Molecular orbital theory, bonding, antibonding and non-bonding orbitals- MO diagrams for H<sub>2</sub> , He<sub>2</sub> , N<sub>2</sub> and O<sub>2</sub> bond order

Self study: Ionic bond, covalent bond, Coordinate bond

### UNIT III Solid State and Energetics

12 hrs

Macroscopic properties of solids- Types of characteristics of crystals- Covalent solids structure and properties of diamond and graphite- Ionic crystals solid NaCl- Metallic crystals- Molecular crystals intermolecular forces- Metals - free electron theory and band theory of metallic bond- Superconductors- Lattice energy- Born Haber cycle- Law of conservation of energy- Enthalpy of reactions- Entropy and Gibbs energy- Relationship between Gibbs energy and equilibrium.

Self Study: Difference between crystalline and amorphous substances

#### **UNIT IV Acid, Bases and Redox Processes**

**12 hrs**

Concept of acids and bases- Arrhenius concept- Bronsted Lowry concept conjugate acids and bases- Lewis concept- Effect of solvents and substituents on relative strengths of acids and bases- Hydrolysis- Ionization of water- pH scale definition of pOH ,  $pK_a$ ,  $pK_b$  simple numerical problem- Buffer solution - Redox processes- Electronic concept of oxidation and reduction- Oxidation number rules- Calculation of oxidation number of elements in neutral molecules and in ions- Balancing ionic equation by oxidation number method.

Self Study: Ideas on acids, bases and salts

#### **UNIT V Practical Chemistry-I: Qualitative Analysis**

**12 hrs**

Introduction acquaintance with chemical laboratory laboratory equipments solid reagents, liquid reagents and test papers laboratory instructions and some don'ts Bunsen burner (self study) -Chemistry involved in the analysis of anion and cations - Dry tests (action of heat, flame test, filter ash test) -Wet test ( with acids , with  $Na_2CO_3$  extract)- Elimination of interfering anions and preparation of original solutions-Classification of cations into analytical groups- Condition for precipitation, application of solubility product and common ion effect in qualitative analysis- Safety in laboratory- General safety measures (safety equipment, safety notices, personal protection, dangers to avoid )- Chemical hazards (corrosive, irritant substances, toxic compounds, flammable explosives)- Physical hazards (fire, pressure) fire extinguisher- Spillage and waste disposal- First aid ( immediate assistance, burns, eye injuries, bleeding, toxic materials) first aid kit.

Self Study: Simple salt analysis.

**Note: Course materials will be supplied to the students**

**ALLIED CHEMISTRY PRACTICAL – I (FOR PHYSICS)**

**Inorganic qualitative analysis**

**(Subject Code: 23UCHE32)**

**Semester: III**

**EC-P4**

**Credit: 2**

**Hours/W : 2**

**On completion of the course the students should be able to**

**CO 1:** Explain and demonstrate the techniques of elimination of interfering radicals (K2)

**CO 2:** Apply the physical and chemical properties of various ions in the identification of unknown samples (K3)

**CO 3 :** Categorize the metal ions into different groups. (K3)

**CO 4 :** Identify the presence of inorganic salts in biological samples. (K4)

**CO 5 :** Separate ions using common ion effect and solubility product (K5)

**CO 6 :** Analyze samples using microscale techniques (K4)

Qualitative analysis of a simple salt containing one anion and one cation

**ANIONS:** Carbonate, Borate, Fluoride, Oxalate and Phosphate

**CATIONS:** Lead, Bismuth, Copper, Cadmium, Cobalt, Nickel, Manganese, Zinc, Barium, Strontium and Ammonium

**Note: Laboratory manual is supplied**

## ALLIED CHEMISTRY- II (FOR PHYSICS)

SUBJECT CODE: 23UCHE41

Semester: IV	EC-T4	Credits : 3	Hours / W : 3
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**On completion of the course the students should be able to**

**CO 1 :** Write the nomenclature of organic compounds.(K2)

**CO 2:** Develop the knowledge in the area of electromotive force(K1)

**CO 3 :** Use various processes involved in metallurgy for industrial applications(K5)

**CO 4 :** Know the application of chemistry in industries(K3)

**CO 5 :** Develop the practical knowledge in volumetric analysis.(K2)

### UNIT I Fundamentals of Organic Chemistry

**9 hrs**

Hybridization- Need for the concept of hybridization-  $sp$ ,  $sp^2$  and  $sp^3$  hybridization with suitable examples- Isomerism in organic compounds- Structural isomerism types with example- Stereoisomerism conformational, geometrical and optical isomerism- Geometrical isomerism cis and trans nomenclature- Optical isomerism elemental of symmetry chirality optical activity enantiomers, diastereomers, mesomer and racemic mixture optical activity exhibited by lactic acid and tartaric acid.

