

**ANNEXURE 18B06**

**V.V. VANNIAPERUMAL COLLEGE FOR WOMEN**



(Belonging to Virudhunagar Hindu Nadars)

An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai

*Re-accredited with 'A' Grade (3<sup>rd</sup> Cycle) by NAAC*

VIRUDHUNAGAR - 626 001

**CHOICE BASED CREDIT SYSTEM  
REGULATIONS AND SYLLABUS  
(with effect from Academic Year 2018 - 2019)**

V.V. Vanniaperumal College for Women, Virudhunagar, established in 1962, offers 19 UG Programmes, 14 PG Programmes, 6 M.Phil. Programmes and 3 Ph.D. Programmes. All these programmes, except Ph.D. Programmes, have been framed as per the guidelines given by UGC under Choice Based Credit System (CBCS).

The Departments of Commerce, English and History upgraded as Research Centres offer Ph.D. Programmes as per the norms and regulations of Madurai Kamaraj University, Madurai and do not come under the purview of CBCS.

**CHOICE BASED CREDIT SYSTEM (CBCS)**

The CBCS provides an opportunity for the students to choose courses from the prescribed Courses. The CBCS is followed as per the guidelines formulated by the UGC. The Students' performance will be evaluated based on the uniform grading system. Computation of the Cumulative Grade Point Average (CGPA) is made to ensure uniformity in evaluation system.

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**List of Programmes in which CBCS/Elective Course System is implemented**

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**UG PROGRAMMES**

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|--------------------------|---|--|
| Arts & Humanities        | : | History (E.M. & T.M.), English and Tamil   |
| Physical & Life Sciences | : | Mathematics, Zoology, Chemistry, Physics, Biochemistry, Home Science - Nutrition and Dietetics, Costume Design and Fashion, Microbiology, Biotechnology, Computer Science, Information Technology and Computer Applications. |
| Commerce & Management    | : | Commerce, Commerce with Computer Applications, Commerce with Professional Accounting Business Administration.  |

## PG PROGRAMMES

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Physics, Biochemistry, Food Processing & Quality Control, Chemistry, Zoology, Computer Science, Information Technology, Computer Applications (MCA*)
Commerce & Management	:	Commerce, Business Administration (MBA*)

\* AICTE approved Programmes

## PRE-DOCTORAL PROGRAMMES (M.Phil.)

Arts & Humanities	:	History, English, Tamil
Physical & Life Sciences	:	Mathematics, Biochemistry
Commerce & Management	:	Commerce

## OUTLINE OF CHOICE BASED CREDIT SYSTEM

1. Core Courses
2. Elective Courses
  - 2.1. Discipline Specific Elective Courses (DSEC)
  - 2.2. Dissertation / Project
3. Non Major Elective Courses (NMEC)
4. Generic Elective Courses (GEC)
5. Ability Enhancement Courses (AEC)
  - 5.1 Ability Enhancement Compulsory Courses (AECC)
  - 5.2. Skill Enhancement Courses (SEC)

### List of Non Major Elective Courses (NMEC) Offered

#### UG PROGRAMMES

Name of the Course	Semester	Department
History of India upto A.D.1858	III	History(EM)
இந்திய வரலாறு கி.பி. 1858 வரை	III	History (TM)
Indian National Movement (A.D 1885-1947)	IV	History(EM)
இந்திய தேசிய இயக்கம் (கி.பி. 1885 – 1947)	IV	History(TM)
English for Professions I	III	English
English for Professions II	IV	
இக்காலநீதி இலக்கியம்	III	Tamil
உரைநடை இலக்கியம்	IV	
Basic Hindi - I	III	Hindi
Basic Hindi - II	IV	
Practical Banking	III	Commerce
Basic Accounting Principles	IV	
Business Management	III	Business Administration
Entrepreneurship	IV	
Quantitative Aptitude – I	III	Mathematics
Statistics and Operation Research	IV	
Physics in Everyday life	III	Physics
Fundamentals of Electronics	IV	
Industrial Chemistry	III	Chemistry
Drugs and Natural Products	IV	
Applied Zoology	III	Zoology
Animal Science	IV	
Basic Food Science	III	Home Science – Nutrition and Dietetics
Basic Nutrition and Dietetics	IV	
Women and Health	III	Biochemistry
Life style associated disorders	IV	
Medical Lab Technology	III	Microbiology
Applied Microbiology	IV	
Infectious Diseases	III	Biotechnology
Organic Farming	IV	
Basics of Fashion	III	Costume Design And Fashion
Interior Designing	IV	
Introduction to Computers and Office Automation	III	Computer Science
Introduction to Internet and HTML 5	IV	
Computer Fundamentals and E-mail	III	Information Technology
Introduction to HTML	IV	
Fundamentals of Computers	III	Computer Applications
Web Design with HTML	IV	
Horticulture – I	III	Botany
Horticulture – II	IV	
மருத்துவ தாவரவியல் - I	III	
மருத்துவ தாவரவியல் - II	IV	
Library and Information Science – I	III	Library Science
Library and Information Science - II	IV	

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## List of Generic Elective Courses (GEC) Offered

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### GENERIC ELECTIVE COURSES – 1

1. Human Rights/
2. Women Studies

### GENERIC ELECTIVE COURSES – 2

1. Constitution of India/
2. Modern Economics/
3. Adolescent Psychology/
4. Disaster Management

### ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)

1. Environmental Studies
2. Value Education

மேல்நிலைக் கல்வி வரை தமிழை முதன்மைப் பாடமாக எடுத்துப் படிக்காத மாணவிகள் கீழ்க்கண்ட பாடங்களைக் கட்டாயம் படிக்க வேண்டும்.

- a) அடிப்படை தமிழ் -எழுத்தறிதல்
- b) அடிப்படைத் தமிழ் -மொழித்திறனறிதல்

### ELIGIBILITY FOR ADMISSION

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Tamilnadu or any other equivalent Examination accepted by Academic Council with Mathematics/Botany as one of the subjects in Higher Secondary Course.

### DURATION OF THE PROGRAMME

The candidates shall undergo the prescribed Programme of study for a period of three academic years (six semesters).

### MEDIUM OF INSTRUCTION

English

**COURSES OFFERED**

- Part I : Tamil/Hindi
- Part II : English
- Part-III : Core Courses  
 Elective Courses: Discipline Specific Electives Courses  
 Field Project  
 Allied Courses: 1. Mathematics /Botany  
 2. Physics
- Part IV: Non-Major Elective Courses (NMEC)  
 Generic Elective Courses (GEC)  
 Ability Enhancement Compulsory Courses (AECC)  
 Skill Enhancement Courses (SEC)
- Part V: National Service Scheme, Physical Education, Youth Red Cross Society, Red Ribbon Club, Science Forum, Eco Club, Library and Information Science, Consumer Forum, Health and Fitness Club, National Cadet Corps

Study Tour/ Field visit is mandatory for UG students.

Internship / Field Project is compulsory for II year UG Science students

**Internship:** A designated activity that carries one credit involving more than 7 days of working in an organization under the guidance of an identified mentor

**Field Project:** Project students comprising of maximum 5 members in a team need to undertake project that involve conducting surveys inside/outside the college premises and collection of data from designated communities or natural places.

**EVALUATION SCHEME**

Components	Internal Assessment Marks	External Examination Marks	Total Marks
Theory	25	75	100
Practical	40	60	100
Project	40	60	100

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**PART III - Core Courses, Discipline Specific Elective Courses & Allied Courses**


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**INTERNAL ASSESSMENT****Distribution of Marks****Theory**

Mode of Evaluation		Marks
Periodic Test	:	15
Assignment	:	5
Quiz	:	5
<b>Total</b>	<b>:</b>	<b>25</b>

Three Periodic Tests - Average of the best two will be considered

Two Assignments - Best of the two will be considered

Three Quiz Tests - Best of the three will be considered

**Practical**

Mode of Evaluation		Marks
Model Test	:	30
Performance	:	10
<b>Total</b>	<b>:</b>	<b>40</b>

Two Model Tests - Best one will be considered

Performance - Attendance and Record

**Question Pattern for Periodic Tests****Duration: 2 Hours**

Section	Type of Question	No. of Questions	No. of Questions to be answered	Marks for each question	Total Marks
A Q. No.(1- 4)	Multiple choice	4	4	1	4
B Q. No.(5 - 7)	Either or type	3	3	7	21
C Q. No.(8-10)	Open Choice	3	2	10	20
<b>Total</b>					<b>45</b>

**EXTERNAL EXAMINATION****Question Pattern****Duration: 3 Hours**

Section	Type of Question	No. of Questions	No. of Questions to be answered	Marks for each question	Total Marks
A Q. No.(1- 10)	Multiple choice (Atleast Two questions from each unit)	10	10	1	10
B Q. No.(11 -15)	Either or type (one set from each unit)	5	5	7	35
C Q. No.(16-20)	Open Choice (one from each unit)	5	3	10	30
				<b>Total</b>	<b>75</b>

**CORE COURSES ASSESSMENT**

Online Test will be conducted for the Core Courses in V & VI Semester.

Multiple Choice question Pattern will be followed.

