# MANNAR THIRUMALAI NAICKER COLLEGE

# PASUMALAI, MADURAI– 625 004

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

(Re-accredited with 'A' Grade by NAAC)

## B.Sc., Chemistry

## SYLLABUS AND REGULATIONS

UNDER
CHOICE BASED CREDIT SYSTEM (CBCS)
**(For those who joined during 2018-2019 and after)**

**Qualification for Admission**

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu, CBSE Board with Chemistry as one of the subjects in Higher Secondary Education.

**Duration of the Course**

The students shall undergo the prescribed B.Sc(Chemistry) course of study for a period of three academic years (six semesters).

**Subject of Study**

Part I: Tamil
Part II: English
Part III:
1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :
1. Non Major Electives
2. Skill Based Subjects
3. Environmental Studies
4. Value Education

Part V :
Extension activities

**The scheme of Examination**

The components for continuous internal assessment are:

| | |
|---|---|
| Two tests and their average | --15 marks |
| Seminar /Group discussion | --5 marks |
| Assignment | --5 marks |
| Total | --25 marks |

**Pattern of the questions paper for the continuous Internal Assessment**

**(For Part I, Part II, Part III , NME & Skilled Paper in Part IV )**

The components for continuous internal assessment are:

**Part –A**
Six multiple choice questions (answer all) 6 x01= 06 Marks
**Part –B**
Two questions (‘either …. or ‘type) 2 x 07=14 Marks
**Part –C**
One question out of two 1 x 10 =10 Marks

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Total 30 Marks

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Pattern of the question paper for the Summative Examinations:
**Note: Duration- 3 hours**
**Part –A**
Ten multiple choice questions 10 x01 = 10 Marks
(No Unit shall be omitted; not more than two questions from each unit.)
**Part –B**
Five Paragraph questions (‘either …. or ‘type) 5 x 07 = 35 Marks
(One question from each Unit)
**Part –C**
Three Essay questions out of five 3 x 10 =30 Marks
(One question from each Unit)

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Total 75 Marks

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**The Scheme of Examination (Environmental Studies and Value Education)**

| | |
|---|---|
| Two tests and their average | --15 marks |
| Project Report | --10 marks* |
| Total | --25 marks |

** The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

**Question Paper Pattern**

**Pattern of the Question Paper for Environmental Studies & Value Education only) (Internal)**

**Part –A**

(Answer is not less than 150 words)

Four questions (‘either …. or ‘type) 4 x 05=20 Marks

**Part –B**

(Answer is not less than 400 words)

One question (‘either …. or ‘type) 1 x 10=10 Marks

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Total 30 Marks

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**Pattern of the Question Paper for Environmental Studies & Value Education only) (External)**

**Part –A**

(Answer is not less than 150 words)

Five questions (either or type) 5 x 06 =30 Marks

(One question from each Unit)

**Part –B**

(Answer is not less than 400 words)

Three questions out of Five 3 x 15 = 45 Marks
each unit (One question from each Unit)

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**Total** 75 Marks

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**Minimum Marks for a Pass**

40% of the aggregate (Internal +Summative Examinations).
No separate pass minimum for the Internal Examinations.
27 marks out of 75 is the pass minimum for the Summative Examinations.

## PROGRAMME SPECIFIC OUTCOMES

**PSO1:** To ability to employ critical thinking and efficient problem-solving skills in the areas of analytical, inorganic, organic, and physical chemistry.

**PSO2**: To demonstrate proficiency in writing and speaking about chemistry topics in a clear and concise manner to both chemists and non-chemists according to professional standards

**PSO3:** To conceptualize and apply the ideas of chemical sciences in the areas of organic synthesis, synthesis of materials, corrosion inhibition, environment sustainability etc.

**PSO4**: To demonstrate proficiency in the use of appropriate instrumentation to collect and record data from chemical experiments

**MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)**
**DEPARTMENT OF B.Sc CHEMISTRY**
**(For those who joined in 2018 and after)**