Self study: Fundamentals of isomerism and hybridization.

### UNIT II Electromotive Force

**9 hrs**

Introduction- Requirements of an electrochemical change- Electrochemical cells difference between electrolytic and galvanic cells- Salt bridge- Electrode potential and standard electrode potential- Electrochemical series and applications- Conventions used in electrode representation and in cell representation- Types of electrodes description of hydrogen, calomel and glass electrodes Nernst equation- Weston cadmium cell- Experimental determination of a cell emf and determination of electrode potential simple calculation- Potentiometric titrations and their advantages principle and method of acid base, redox and precipitation titrations- Determination of pH using hydrogen, glass and quinhydrone electrodes

Self study: Electrolysis and galvanic cells

### UNIT III Polymers

**9 hrs**

Polymers - Properties of polymers ;Mechanical, physical, thermal, optical, electrical and chemical properties- Preparation and uses of thermoplastics polyethylene and PVC- Preparation and uses of thermosetting plastics nylon, epoxy resins, Bakelite- Rubber and uses of rubber- Vulcanization. - Biopolymers.

Self study: Simple extraction procedure

**UNIT IV Industrial Chemistry****9 hrs**

Silicones preparation, properties and uses- Manufacture and types of glass- Fuel gases manufacture, composition and uses of producer gas, water gas, LPG and bio Gas- Softening of water: Ion exchange, electro dialysis and reverse osmosis methods – Solubility-Colligative properties-K<sub>b</sub>, K<sub>f</sub>.. Rast method-molecular properties-polarity-dipole moment- o, p-Nitrophenol, Polarity-boiling point, solubility. hydrogen bonding-origin-applications-Vander Waal's forces.

Self study: Fundamentals of magnetism

**UNIT V Practical Chemistry II- Volumetry****9 hrs**

Introduction definition of various terms (titrations, volumetric analysis, titrant indicator, end point requirements of the reaction selected for the titration common types of titration. Law of equivalence equivalent weight of acids, bases, oxidizing agents, reducing agents and salts calculation of molecular weights and equivalent weights. Requirements of a primary standard - Secondary standards- Numerical problems in the preparation of solutions- Law of normalities preparation of HCl, H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub> (approximately 0.1N) from standard acids- Principles behind - Acid base titration - pH versus volume curves, choice of indicators from different acid base titrations- Permanganometry- Dichrometrydiphenylamine and potassium ferricyanide as indicators- Iodometry Preparation of iodine and starch solutions - starch as indicators- Iodometry role of KMnO<sub>4</sub> and K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>-

Self study: Preparation of solution

**Note: Course materials will be supplied to the students**

## ALLIED CHEMISTRY PRACTICAL – II (FOR PHYSICS)

### Inorganic Qualitative Analysis

(Subject Code: 23UCHE42)

Semester: IV

EC-P4

Credit: 2

Hours/W: 2

**On completion of the course the students should be able to**

**CO 1:** Explain the basic principles involved in titrimetric analysis.(K2)

**CO 2 :** Compare the methodologies of different titrimetric analysis.(K3)

**CO 3 :** Calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.(K4)

**CO 4 :** Identify the end point of various titrations.(K5)

S. No	Estimation	Link	Standard
1	Strong Acid	Weak Base/Strong Base	Strong Base
2	Strong Acid	Strong Base	Weak Acid
3	Strong Base	Strong Acid	Weak Base
4	Oxalic acid	Potassium Permanganate	Oxalic acid
5	Ferrous Sulphate	Potassium Permanganate	Ferrous Ammonium Sulphate
6	Potassium dichromate	Ferrous Sulphate	Potassium dichromate
7	Ferrous Ammonium Sulphate	Potassium dichromate	Ferrous Sulphate
8	Potassium Permanganate	Sodium thiosulphate	Potassium dichromate
9	Magnesium Sulphate	EDTA	Zinc Sulphate
10	Zinc Sulphate	EDTA	Magnesium Sulphate

**Note: Laboratory manual will be supplied**