**PART IV - Skill Enhancement Courses and Non Major Elective Courses****INTERNAL ASSESSMENT****Distribution of Marks****Theory**

Mode of Evaluation		Marks
Periodic Test	:	25
Assignment	:	10
Quiz	:	5
<b>Total</b>	<b>:</b>	<b>40</b>

Three Periodic tests - Average of the best two will be considered

Two Assignments - Best of the two will be considered

Three Quiz Tests - Best of the three will be considered

**Question Pattern****Duration: 1 Hour**

Section	Type of Question	No. of Questions	No. of Questions to be answered	Mark for each Question	Total Marks
A Q. No.(1- 4)	Open Choice	4	3	5	15
B Q. No.(5- 6)	Open Choice	2	1	10	10
<b>Total</b>					<b>25</b>

**EXTERNAL EXAMINATION****Question Pattern****Duration: 2 Hours**

Section	Type of Question	No. of Questions	No. of Questions to be answered	Mark for each Question	Total Marks
A Q. No.(1- 8)	Open Choice	8	6	5	30
B Q. No.(9- 13)	Open Choice	5	3	10	30
<b>Total</b>					<b>60</b>

**PART IV- Generic Elective Courses and Ability Enhancement Compulsory Courses**

- Assessment by Internal Examiner only
- Model Examination is conducted after two periodic tests.
- Book and Study Material prepared by the Faculty Members of the respective departments will be prescribed.

**ASSESSMENT PATTERN**

Mode of Evaluation		Marks
Periodic Test	:	30
Assignment	:	10
Model Examination	:	60
<b>Total</b>	<b>:</b>	<b>100</b>

Two Periodic tests - Best of the two will be considered

Two Assignments - Best of the two will be considered



**Question Pattern for Periodic Test****Duration: 1 Hour**

Section	Type of Question	No. of Questions	No. of Questions to be answered	Mark for each Question	Total Marks
A Q. No.(1- 4)	Open Choice	4	3	6	18
B Q. No.(5- 6)	Open Choice	2	1	12	12
<b>Total</b>					<b>30</b>

**Question Pattern for Model Examination****Duration: 2 Hours**

Section	Type of Question	No. of Questions	No. of Questions to be answered	Mark for each Question	Total Marks
A Q. No.(1- 8)	Open Choice	8	5	6	30
B Q. No.(9- 13)	Open Choice	5	3	10	30
<b>Total</b>					<b>60</b>

## **ELIGIBILITY FOR THE DEGREE**

- i) The candidate will not be eligible for degree without completing the prescribed Courses of study and a minimum Pass marks in all the Courses.
- ii) Attendance, progress and conduct certification from the Head of the Institution will be required for the students to write the examination.
  - No Pass minimum for Internal Assessment.
  - Pass minimum for External Examination is 27 marks out of 75 marks for Core Courses, Allied Courses and Discipline Specific Elective Courses.
  - Pass minimum for External Examination is 21 marks out of 60 marks for Non Major Elective Courses and Skill Enhancement Courses.
  - The aggregate minimum pass percentage is 40.
  - Pass minimum for External Practical Examination is 21 marks out of 60 marks.
  - Pass minimum for Generic Elective Course and Ability Enhancement Compulsory Course is 40.

## BACHELOR OF CHEMISTRY

### PROGRAM CODE -2017

#### PROGRAMME OUTCOMES

- acquire intellectually disciplined process of thinking in analyzing, synthesizing, evaluating and applying scientific concepts.
- Develop good rapport with fellow-beings through efficient oral, written and technical communication.
- Connect with the society to transform ideas into action.
- Volunteer support in spreading scientific temperament and stand for the national cause in all core issues.
- Uphold the values and beliefs inherent in the nation's tradition and culture.
- Strive to preserve nature in all forms for a sustainable future.
- Develop an independent and self-disciplined specialized learning in tune with the changing socio-technological scenario

#### PROGRAMME SPECIFIC OUTCOMES

- Obtain chemical knowledge concerning the fundamentals in the basic areas of Organic, Inorganic, Analytical and Physical Chemistry.
- Use standard laboratory equipments, modern instrumentation and classical techniques to carry out experiments.
- Comprehend the proper procedures and regulations for safe handling and use of chemicals.
- Understand the transformation of chemical energy into electrical energy.

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### PART – I-TAMIL

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UTAG11	தாள்: 1 பொதுத்தமிழ்	3	100
2.	II	18UTAG21	தாள்: 2 பொதுத்தமிழ்	3	100
3.	III	18UTAG31	தாள்: 3 பொதுத்தமிழ்	3	100
4.	IV	18UTAG41	தாள்: 4 பொதுத்தமிழ்	3	100
<b>TOTAL</b>				<b>12</b>	<b>400</b>

### PART I -HINDI

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UHDG11	Prose – I & II, Ancient Stories - I, General Essays, Functional Hindi – I & Grammar	3	100
2.	II	18UHDG21	Drama, Ancient Stories - II, Letter Correspondence, Functional Hindi-II & Grammar	3	100
3.	III	18UHDG31	Ancient Poetry, Drama, Indian History, Hindi Grammar & Functional Hindi III	3	100
4.	IV	18UHDG41	Modern Poetry, Hindi Literary Essays, Letter Correspondence, Conversation & Functional Hindi IV	3	100
<b>TOTAL</b>				<b>12</b>	<b>400</b>

### PART II

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UENG11A	English for Advanced Learners I	3	100
		18UENG11B	English for Career Guidance - I		
		18UENG11C	English for Communicative Competence-I		
2.	II	18UENG21A	English for Advanced Learners II	3	100
		18UENG21B	English for Career Guidance - II		
		18UENG21C	English for Communicative Competence - II		
3.	III	18UENG31A	English for Advanced Learners III	3	100
		18UENG31B	English for Career Guidance – III		
		18UENG31C	English for Communicative Competence - III		
4.	IV	18UENG41A	English for Advanced Learners IV	3	100
		18UENG41B	English for Career Guidance – IV		
		18UENG41C	English for Communicative Competence - IV		
<b>TOTAL</b>				<b>12</b>	<b>400</b>

**PART III – CORE, DISCIPLINE SPECIFIC ELECTIVE COURSES**

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1	I	18UCHC11	Inorganic Chemistry-I	4	100
2	I	18UCHC12	Organic and Physical Chemistry	4	100
3	II	18UCHC21	Organic Chemistry-I	4	100
4	II	18UCHC22	Inorganic and Physical Chemistry	4	100
5	II	18UCHC21P	Core Practical- I Volumetric Analysis	2	100
6	III	18UCHC31	Inorganic, Organic and Physical Chemistry-I	5	100
7	IV	18UCHC41	Inorganic, Organic and Physical Chemistry-II	5	100
8	IV	18UCHC41P	Core Practical –II Inorganic Semi-micro Qualitative Analysis	2	100
9	V	18UCHC51	Organic Chemistry-II	4	100
10	V	18UCHC52	Physical Chemistry-I	4	100
11	V	18UCHC53	Inorganic Chemistry-II	4	100
12	V	18UCHE51 18UCHE52	Discipline Specific Elective 1 (DSE 1) 1. Analytical Methods and Introduction to Computers 2. Nanotechnology	4	100
13	V	18UCHO51	Online Assessment	1	50
14	VI	18UCHC61	Organic Chemistry-III	4	100
15	VI	18UCHC62	Physical Chemistry-II	4	100
16	VI	18UCHC63	Applied Chemistry	4	100
17	VI	18UCHE61 18UCHE62	Discipline Specific Elective 2 (DSE 2) 1. Medicinal Chemistry 2. Industrial Chemistry	4	100
18	VI	18UCHO61	Online Assessment	1	50
19	VI	18UCHC61P	Practical –III Gravimetric Analysis and Organic Preparation	3	100
20	VI	18UCHC62P	Practical –IV Organic Analysis and Estimation	3	100
21	VI	18UCHC63P	Practical –V Physical Chemistry Experiments	2	100
<b>Total</b>				<b>72</b>	<b>2000</b>

**PART III – ALLIED COURSE I- MATHEMATICS**

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UMTA11	Mathematics –I	4	100
2.	II	18UMTA21	Mathematics – II	3	100
		18UMTA22	Mathematics - III	3	100
<b>Total</b>				<b>10</b>	<b>300</b>

**PART III – ALLIED COURSE I- BOTANY**

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	I	18UBYA11	Taxonomy of Angiosperms and Medicinal Botany	4	100
2.	II	18UBYA21	Applied Botany	3	100
		18UBYA21P	Allied Botany Practicals	3	100
<b>Total</b>				<b>10</b>	<b>300</b>

**PART III - ALLIED COURSE II- PHYSICS**

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	18UPHA31	Allied Physics-I	4	100
2.	IV	18UPHA41	Allied Physics-II	4	100
	IV	18UPHA41P	Allied Physics Practical -I	2	100
<b>Total</b>				<b>10</b>	<b>300</b>