**COURSE PATTERN**

| Study Component | I Sem | II Sem | III Sem | IV Sem | V Sem | VI Sem | Total Hours | Total Credit | No. of course | Total marks |
|---|---|---|---|---|---|---|---|---|---|---|
| Part – I Tamil | 6(3) | 6(3) | 6(3) | 6(3) | | | 24 | 12 | 4 | 400 |
| Part –II English | 6(3) | 6(3) | 6(3) | 6(3) | | | 24 | 12 | 4 | 400 |
| Part –III | | | | | | | | | | |
| Core subjects | 4(4)<br>2(0) | 4(4)<br>2(2) | 4(4)<br>2(0) | 4(4)<br>2(2) | 5(5)<br>5(5)<br>3(0)<br>3(0)<br>2(0) | 5(5)<br>5(5)<br>3(6)<br>3(5)<br>2(4) | 60 | 55 | 13 | 1300 |
| Core Elective | | | | | 4(4) | 4(4) | 8 | 8 | 2 | 200 |
| Allied Physics | 4(4)<br>2(0) | 4(3)<br>2(1) | 4(4)<br>2(0) | 4(3)<br>2(1) | | | 24 | 16 | 6 | 600 |
| Allied Mathematics | | | 4(4) | 4(4) | 6(4) | 6(4) | 20 | 16 | 4 | 400 |
| Part-IV | | | | | | | | | | |
| Skill Based Subjects | 2(2)<br>2(2) | 2(2)<br>2(2) | | | 2(2) | 2(2) | 12 | 12 | 6 | 600 |
| Environment studies / value education | 2(2) | 2(2) | | | | | 4 | 4 | 2 | 200 |
| Non-Major Elective | | | 2(2) | 2(2) | | | 4 | 4 | 2 | 200 |
| Part V | | | | | | | | | | |
| Extension Activities | | | | 0(1) | | | 0 | 1 | 1 | 100 |
| Total | **30 (20)** | **30 (22)** | **30 (20)** | **30 (23)** | **30 (20)** | **30 (35)** | **180** | **140** | **44** | **4400** |

| SEMESTER – I | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subject Code** | **Title of the Paper** | **No. of Courses** | **Hours/ Week** | **Credits** | **Maximum Marks** | | |
| | | | | | **Int** | **Ext** | **Tot** |
| 18UTAG11 | **Part-I: Tamil**<br>தற்கால கவிதையும் உரைநடையும் | 1 | 6 | 3 | 25 | 75 | 100 |
| 18UENG11 | **English-II:**<br>Exploring Language Through Literature-I | 1 | 6 | 3 | 25 | 75 | 100 |
| | **Part-III Core Subject** | | | | | | |
| 18UCHC11 | Inorganic Chemistry -I | 1 | 4 | 4 | 25 | 75 | 100 |
| ~~18UCHCP1~~ | Major Chemistry Practical – I<br>(Inorganic semi micro Qualitative analysis) | - | 2 | - | - | - | - |
| | **Part-III Allied Subject** | | | | | | |
| 18UPHA11 | Allied Physics – I<br>(Mechanics, Properties of matter and Relativity) | 1 | 4 | 4 | 25 | 75 | 100 |
| ~~18UPHAP1~~ | Allied Physics Practical-I | | 2 | - | - | - | - |
| | **Part-IV Skill Subject** | | | | | | |
| 18UCHS11 | Sugar Technology | 1 | 2 | 2 | 25 | 75 | 100 |
| 18UCHS12 | Perfume Chemistry | 1 | 2 | 2 | 25 | 75 | 100 |
| | **Part-IV Mandatory Subject** | | | | | | |
| 18UEVG11 | Environmental Studies | 1 | 2 | 2 | 25 | 75 | 100 |
| | **TOTAL** | **7** | **30** | **20** | **175** | **525** | **700** |

## SEMESTER – II

| Subject Code | Title of the Paper | No. of Courses | Hours/ Week | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | Int | Ext | Total |
| 18UTAG21 | **Part I:Tamil**<br>பக்தி இலக்கியமும் நாடகமும் | 1 | 6 | 3 | 25 | 75 | 100 |
| 18UENG21 | **Part II : English**<br>Exploring Language Through Literature-II | 1 | 6 | 3 | 25 | 75 | 100 |
| | **Part-III Core Subject** | | | | | | |
| 18UCHC21 | Organic Chemistry-I | 1 | 4 | 4 | 25 | 75 | 100 |
| 18UCHCP1 | Major Chemistry Practical – I (Inorganic semi micro Qualitative analysis) | 1 | 2 | 2 | 40 | 60 | 100 |
| | **Part-III Allied Subject** | | | | | | |
| 18UPHA21 | Allied Physics –II | 1 | 4 | 3 | 25 | 75 | 100 |
| 18UPHAP1 | (Thermal Physics and Sound )<br>Allied Physics Practical – I | 1 | 2 | 1 | 40 | 60 | 100 |
| | **Part-IV Skill Subject** | | | | | | |
| 18UCHS21 | Leather Technology | 1 | 2 | 2 | 25 | 75 | 100 |
| 18UCHS22 | Paper and Pulp Technology | 1 | 2 | 2 | 25 | 75 | 100 |
| 18UVLG21 | **Part –IV Mandatory Subject**<br>Value Education | 1 | 2 | 2 | 25 | 75 | 100 |
| | **Total** | **9** | **30** | **22** | **255** | **645** | **900** |