**PART IV -SKILL ENHANCEMENT COURSES**

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	II	18UCHS21	Polymer Chemistry	2	100
2.	III	18UCHS31	Food Chemistry	2	100
3.	IV	18UCHS41	Leather Chemistry	2	100
4.	V	18UCHS51P	Analysis of Oils/Fats & Water Practical	2	100
5.	V	18UCHS52	Dairy Chemistry	2	100
6.	VI	18UCHS61	Green Chemistry	2	100
<b>Total</b>				<b>12</b>	<b>600</b>

**PART IV –NON MAJOR ELECTIVE COURSES**

S.No.	Sem.	Code	Title of the Course	Credits	Marks
1.	III	18UCHN31	Industrial Chemistry	2	100
2.	IV	18UCHN41	Drugs and Natural Products	2	100
<b>Total</b>				<b>4</b>	<b>200</b>

**PARTIV– GENERIC ELECTIVE AND ABILITY ENHANCEMENT  
COMPUSORY COURSES**

S.No.	Sem.	Code	Title of the Course	Credits	Marks		
1.	I	18UGVE11	Value Education	2	100		
2.	III	18UGEH31 18UGEW32	Human Rights Women studies	1	100		
3.	IV	18UGEC41	Constitution of India	1	100		
4.		18UGEM42	Modern Economics				
5.		18UGEG43	Global Warming				
6.		18UGEA44	Adolescent psychology				
7.		18UGED45	Disaster Management				
8.		18UCHI41G	Internship/Field Project			1	100
9.		PART V	Extension Activities			1	-
10	V	18UGES51	Environmental Studies	2	100		
<b>TOTAL</b>				<b>8</b>	<b>500</b>		

**PART –V EXTENSION ACTIVITIES**

S.No.	Sem.	Code	Title of the Course	Credit
1	I, II, III & IV	18UVNS1 18UVNS2	National Service Scheme	1
2		18UVPE1 18UVPE2	Physical Education	
3		18UVYR1 18UVYR2	Youth Red Cross Society	
4		18UVRR1	Red Ribbon Club	
5		18UVSF1	Science Forum	
6		18UVEC1	Eco Club	
7		18UVLI1	Library and Information Science	
8		18UVCC1	Consumer Forum	
9		18UVHF1	Health and Fitness Club	
10		18UVNC1 18UVNC2	National Cadet Corps	



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### BACHELOR OF CHEMISTRY

Programme Code – 2017

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
I	Part I	18UTAG11	Tamil/Hindi I	6	3	25	75
	Part II	18UENG11	English I	6	3	25	75
	Part III	18UCHC11	<b>Core Course -1</b> Inorganic Chemistry-I	4	4	25	75
		18UCHC12	<b>Core Course - 2</b> Organic and Physical Chemistry	4	4	25	75
		18UCHC21P	<b>Core Course</b> Practical – I Volumetric Analysis	2	-	-	-
		18UMTA11/ 18UBYA11 18UBYA21P	<b>Allied Course –I</b> Mathematics – I / Allied Botany-I Allied Botany Practical	6/4 2	4 -	25 -	75 -
	Part IV	18UGVE11	Value Education	2	2	40	60
	<b>TOTAL</b>			<b>30</b>	<b>20</b>	<b>600</b>	



Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
II	Part I	18UTAG21	Tamil /Hindi II	6	3	25	75
	Part II	18UENG21	English II	6	3	25	75
	Part III	18UCHC21	<b>Core Course - 3</b> Organic Chemistry-I	4	4	25	75
		18UCHC22	<b>Core Course - 4</b> Inorganic and Physical Chemistry	4	4	25	75
		18UCHC21P	<b>Core Course</b> Practical –I Volumetric Analysis	2	2	40	60
		18UMTA21/ 18UBYA21	<b>Allied Course –</b> Allied Mathematics - II / Allied Botany-II	3 /4	3/4	25	75
		18UMTA22/ 18UBYA21P	Allied Mathematics – III / Allied Botany Practicals	3/2	3/2	25/40	75/60
	Part IV	18UCHS21	<b>SEC -1</b> Polymer Chemistry	2	2	25	75
	<b>TOTAL</b>			<b>30</b>	<b>24</b>	<b>800</b>	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
III	Part I	18UTAG31	Tamil/ Hindi III	6	3	25	75
	Part II	18UENG31	English III	6	3	25	75
	Part III	18UCHC31	<b>Core Course -5</b> Inorganic, Organic and Physical Chemistry-I	5	5	25	75
		18UCHC41P	<b>Core Course</b> Practical – 2 Inorganic Semi-micro Qualitative Analysis	2	-	-	-
		18UPHA31 18UPHA41P	<b>Allied-Course -II</b> Allied Physics Allied Physics Practical	4 2	4 -	25 -	75 -
	Part IV	18UCHS31	<b>SEC -2</b> Food Chemistry	2	2	40	60
		18UCHN31	<b>NMEC-1</b> Industrial Chemistry	2	2	40	60
	Part IV	18UGEH31/ 18UGEW32	<b>Generic Elective -1</b> 1.Human Rights/ 2. Women studies	0	1	40	60
		18UGEC41/ 18UGEM42/ 18UGEA43/ 18UGED44	<b>Generic Elective -2</b> Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management	1	-	-	-
		<b>TOTAL</b>			<b>30</b>	<b>20</b>	<b>700</b>

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
IV	Part I	18UTAG41	Tamil /Hindi IV	6	3	25	75
	Part II	18UENG41	English IV	6	3	25	75
	Part III	18UCHC41	<b>Core Course - 6</b> Inorganic, Organic and Physical Chemistry-II	5	5	25	75
		18UCHC41P	<b>Core Course</b> Practical -2 Inorganic Semi -micro Qualitative Analysis	2	2	40	60
		18UPHA41 18UPHA41P	<b>Allied Course – II</b> Allied Physics Allied Physics Practical	4 2	4 2	25 40	75 60
	Part IV	18UCHS41	<b>SEC -3</b> Leather Chemistry	2	2	40	60
		18UCHN41	<b>NMEC-2</b> Drugs and Natural Products	2	2	40	60
		18UCHI41G	Internship/Field Project	0	1	100	-
			<b>Generic Elective -2</b>				
		18UGEC41/ 18UGEM42/ 18UGEA43/ 18UGED44	Constitution of India/ Modern Economics/ Adolescent Psychology/ Disaster Management	1	1	40	60
		Part V		Extension Activities	-	1	-
				<b>TOTAL</b>	<b>30</b>	<b>26</b>	<b>1000</b>

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
V	Part III	18UCHC51	<b>Core Course – 7</b> Organic Chemistry-II	4	4	25	75
		18UCHC52	<b>Core Course - 8</b> Physical Chemistry-I	4	4	25	75
		18UCHC53	<b>Core Course – 9</b> Inorganic Chemistry-II	4	4	25	75
		18UCHC61P	<b>Core Course</b> Practical - 3 Gravimetric Analysis and Organic Preparation	3	-	-	-
		18UCHC62P	<b>Core Course</b> Practical - 4 Organic Analysis and Estimation	3	-	-	-
		18UCHC63P	<b>Core Course</b> Practical -5 Physical Chemistry Experiments	2	-	-	-
		18UCHE51	<b>DSEC -1</b> 1.Analytical Methods and Introduction to Computers/ 2.Nanotechnology	4	4	25	75
		18UCHE52	2.Nanotechnology				
		18UCHO51	Online Assessment	-	1	50	
	Part IV	18UCHS51P	<b>SEC -4</b> Analysis of Oils/Fats & Water Practical	2	2	40	60
		18UCHS52	<b>SEC -5</b> Dairy Chemistry	2	2	40	60
		18UGES51	Environmental Studies	2	2	40	60
			<b>TOTAL</b>	<b>30</b>	<b>23</b>	<b>750</b>	

Semester	Course Code	Courses	Hours per week	Credits	Total Marks		
					Int.	Ext.	
VI	Part III	18UCHC61	<b>Core Course -10</b> Organic Chemistry-III	5	4	25	75
		18UCHC62	<b>Core Course -11</b> Physical Chemistry-II	5	4	25	75
		18UCHC63	<b>Core Course -12</b> Applied Chemistry	5	4	25	75
		18UCHC61P	<b>Core Course</b> Practical - 3 Gravimetric Analysis and Organic Preparation	3	3	40	60
		18UCHC62P	<b>Core Course</b> Practical - 4 Organic Analysis and Estimation	3	3	40	60
		18UCHC63P	<b>Core Course</b> Practical -5 Physical Chemistry Experiments	2	2	40	60
		18UCHE61 18UCHE62	<b>DSEC -2</b> 1.Medicinal Chemistry / 2.Industrial Chemistry	5	4	25	75
	18UCHO61	Online Assessment	-	1	50		
	Part IV	18UCHS61	<b>SEC -6</b> Green Chemistry	2	2	40	60
	<b>TOTAL</b>			<b>30</b>	<b>27</b>	<b>850</b>	



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VIRUDHUNAGAR - 626 001

### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester III	<b>INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-I</b>	Hours/Week: 5	
Core Course-5		Credits: 5	
Course Code <b>18UCHC31</b>		Internal 25	External 75

### COURSE OUTCOMES

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

- inculcate the principle of semi-micro qualitative analysis.
- get knowledge in the synthetic utility of organic reagents.
- study the chemistry and uses of aliphatic nitrogen compounds.
- able to get knowledge of alicyclic compounds and conformational analysis.
- gain basic knowledge on theory of dilute solution and colligative properties.
- understand the symmetry aspects in chemical systems.
- comprehend the importance of point group and its classification.
- apprehend the basic concepts of crystallography.

### UNIT I

a) Principles and techniques of semi micro methods –Aims of semi micro qualitative analysis – Types of reactions involved in qualitative analysis –Dry reactions – Precipitation reactions – applications of solubility product principle in qualitative analysis – Complexation reaction – Oxidation and reduction reactions- Spot tests - Preparation of solution for cation testing on semi micro scale- Removal of interfering ions in the analysis of cations –Oxalate , tartarate, borate, fluoride, chromate, phosphate and arsenite.

b) Organic reagents in inorganic analysis – applications of organic reagents – dimethyl glyoxime – aluminon – thiourea – uranyl zinc acetate - Rhodamine B- cupron - Magneson – alizarin. (15 Hours)

## UNIT II

### Aliphatic Nitrogen compounds:

- Nitrocompounds: Isomerism – General methods of preparation and properties of nitroalkanes Differences between nitroalkanes and alkyl nitrites.
- Alkyl cyanides and isocyanides: Thorpe nitrile condensation – carbylamine reaction – differences between cyanides and isocyanides.
- Amines: Classification – preparation of amines by Hofmann method - reaction of amines with nitrous acid – Mannich reaction - Hofmann mustard oil reaction – Basic character of amines – Quaternary ammonium salts – phase transfer catalysis
- Diamines: Preparation, properties and uses of ethylene diamine and hexamethylene diamine
- Diazo compounds: Preparation and synthetic applications of diazoacetic ester and diazomethane.
- Amide: Introduction to amides - Urea – Preparation, Properties, uses and structure. (15 Hours)

## UNIT III

### Alicyclic Compounds, Conformational Analysis & Tautomerism

- Alicyclic compounds: Preparation-Freund's and Dieckmann methods-properties of cycloparaffins – relative stability of cycloalkanes – Baeyer's strain theory – its limitations and modification.
- Conformational analysis: Differences between configuration and conformation. Fischer, Sawhorse and Newman projection formulae –conformational analysis of ethane, n- butane, 1,2 - dichloroethane, cyclohexane and monosubstituted cyclohexane.
- Civetone and muscone –synthesis and structure only (no Structural elucidation)
- Tautomerism: Definition-conditions of tautomerism-prototropy and anionotropy. Difference between tautomerism and resonance. Keto-enol tautomerism, nitro-acinitro tautomerism, lactum-lactim tautomerism. (15 Hours)

## UNIT IV

### Theory of Dilute Solution:

- Colligative properties – lowering of vapour pressure – Raoult's law – Derivation of Raoult's law – Measurement of lowering of vapour pressure – Ostwald &

Walker's Dynamic method – Determination of molecular weight from lowering of vapour pressure

- b) Elevation of boiling point – Measurement of elevation of boiling point by Cottrell's method – determination of molecular weight – Relation between lowering of vapour pressure and elevation of boiling point – Ebullioscopic constant
- c) Depression of freezing point – Measurement of depression of freezing point by Beckmann's method – Determination of molecular weight from depression of freezing point – Cryoscopic constant
- d) Osmotic pressure – laws of osmotic pressure – Determination of Osmotic pressure by modern Osmometer – van't Hoff theory of dilute solution – Reverse osmosis – Desalination of sea water. (15 Hours)

## UNIT V

### Group theory and Solid State

- a) Introduction – molecular symmetry elements and symmetry operations – product of symmetry operations – commutative symmetry operations – properties of group – similarity transformation – matrix representation of symmetry elements - classes and sub groups.
- b) Point group – definition – classification of molecules into point groups –  $C_{2v}$ ,  $C_{3v}$ ,  $C_{2h}$ ,  $D_{2h}$ ,  $T_d$ ,  $D_{6h}$  and  $O_h$  – group multiplication table for  $C_{2v}$  point group.
- c) Isotropy and anisotropy – laws of crystallography – Representation of planes – Miller indices, space lattice, Unit cell, Bravais lattices – Seven crystal systems – X-ray diffraction – Derivation of Bragg's equation – Determination of structure of NaCl by rotating crystal method – Ionic crystals - CsCl – Covalent crystals – diamond. (15 Hours)

## TEXT BOOKS

1. Gopalan, R. (2011). *Elements of Analytical Chemistry*, New Delhi: Sultan Chand & Sons, 3<sup>rd</sup> Edition.
2. Arun Bahl & Bahl, B.S. (2012). *Advanced Organic Chemistry*, New Delhi: S.Chand & Company Ltd, 19<sup>th</sup> Edition.



3. Arun Bahl, Bahl, B.S. & Tuli, G.D. (2017). *Essentials of Physical Chemistry*, New Delhi: S.Chand & Company Ltd., 2<sup>nd</sup> Edition.
4. Swarnalakshmi, S. (2012). *A Simple Approach to Group Theory in Chemistry*, Hyderabad: University Press, 1<sup>st</sup> Edition.

#### REFERENCE BOOKS

1. Tewari, K.S. & Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*, New Delhi: Vikas Publishing House Pvt. Ltd., 3<sup>rd</sup> Edition.
2. Finar, I.L. (2006). *Organic Chemistry*, Singapore: Pearson Education Pvt. Ltd. Volume -I, 6<sup>th</sup> Edition.
3. Soni, P.L. (2008). *Text Book of Physical Chemistry*, New Delhi: Sultan Chand & Sons, 2<sup>nd</sup> Edition.
4. Negi, A.S. & Anand, S.C. (2008). *A text book of Physical Chemistry*, New Delhi: A New Age International Publishers, 2<sup>nd</sup> Edition.
5. Puri, Sharma, Pathania, (2008). *Elements of Physical Chemistry*, Delhi: Vishal Publishing & Co, Jalandhar, 4<sup>th</sup> Edition.
6. Ramakrishnan, V. & Gopinathan, M.S. (2014). *Group Theory in Chemistry*, Delhi: Vishal Publishing Company, Jalandhar, 1<sup>st</sup> Edition.
7. Bajpai, (2011). *Advanced Physical Chemistry*, New Delhi: S. Chand & Company Limited, 2<sup>nd</sup> Edition.



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VIRUDHUNAGAR - 626 001

### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester III	<b>FOOD CHEMISTRY</b>	Hours/Week: 2	
Skill Enhancement Course- 2		Credits: 2	
Course Code <b>18UCHS31</b>		Internal 40	External 60

#### COURSE OUTCOMES

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

- understand the function of food and biological role of vitamins, carbohydrates, proteins, minerals and water.
- acquire a knowledge about cooking and preservation of food.
- learn more about food additives and their role.
- comprehend the food adulterants and their harmful effects.
- gain knowledge about food poison and first aid for food poisoning.

#### UNIT I

**Introduction** – Food – classification – Functions of food- metabolism – role of carbohydrates, proteins, lipids, vitamins, minerals and water. (6 Hours)

#### UNIT II

**Food Processing** – Cooking - effect of cooking on nutrients, various food stuffs - preservation – types of preservation – Physical preservation – refrigeration, freezing, canning, dehydration and freeze drying - chemical preservatives. (6 Hours)

#### UNIT III

**Food Additives** - Sweeteners – Food colours – Flavouring agents – Antioxidants – Emulsifiers – Acidulants. (6 Hours)

#### UNIT IV

**Food Adulteration** -Common food adulterants – Analysis of food adulterants – Harmful effects of food adulterants. (6 Hours)

#### UNIT V

**Food poison**-Natural poisons (alkaloids, Nephrotoxins) – Sources of chemical poison in food - lead and mercury - Pesticides (DDT, BHC, Malathion) – Treatments for food poisoning. (6 Hours)

#### TEXT BOOK

1. Ramani, V. (2014). *Food Chemistry*, Chennai: MJP Publishers, 1<sup>st</sup> Edition.
2. Thankamma Jacob, (1979). *A Text Book of Applied Chemistry for Home Science and Allied Sciences*, New Delhi: The Macmillan Company of India Ltd, 1<sup>st</sup> Edition.

#### REFERENCE BOOKS

Jayashree Ghosh, (2013). *Fundamental Concepts of Applied Chemistry*, New Delhi: S.Chand & Company Ltd, 1<sup>st</sup> Edition.



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### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester III	<b>INDUSTRIAL CHEMISTRY</b>	Hours/Week: 2	
Non Major Elective Course - 1		Credits: 2	
Course Code <b>18UCHN31</b>		Internal 40	External 60

### COURSE OUTCOMES

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

- comprehend the chemistry of fertilizers, milk products, insecticides and pesticides.
- apprehend about polymer industry, petrochemical industry, nuclear power plants and disposal of nuclear power waste.
- prepare soap, detergent and understand chemistry of cleansing action of soap.

### UNIT I

**Food Industry** – Introduction - Scope – Various type of chemical industries – Fertilizers – Polymer – Cement – Petrochemical – Pharma chemicals - Milk and Milk Products - Composition of Milk, Flavour and aroma of Milk, Physical properties of milk. Effect of heat on Milk - Milk products - cream, butter, ice cream, milk powder.

(6 Hours)

### UNIT II

**Agricultural Industry** – Nutrients for plant – Major and minor nutrients – Role of NPK – Urea – Super Phosphate – Mixed fertilizers – Fertilizer manufacturing units in India – Insecticides and pesticides – DDT. Health hazards of pesticides. (6 Hours)

### UNIT III

**Polymer Industry** – Natural and synthetic rubbers – examples for synthetic rubber – applications – Plastic – Bakelite – Nylon 66 – PVC – Uses (Structure not necessary).

**Soap and Detergents:** Manufacture of Soap and Detergents. Cleansing action of soap Problems of Detergents as waste water in water resources. (6 Hours)

### UNIT IV

**Petrochemical industry** - Crude oil – Chemicals from crude oil – Natural gas – LPG Aviation fuel – Fuels used in locomotives – trucks and ships – Fuels used in light commercial vehicles – Air pollution problems due to Automobiles and its control.

(6 Hours)

### UNIT V

**Cement Industry:** Introduction – Raw materials of cement – Types of cement – manufacturing process of cement - setting of cement – cement industries in India.

(6 Hours)

### TEXT BOOKS

1. Sharma, B.K.(2008). *Industrial Chemistry*, Meerut: GOEL Publishing House, 1<sup>st</sup> Edition.
2. Bagavathi Sundari. K,(2006). *Applied Chemistry*, Chennai: MJP Publishers, 1<sup>st</sup> Edition.

### REFERENCE BOOKS

1. Jaya Shree Ghosh, (2013). *Fundamental Concepts of Applied Chemistry*, New Delhi: S.Chand & Company Ltd, 1<sup>st</sup> Edition.
2. Small scale Industries manual from District Industrial centre. (DIC)

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Semester: III	<b>HUMAN RIGHTS</b>  <b>(2018 -19 onwards)</b>	Hours/Week: 0	
Generic Elective - 1		Credits : 1	
Course Code: <b>18UGEH31</b>		<u>Internal</u> 100	<u>External</u> -

### COURSE OUTCOMES

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

- understand the basic concepts on human rights and human values.
- learn the definition and the development of human rights.
- understand the various theories on human rights.
- know the international instruments and conventions on human rights.
- acquire idea of the evolution of human rights in India.
- imbibe the knowledge of human rights violation in India.

### UNIT I

Human Rights - Definition – Development of Human Rights: The Magna Carta (1215) - The Declaration on Rights of Man and Citizen (1789) - The Bill of Rights (1791).

### UNIT II

Universal Declaration of Human Rights (1948) - International Covenant on Civil and Political Rights– International Covenant on Economic, Social and Cultural Rights.

### UNIT III

Human Rights in India - Constitutional Guarantees on Human Rights - The Protection of Human Rights Act (1993).

#### **UNIT IV**

National Human Rights Commission - State Human Rights Commission – Human Rights Court.

#### **UNIT V**

Human Rights Violations in India- Children – Women – Refugees – Minorities – SCs & ST – Trans-gender.

#### **TEXT BOOK**

Study Material prepared by the faculty in Department of History.

#### **REFERENCE BOOKS**

1. Basu,L.N. (2006). *Human Rights: Practice and Limitations*, Jaipur: Pointer Publishers.
2. Chauhan,S.R, and Chauhan,N.S (ed.), (2007). *International Dimension of the Human Rights*, Vol. I – III, New Delhi: Rajdhani Publishers.
3. Gupta,U.N. (2004). *Human Rights*, Vol.I – IV, New Delhi: Atlantic Publishers.
4. Natarajan,A. (2004). *Human Rights in International Perspectives*, Madurai: Munnetra Pathipagam.
5. Raja Muthirulandi, E. (2003). *Manidha Urimaigal (Tamil)*, Madurai: BPI Publishers.

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Semester: III	<b>WOMEN STUDIES</b>	Hours/Week: 0	
Generic Elective - 1		Credits : 1	
Course Code: <b>18UGEW32</b>		<b>(2018 -19 onwards)</b>	<u>Internal</u> 100

### COURSE OUTCOMES

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

- understand the concept of feminism.
- acquire the knowledge on the atrocities committed against women.
- know more of women's organisations and political rights.
- know about the various government welfare schemes for women.
- gain knowledge on the legal rights of women.
- analyse the real empowerment of women in all fields.

### UNIT I

Women Studies - Definition - Feminism- Kinds of Feminism.

### UNIT II

Violence Against Women – Female Foeticide–Domestic violence - Problems of working women -Eve-Teasing - Sexual Harassment- Portrayal of women in Mass Media.

### UNIT III

Women Indian Association -National Council of Women in India - Self Help Groups – Panchayat Raj and role of women in politics -NGOs and women Development.

### UNIT IV

Central Government's Social Welfare schemes- State Government's Social Welfare Programmes for Women – Women and Children.



## UNIT V

Dowry Prohibition Act 1961 - Equal Remuneration Act 1976 – Hindu Women’s Right to Property Act 1989 – Prohibition of indecent Representation of Women Act 1987 – Domestic Violence (Prevention) Act 2005 – POCSO Act 2012.

## TEXT BOOK

Study Material prepared by the faculty in Department of History.

## REFERENCE BOOKS

1. Anwarul Yaquin, Badar Anwar, (1982). *Protection of Women Under the Law*, New Delhi.
2. Chatterjee, B.B, (1971). *Impact of Social Legislation on Social Change*, Calcutta.
3. Gandhi, M.K., (1962). *Women and Social Injustice*, Ahemadabad.
4. Gangrade, K.D, (1978). *Social Legislation in India, Vol.I and II*, Delhi.
5. Mandakini Das, Pritirekha, Das Pathnayak (ed)., (2010). *Empowering Women: Issues and Challenges and Strategies*, New Delhi.

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Semester: III & IV	<b>CONSTITUTION OF INDIA</b>	Hours/Week: 1 + 1	
Generic Elective - 2		Credits : 1	
Course Code: <b>18UGEC41</b>		<b>(2018 -19 onwards)</b>	<u>Internal</u> 100

### COURSE OUTCOMES

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

- understand the basic tenets of the constitution.
- realize the duties and responsibilities as a citizen of India.
- shine in competitive examinations.
- understand that the constitution is a base for the functioning of the Government
- aware of the actual working of political institutions.
- know the powers of judiciary in the protection of citizen.

### UNIT I

Constituent Assembly - Sources – Salient Features of the Constitution – Fundamental Rights – Fundamental Duties – Directive Principles of State Policy.

### UNIT II

President and Vice-President – Election, Position, Powers and Functions – Prime Minister and his cabinet.

### UNIT III

Indian Parliament – Lok Sabha and Rajya Sabha – Composition – Powers and Functions.

#### **UNIT IV**

Process of Law making – Committee system – Mode of Amendments-  
Constitutional Amendments.

#### **UNIT V**

Judiciary – Supreme Court – Composition - Powers and Functions – Judicial  
Review - State Government – Governor - Chief Minister- High court.

#### **TEXT BOOK**

Study Material prepared by the faculty in Department of History.

#### **REFERENCE BOOKS**

1. Gomathinayagam,P& Anusuya,R. (1980). *Modern Governments*, Rajapalayam:  
Sri Vinayaga Pathipagam.
2. Kapur,A.C. (1975). *Select Constitutions*, New Delhi: S.Chand & Co.
3. Kasthuri,J. (1998). *Modern Governments*, Udumalpet, Ennes Publications.
4. Mahajan, V.D. (1969). *Select Modern Governments*, New Delhi: S.Chand & Co.
5. Ramalingam, T.S. (1971). *Modern Governments*, Madurai, T.S.R. Publications.

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Semester: III & IV	<b>MODERN ECONOMICS</b> <b>(2018-2019 Onwards)</b>	Hours/Week: 1 +1	
Generic Elective - 2		Credits: 1	
Course Code <b>18UGEM42</b>		Internal 100	External -

### COURSE OUTCOMES

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

- understand the economic development and the various sectors of Indian Economy.
- get clear knowledge about economic issues.
- get introduced to the framework of Budgets and Income and Expenditure of the Government.
- understand the role of banks in economic development.
- apply the E-payment methods in day to day life.

**UNIT I: Economic Development:** Economic Development – Meaning – Nature of Indian Economy – Features of Indian Economy - Agriculture and Economic Development – Industrial Sector and Economic Development – LPG – Advantages and Disadvantages – MNCs – Obstacles to Economic Development.

**UNIT II:** Economic Issues: Population growth in India –Causes – Measures –Poverty – Causes – Measures – Unemployment – Causes – Types – Measures.

**UNIT III:** Government Budget and the Economy: Meaning –Types –Principles of Budgeting –Budgetary Procedure –Direct and Indirect Taxes –Merits –Demerits –Causes for Growth of Public Expenditure.

**UNIT IV:** Role of Commercial Banks in Economic Development: Commercial Banks – Classifications – Public Sector Banks – Merits - Private Sector Banks – Merits – Differences between Public Sector Banks and Private Sector Banks - Role of Commercial

Banks in Economic Development —Innovative Schemes for developing Infrastructure – Demonetization – Reasons for Demonetisation – Merits and Demerits of Demonetisation.

**UNIT V: E-Banking:** E-Banking – Advantages – Disadvantages – Mobile Banking – Facilities – Advantages – Disadvantages - Internet Banking – Types – Features – Advantages – Disadvantages – Electronic Payment System (EPS) – Meaning – Benefits – Disadvantages – Methods of EPS– ATM – Debit Card – Credit Card – Smart Card– Electronic Clearing Service (ECS) – National Electronic Funds Transfer (NEFT) – Real Time Gross Settlement (RTGS) - Risks involved in E-Payments – Security tips to overcome Risks in E-Payments

### **TEXT BOOK**

Study Material prepared by the faculty in Department of Commerce and Economics.

### **REFERENCE BOOKS**

1. Sankaran .S, (2012). *Micro Economics*, Chennai: Margham Publications.
2. Sankaran. S, (2012). *Monetary Economics*, Chennai: Margham Publications.
3. Ruddar Dutt and Sundharam. K.P.M., (2017). *Indian Economy*, New Delhi: S. Chand & Company Ltd.
4. Mithani.D.M., (2010). *Money, Banking, Trade and Public Finance*, Mumbai: Himalaya Publishing House.
5. Rama. A and Aruna Devi. A. (2019). *Banking Technology*, Chennai: New Century Book House (P) Ltd.

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Semester: III & IV	<b>ADOLESCENT PSYCHOLOGY</b>  (2018 -19 onwards)	Hours/Week: 1+ 1	
Generic Elective- 2		Credits: 1	
Course Code <b>18UGEA43</b>		Internal 100	External -

### COURSE OUTCOMES

On completion of the course, students will be able to

- gain knowledge regarding the changes in different domains of development during adolescence.
- develop and maintain good relationship with parents and peers.
- aware of the issues challenging adolescents and measures to be taken to prevent those issues.
- face the challenges they face across the life span
- adopt a few counseling techniques.

### UNIT I

Adolescence- Age of adolescence, characteristics, problems of adolescence. Biological transitions, Emotional transitions, Social transitions, Cognitive transitions, Changes in moral behavior, Developmental tasks.

### UNIT II

Challenges of Adolescents-Health issues, Sexually transmitted diseases, Mental health issues, Social issues- Sexual abuse, Substance abuse, Influence of electronic media.

### UNIT III

Development of Self- Identity development and autonomy, self - esteem, Gender and self- regulation. Self-reliance and personal decision making process. Peer Pressure and Family conflicts.

## UNIT IV

Counselling – Styles of Counselling – An effective Counseling relationship-  
Managing crises – Effective Counselor - Maintain boundaries – Taking care of  
ourselves.

## UNIT V

Qualities of a good Counsellors

Empathy – open mindedness – Genuine and Trust Winning – Maintaining  
confidentiality – certain Do's and Dont's.

### Related Experience

Discussion about the problems confronting adolescents today.

Group discussion on the use and misuse of electronic media by adolescents.

Discussion on issues relating to parent, adolescents relationship.

To study about the health problems of adolescents.

To make a study on the stress experience by adolescents.

Critical Analyses issues and debates in Counseling psychology.

Reflect on the their role in different fields of Counseling.

### TEXT BOOK

Study Material prepared by the faculty in Department of Home Science.

### REFERENCE BOOKS

1. Chauhan S. (1983), *Psychology of Adolescence*, New Delhi: Allied Publishers Private Limited.
2. Elizabeth B Hurlock (1985). *Developmental Psychology A Life - Span Approach*, New York: TMH Edition.
3. Aron, A., & Aron, E.N. (1994). *Statistics for Psychology*. New Jersey: Prentice Hall.
4. Miles, J. (2001). *Research Methods and Statics*, Exeter: Crucial.

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Semester: III & IV	<b>DISASTER MANAGEMENT</b>  (2018 -19 onwards)	Hours/Week: 1+ 1	
Generic Elective-		Credits: 1	
Course Code <b>18UGED44</b>		Internal 100	External -

### COURSE OUTCOMES

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

- get a general insight in the dimensions of disasters caused by nature as well as the disasters and environmental hazards induced by human developmental activities
- become aware of the fundamentals of disaster assessment and environmental impact assessment
- become sensitized to the various institutional agencies for disaster management
- be aware of disaster recovery plan
- understand the association at National, State and District level of cope up with disaster

### UNIT I

Disaster – Features and Effects of Disaster – Process of Disaster – Hazards and its Classification – Vulnerability and its Categories - Stages in Disaster – Disaster Management and its Activities – Disaster Management Cycle.

### UNIT II

Earthquake - Factors Determining Earthquakes –Seismic Waves in Earthquake Processes - Magnitude and Intensity - Earthquake Damages - Disaster Management and Earthquake.

Volcanoes - Active and Non-Active Volcanoes - Types of Volcanoes – Landslides - Basic Causes of Landslides – Tsunami - Causes of Tsunami - Tsunami Warning System - Disaster Management Team and Tsunami – Flood - Types of Flood - Damages due to Floods.



### UNIT III

Damage Assessments for Different Disaster – Objectives, Features, Levels, Types: Damage to Buildings, House Property, Land, Crops and Live Stock – Impact of Human Lives – Assessment Damages - Damage Reports: Flash Report, Initial Report, Interim Report, Specialist Report and Final Report – Points to be Considered while Preparing Reports - Reporting Format and Quantification of Needs– Disaster Assistance: Individual Assistance and Public Assistance.

### UNIT IV

National Crisis Management Committee (NCCM), State Crisis Management Group (SCMG): Task, District Disaster Management Committee, Disaster-Related Roles and Resources, Disaster Agencies, Site Operations Centre and Rescue Camps.

### UNIT V

Disaster Mitigation Strategies in Floods and Water Hazards, Earthquakes, Volcanic Eruptions, Landslides, Drought and Desertification – Main Mitigation Strategies - - The Disaster Recovery Planning: Objectives and Phases - Reconstruction and Rehabilitation: Physical, Social, Psychological and Economic rehabilitation.

### TEXT BOOK

Study material prepared by the faculty in Department of Commerce.

### REFERENCE BOOKS

1. Rajdeep Dasgupta. (2011). *Disaster Management and Rehabilitation*, New Delhi: Mittal Publications.
2. Sunder.I. & Sezhiyan.T. (2012). *Disaster Management*, New Delhi : Sarup and Sons.
3. Ramana Murthy.K. (2004). *Disaster Management*, New Delhi: Dominant.



## V.V. VANNIAPERUMAL COLLEGE FOR WOMEN

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VIRUDHUNAGAR - 626 001

### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester IV	<b>INORGANIC , ORGANIC AND PHYSICAL CHEMISTRY-II</b>	Hours/Week: 5	
Core Course-6		Credits: 5	
Course Code <b>18UCHC41</b>		Internal 25	External 75

### COURSE OUTCOMES

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

- understand the chemistry of d block elements.
- gain knowledge on nuclear chemistry.
- know how different configurations decide the properties and geometry of organic compounds.
- get an idea about the chemistry of carbohydrates.
- comprehend about oils and fats.
- apprehend the theory and concepts of Quantum mechanics and their application to simple systems.

### UNIT I

#### Chemistry of d block elements:

Electronic configuration –Oxidation states – complex formation – Non – stoichiometric compounds – example - coinage metals – Resemblance among Cu, Ag and Au – Resemblance between Coinage metals and the Eighth group elements – Extraction and alloys of Cu, Ag & Au. (15 Hours)

### UNIT II

#### Nuclear chemistry

a) Constitution of the nuclei – stable and unstable nuclei – their relationship to n-p ratio- magic number –mass defect and binding energy – whole number rule – packing fraction – mass energy relationship - Soddy's group displacement law.

- b) Artificial radioactivity: Definition – different types of artificial radioactivity brought about by accelerated particles. Nuclear fusion and fission- Theories of fission – application of fission – principle of atom bomb – nuclear fusion – emission of energy – stellar energy and hydrogen bomb.
- c) Applications of radioactivity: Applications in medicine, agriculture and industry – as trace elements in the elucidation of structure and in the investigation of reaction mechanism in analytical chemistry – activation analysis – carbon dating. (15 Hours)

### UNIT III

#### Stereochemistry

- a) Geometrical isomerism – definition – geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes – determination of configuration of geometrical isomers – E, Z – notation.
- b) Optical isomerism:
- i) Optical activity – specific rotation – elements of symmetry – cause for optical activity.
  - ii) Optical isomerism of compounds containing asymmetric carbon atom: optical isomerism of lactic acid and tartaric acid - racemisation and resolution of racemic mixtures – Walden inversion and asymmetric synthesis – chirality – specification of absolute configuration by R and S notation.
  - iii) Optical activity of compounds without asymmetric carbon atoms – allenes, spiranes and biphenyl compounds. (15 Hours)

### UNIT IV

#### Carbohydrates, Oils & Fats

- a) Carbohydrates: Introduction – Classification with example – Monosaccharide – differences between glucose and fructose – configuration of glucose – interconversion of glucose and fructose – ascending and descending of sugar series – mutarotation – epimerization.
- Disaccharide – Properties and structure elucidation of sucrose and maltose – Polysaccharide - Preparation, properties, structure (elucidation not necessary) and industrial uses of starch and cellulose.

b) Oils and fats: Definition- properties-hydrolysis, hydrogenation, hydrogenolysis, drying of oils, rancidification and its types - determination and applications of saponification value, iodine value and acid value - Difference between oils and fats. (15 Hours)

## UNIT V

### Quantum Chemistry

Introduction – Black body radiation and Planck's theory (no derivation) – Compton effect – Photo electric effect – Heisenberg's uncertainty principle - Dualistic nature of matter – de-Broglie equation – derivation - Postulates of quantum mechanics – derivation of Schrodinger's wave equation – its significance – Application of SWE to 1-dimensional and 3-dimensional box. (15 Hours)

### TEXT BOOKS

1. Satya Prakash, Tuli, G.D. Basu, Madan, R. (2011). *Advanced Inorganic Chemistry*, New Delhi: S.Chand & Company, Ltd, 1<sup>st</sup> Edition.
2. Arun Bahl & Bahl B.S, (2009) *Advanced Organic Chemistry*, New Delhi: S.Chand & Company Ltd, 19<sup>th</sup> Edition.
3. Chandra,A.K. (2000). *Introductory Quantum Chemistry*, New Delhi: Tata McGraw Hill Publishing Co., 3<sup>rd</sup> Edition.
4. Prasad.R.K,(2004). *Quantum Chemistry*, New Delhi: New Age International Publishers, 4<sup>th</sup> Edition.

### REFERENCE BOOKS

1. Puri, Sharma, Kalia, (2017). *Principles of Inorganic Chemistry*, New Delhi: Vishal Publishers, 33<sup>rd</sup> Edition.
2. Soni, P.L. (2008). *A Text book of Inorganic Chemistry*, New Delhi: Sultan Chand & Sons, 20<sup>th</sup> Edition.
3. Madan, R.D. (2018). *Modern Inorganic Chemistry*, New Delhi: S.Chand & Company Ltd, 3<sup>rd</sup> Edition.
4. Tewari, K.S. & Vishnoi, N.K. *A Text book of Organic Chemistry*, New Delhi: Vikas Publishing House Pvt. Ltd, 3<sup>rd</sup> Edition.
5. Finar, I.L. (2003).-Volume I, *Organic Chemistry*, Singapore: Pearson Education Pvt. Ltd, 6<sup>th</sup> Edition.

6. Agarwal, O. P. (2017). *Organic Chemistry Reactions and Reagents*, Meerut: GOEL Publishing House, 22<sup>nd</sup> Edition.
7. Soni, P.L, (2008). *Text Book of Physical Chemistry*, New Delhi: Sultan Chand & Sons, 2<sup>nd</sup> Edition.
8. Negi, A.S. & Anand S.C, (2008). *A text book of Physical Chemistry*, New Delhi: A New Age International Publishers, 2<sup>nd</sup> Edition.
9. Puri, Sharma, Pathania, (2008). *Elements of Physical Chemistry*, Delhi: Vishal Publishing & Co, Jalandhar, 4<sup>th</sup> Edition.
10. Lee, J.D. (2007). *Concise Inorganic Chemistry*, Malden USA: 4<sup>th</sup> Edition.



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VIRUDHUNAGAR - 626 001

### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester IV	<b>LEATHER CHEMISTRY</b>	Hours/Week: 2	
Skill Enhancement Course- 3		Credits: 2	
Course Code <b>18UCHS41</b>		Internal 40	External 60

### COURSE OUTCOMES

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

- get a brief history of tanning industry and leather manufacturing processes.
- understand various steps involved in processing of leather.
- know about different tanning methods.
- understand the finishing processes of tanning.
- get an insight of pollution caused by tannery industries and prevention.

### UNIT I

History of tanning industry - chief processes involved in leather manufacture – Structure of hide and skin. (6 Hours)

### UNIT II

Detailed study of leather processing – Flaying – Curing – Drying – Salt curing - Brine curing-Beam house processes – Soaking – Unhairing – Liming – Fleshing – Deliming – Bating -Pickling. (6 Hours)

### UNIT III

Tanning process – Different tannage materials - Methods of tanning – Vegetable tanning – Chrome tanning – one bath method – Two bath method - aldehyde tannage. (6 Hours)

#### **UNIT IV**

Finishing processes after tanning – removal of surplus tan liquor – washing – neutralizing – trimming – removal of excess of water – retanning – dyeing - fat liquoring - drying. (6 Hours)

#### **UNIT V**

Pollution due to tanneries – effect of pollutants - Treatment of tannery effluents - primary, secondary and tertiary processes. (6 Hours)

#### **TEXT BOOKS**

Jayashree Ghosh , (2013). *Fundamental Concepts of Applied chemistry*, New Delhi:S.Chand & Company LTD, 1<sup>st</sup> Edition.

#### **REFERENCE BOOKS**

Sharma, B.K. (2008), *Industrial Chemistry*, Meerut: GOEL Publishing House, 13<sup>th</sup> Edition.



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### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester IV	<b>DRUGS AND NATURAL PRODUCTS</b>	Hours/Week: 2	
Non Major Elective Course-2		Credits: 2	
Course Code <b>18UCHN41</b>		Internal 40	External 60

### COURSE OUTCOMES

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

- know the terminologies of drugs
- comprehend about antibiotics.
- apprehend about chemotherapy
- gain knowledge on the biological role of various vitamins and steroids.
- gain knowledge about the uses of terpenoids.
- know the medicinal uses of alkaloids.

### UNIT I

Importance of Drugs –terminologies – Pharmacy – Pharmacology – Pharmacodynamics – Pharmacokinetics – Molecular Pharmacology – Pharmacophore – antimetabolites – actinomycetes - Bacteria, Virus, fungi –mutation. (6 Hours)

### UNIT II

Antibiotics – Definition-classification-uses of Ampicillin, streptomycin, Erythromycin, tetracycline, rifomycin (structure not necessary) – drug action and side effects. (6 Hours)



### UNIT III

Chemotherapy-introduction-classification-Definition and examples of Antipyretics- Analgesics - Anti-inflammatory agents - Sulpha drugs- Antimalarials- Antiseptics (structure not necessary) (6 Hours)

### UNIT IV

Vitamin – Classification – Sources and deficiency of various vitamins. (structure not necessary)

Steroids – Classification- biological importance of Male sex hormone, Female sex hormone . (structure not necessary) (6Hours)

### UNIT V

Terpenoids: Definition – classification – occurrence – uses of citral, geraniol, limonene, menthol and zingiberene. (structure not necessary)

Alkaloids: Definition – classification - occurrence – medicinal uses of quinine, atropine, morphine, nicotine and papavarine. (structure not necessary) (6 Hours)

### TEXT BOOKS

1. Jayashree Ghosh, (2012). *A Text Book of Pharmaceutical Chemistry*, New Delhi: S.Chand & Company Ltd, 1<sup>st</sup> Edition.
2. Jain, M.K. & Sharma, S.C. (2016). *Modern Organic Chemistry*, New Delhi: Vishal Publishing Co, 1<sup>st</sup> Edition.



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### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester IV	<b>INORGANIC SEMI MICRO QUALITATIVE ANALYSIS</b>	Hours/Week: 2	
Core Practical - 2		Credits: 2	
Course Code <b>18UCHC41P</b>		Internal 40	External 60

Analysis of a mixture containing two anions of which one is an interfering ion and two cations by semi – micro method.

#### Anions:

Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, borate, phosphate, arsenite, and chromate.

#### Cations:

Lead, bismuth, copper, cadmium, aluminium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, magnesium and ammonium.

#### Distribution of Marks:

Max. Marks: 100

Ext: 60

Int: 40

Record Notebook - 10 marks

Two anions with correct procedure (2x 10) - 20 marks

Two anions with correct procedure (2x 15) - 30 marks

Total - 60 marks



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### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester III	<b>GENERAL CHEMISTRY-I</b>	Hours/Week: 4	
Allied Course-II		Credits: 4	
Course Code <b>18UCHA31</b>		Internal 25	External 75

### COURSE OUTCOMES

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

- know about the periodicity of properties in the long form of the periodic table.
- gain information about the purification of organic compounds.
- know about the classification of organic reagents and reactions.
- learn the types of adsorption, catalyst and colloids.
- gain knowledge about the laboratory reagents and their uses.
- comprehend the ways of expressing the various concentrations of solutions.
- apprehend the types of pollution, their sources, impacts and preventive measures.

### UNIT I

#### Periodic Table and Periodic Properties:

Long form of periodic table – characteristics - classification of elements on the basis of electronic configuration – periodicity of properties – causes of periodicity – factors affecting the magnitude of periodic properties – atomic, covalent and ionic radii – electron affinity – ionization energy – electro negativity – Pauling and Mulliken scale – Alfred and Rochow's scale – applications of electronegativity. (12 Hours)

### UNIT II

#### Laboratory chemicals and reagents

- a) Laboratory chemicals and reagents – different grades – commercial, LR, GR, AR, Chromatographic pure and spectral pure.

- b) Preparation of reagents in the laboratory – Tollen’s reagent – neutral  $\text{FeCl}_3$  – Borsche’s reagent – Schiff’s reagent – Fehling solution A & B.
- c) Units of concentration of solution – Normality, Molarity, Molality, Mole fraction, Mass percentage and Volume percentage – Simple problems dealing with the preparation of reagents. (12 Hours)

### UNIT III

#### Adsorption, Catalysis and Colloids

- a) Adsorption – Characteristics – Types of adsorption – Applications of adsorption.
- b) Catalysts – characteristics – different types with examples – catalytic poisoning – catalytic promoters with example.
- c) Colloids – definition and classification - Sols – different types – examples – Emulsion – Types of emulsion – examples - Gels – Types of gels – examples. (12 Hours)

### UNIT IV

#### Purification and Classification of Organic reagents and reactions

- a) Purification of organic compounds – Distillation – fractional distillation – distillation under reduced pressure – steam distillation – Crystallization – fractional crystallization – sublimation – chromatographic techniques – column and thin layer chromatography (brief study)
- b) Classification of organic reagents: Electrophiles – nucleophiles – free radicals – examples – Reactions: Addition – substitution – elimination – polymerization – rearrangement with an example for each. (12 Hours)

### UNIT V

#### Pollution:

- a) Air Pollution: Definition – air pollutants – sources – effects of air pollutants – Ozone layer formation and depletion – green house effect – acid rain – preventive measures of air pollution.
- b) Water pollution: sources – waste water (sewage) treatment – industrial and municipal water treatment.
- c) Radioactive pollution: sources – nuclear waste disposal – Effects of radiations.
- d) Soil pollution – sources and control. (12 Hours)

### TEXT BOOKS

1. Satya Prakash, Tuli, G.D. Basu, Madan, R.D. (2011). *Advanced Inorganic Chemistry*, Vol-1, New Delhi: S.Chand & Company. Ltd, 1<sup>st</sup> Edition.
2. Arun Bahl & Bahl B.S. (2012). *Advanced Organic Chemistry*, New Delhi: S.Chand & Company Ltd, 19<sup>th</sup> Edition.
3. Soni, P.L. (2008). *Text Book of Physical Chemistry*, New Delhi: Sultan Chand & Sons, 2<sup>nd</sup> Edition.

### REFERENCE BOOKS

1. Puri, Sharma, Kalia, (2008). *Principles of Inorganic Chemistry*, New Delhi: Milestone Publishers, Jalandhar, 2<sup>nd</sup> Edition.
2. Soni, P.L. (2008). *A Text book of Inorganic Chemistry*, New Delhi: Sultan Chand & Sons, 2<sup>nd</sup> Edition.
3. Madan, R.D. (1986). *Modern Inorganic Chemistry*, New Delhi: S.Chand & Company Ltd, 1<sup>st</sup> Edition.
4. Tewari, K.S. & Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*, New Delhi: Vikas Publishing House Pvt. Ltd, 3<sup>rd</sup> Edition.
5. Negi, A.S. & Anand S.C., (2008), *A Text Book of Physical Chemistry*, New Delhi: A New Age International Publishers, 2<sup>nd</sup> Edition.
6. Puri, Sharma, Pathania (2016), *Elements of Physical Chemistry*, Jalandhar, Delhi: Vishal Publishing & Co, 4<sup>th</sup> Edition.



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### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester IV	<b>GENERAL CHEMISTRY-II</b>	Hours/Week: 4	
Allied Course-II		Credits: 4	
Course Code <b>18UCHA41</b>		Internal 25	External 75

### COURSE OUTCOMES

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

- know about the chemistry of biomolecules such as carbohydrates, proteins, amino acids and nucleic acids.
- understand the basic processes of metallurgy.
- know about oils and fats.
- gain knowledge on soaps and detergents.
- comprehend the basic concepts of fuels and fertilizers.
- learn about the hardness of water.
- gain knowledge about the basic principles of spectroscopy and their applications.

### UNIT I

#### Chemistry of Biomolecules:

- a) Carbohydrates – classification – Monosaccharide – Glucose – fructose – difference between them – Inter conversion of glucose and fructose – Haworth structure of glucose and fructose – properties and structure of starch and cellulose – Derivatives of cellulose and their uses
- b) Amino acids – classification – preparation – properties – Zwitter ion – isoelectric point – Test for amino acids
- c) Proteins – classification – biological function – colour reaction of proteins
- d) Nucleic acids – RNA and DNA – Biological function (Elementary idea only)

(12 Hours)

## UNIT II

### Metallurgy:

Ores, Minerals – various steps in the metallurgical process – Froth floatation – Calcination – roasting – Leaching – Smelting – Mond's process – van Arkel-de Boer's process – Zone refining – Electrolytic refining – Extraction of Titanium. (12 Hours)

## UNIT III

### Oils, Fats, Soaps, Detergents and Water technology

- Oils & fats: Definition - Differences between oils & fats – Saponification value – Iodine value – Determination of saponification and iodine value – uses of oils & fats.
- Soaps and Detergents: Soap – definition – different types – manufacture of soap by Kettle process – cleansing action of soap. Detergents – definition – synthetic detergent – example of cationic and anionic detergents – Distinction between soaps and detergents.
- Hardness of water – types of hardness – Removal of hardness: Permutit method and Ion-exchange process. (12 Hours)

## UNIT IV

### Fuels and Fertilizers

- Fuels – classification – advantages of gaseous fuels – constituents and uses of water gas, producer gas, LPG, gobar gas and natural gas.
- Fertilizers – classification – macro and micro nutrients – functions of nutrients – Preparation and uses of Urea, ammonium sulphate, Super phosphate, Triple super phosphate, Potassium nitrate and NPK. (12 Hours)

## UNIT V

### Basic principles of spectroscopy

- Basic principles of UV, IR and NMR spectroscopy.
- Identification of ethanol and diethyl ether by IR spectroscopy.
- Identification of 1,3-butadiene and benzene by UV spectroscopy.
- NMR – chemical shift – reference standard – TMS – NMR spectrum of ethanol.

## TEXT BOOKS

1. Satya Prakash, Tuli, G.D. Basu, Madan, R.D. (2011). *Advanced Inorganic Chemistry*, Vol II, New Delhi: S.Chand & Company Ltd, 1<sup>st</sup> Edition.
2. Arun Bahl & Bahl, B.S. (2014). *Advanced Organic Chemistry*, New Delhi: S.Chand & Company Ltd, 19<sup>th</sup> edition.
3. Soni, P.L. (2008). *Text Book of Physical Chemistry*, New Delhi: Sultan Chand & Sons, 2<sup>nd</sup> Edition.

## REFERENCE BOOKS

1. Puri, Sharma, Kalia, (2017). *Principles of Inorganic Chemistry*, New Delhi: Vishal Publishers, 33<sup>rd</sup> Edition.
2. Soni P.L. (2008). *A Text Book of Inorganic Chemistry*, New Delhi: Sultan Chand & Sons, 2<sup>nd</sup> edition.
3. Madan, R.D. (2013). *Modern Inorganic Chemistry*, New Delhi: S.Chand & Company Ltd, 3<sup>rd</sup> Edition.
4. Tewari, K.S. & Vishnoi, N.K. (2006). *A Text book of Organic Chemistry*, New Delhi: Vikas Publishing House Pvt. Ltd, 3<sup>rd</sup> Edition.
5. Negi, A.S. & Anand, S.C. (2008). *A text book of Physical Chemistry*, New Delhi: A New Age International Publishers, 2<sup>nd</sup> Edition.
6. Puri, Sharma, Pathania, (2016). *Elements of Physical Chemistry*, Jalandhar, Delhi: Vishal Publishing & Co, 4<sup>th</sup> Edition.
7. Sharma, Y.R. (2007). *Elementary Organic Spectroscopy*, New Delhi: S.Chand , 4<sup>th</sup> Edition.





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### B.Sc. CHEMISTRY (SEMESTER)

(2018 -19 onwards)

Semester: IV	<b>VOLUMETRIC ANALYSIS</b>	Hours/Week: 2	
<b>Allied Course Practical-II</b>		Credits: 2	
Course Code <b>18UCHA41P</b>		Internal 40	External 60

A double titration involving making up of the solution to be estimated or single titration involving making up of the solution to be estimated and the preparation of a primary standard

#### a. Acidimetry and Alkalimetry:

1. Titration between a strong acid and strong base.
2. Titration between a strong acid and weak base.
3. Titration between a weak acid and strong base

#### b. Permanganimetry:

Titration between potassium permanganate and

- i) oxalic acid ii) ferrous sulphate and iii) ferrous ammonium sulphate (Mohr's salt)

#### c. Iodometry:

Titration between sodium thiosulphate and i) potassium permanganate  
ii) potassium dichromate.

#### Distribution of Marks:

Max. Marks: 100

Ext: 60

Int: 40

Record Note Book - 10 marks

Procedure - 10 marks

Estimation - 40 marks

Total - 60 marks

Error	Marks
<2%	40
2-3 %	35
3-4%	30
> 4%	20