**SEMESTER –III**

| Subject Code | Title of the Paper | No. of Courses | Hours /Week | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | Int | Ext | Total |
| 18UTAG31 | **Part –I Tamil**<br>காப்பிய இலக்கியமும் சிறுகதையும் | 1 | 6 | 3 | 25 | 75 | 100 |
| 18UENG31 | **Part –II English Subject**<br>Exploring Language Through Literature-III | 1 | 6 | 3 | 25 | 75 | 100 |
| | Part-III Core Subject | | | | | | |
| 18UCHC31 | Physical Chemistry-I | 1 | 4 | 4 | 25 | 75 | 100 |
| ~~18UCHCP2~~ | Volumetric Analysis Practical | - | 2 | - | - | - | - |
| | Part-III Allied Subject | | | | | | |
| 18UMCA32 | Allied Mathematics-I | 1 | 4 | 4 | 25 | 75 | 100 |
| 18UPHA31 | Allied Physics – III<br>(Electricity and Electronics) | 1 | 4 | 4 | 25 | 75 | 100 |
| ~~18UPHAP2~~ | Allied Physics Practical – II | - | 2 | 0 | - | - | - |
| | **Part-IV Non Major Elective** | | | | | | |
| 18UCHN31 | Waste Water Treatment | 1 | 2 | 2 | 25 | 75 | 100 |
| | **Total** | **6** | **30** | **20** | **150** | **450** | **600** |

**SEMESTER IV**

| Subject Code | Title of the Paper | No. of Courses | Hours /Week | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | Int | Ext | Total |
| 18UTAG41 | **Part –I Tamil**<br>பழந்தமிழ் இலக்கியமும் புதினமும் | 1 | 6 | 3 | 25 | 75 | 100 |
| 18UENG41 | **Part –II English Subject**<br>Exploring Language Through Literature-IV | 1 | 6 | 3 | 25 | 75 | 100 |
| | **Part-III Core Subject** | | | | | | |
| 18UCHC41 | Inorganic Chemistry - II | 1 | 4 | 4 | 25 | 75 | 100 |
| 18UCHCP2 | Volumetric Analysis Practical | 1 | 2 | 2 | 40 | 60 | 100 |
| | **Part-III Allied Subject** | | | | | | |
| 18UMCA42 | Allied Mathematics – II | 1 | 4 | 4 | 25 | 75 | 100 |
| 18UPHA41 | Allied Physics - IV<br>(Optics and Modern Physics) | 1 | 4 | 3 | 25 | 75 | 100 |
| 18UPHAP2 | Allied Physics Practical -II | 1 | 2 | 1 | 40 | 60 | 100 |
| | **Part IV -Non Major Elective** | | | | | | |
| 18UCHN41 | Polymer Chemistry | 1 | 2 | 2 | 25 | 75 | 100 |
| 18UEAG40 - 18UEAG49 | **Part V- Extension Activities** | 1 | 0 | 1 | 100 | - | 100 |
| | **Total** | **9** | **30** | **23** | **355** | **645** | **900** |

**SEMESTER – V**

| Subject Code | Title of the Paper | No. of Courses | Hours /Week | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | Int | Ext | Total |
| | **Part-III Core Subject** | | | | | | |
| 18UCHC51 | Organic Chemistry-II | 1 | 5 | 5 | 25 | 75 | 100 |
| 18UCHC52 | Physical Chemistry-II | 1 | 5 | 5 | 25 | 75 | 100 |
| 18UCHCP3 | Physical Chemistry experiments (Practical) | | 3 | 0 | | | |
| 18UCHCP4 | Gravimetric Analysis and Organic Preparation (Practical) | | 3 | 0 | | | |
| 18UCHCP5 | Organic Analysis and Estimation (Practical) | | 2 | 0 | | | |
| | **Part-III Allied Subject** | 1 | 6 | 4 | 25 | 75 | 100 |
| 18UMCA52 | Allied Mathematics – III | | | | | | |
| **18UCHE51** | **Part- III Core Elective Inorganic and Analytical Chemistry** | 1 | 4 | 4 | 25 | 75 | 100 |
| 18UCHE52 | Bioinorganic Chemistry | | | | | | |
| 18UCHE53 | Clinical and Medicinal Chemistry | | | | | | |
| | **Part-IV Skill Subject** | | | | | | |
| 18UCHS51 | Drug Chemistry | 1 | 2 | 2 | 25 | 75 | 100 |
| | **Total** | **5** | **30** | **20** | **125** | **375** | **500** |

**SEMESTER – VI**

| Subject Code | Title of the Paper | No. of Courses | Hours /Week | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|
| | | | | | Int | Ext | Total |
| | **Part-III Core Subject** | | | | | | |
| 18UCHC61 | Organic Chemistry-III | 1 | 5 | 5 | 25 | 75 | 100 |
| 18UCHC62 | Physical Chemistry-III | 1 | 5 | 5 | 25 | 75 | 100 |
| 18UCHCP3 | Physical Chemistry experiments (Practical) | 1 | 3 | 6 | 40 | 60 | 100 |
| 18UCHCP4 | Gravimetric Analysis and Organic Preparation | 1 | 3 | 5 | 40 | 60 | 100 |
| 18UCHCP5 | (Practical) Organic Analysis and Estimation (Practical) | 1 | 2 | 4 | 40 | 60 | 100 |
| | **Part-III Allied Subject** | | | | | | |
| 18UMCA62 | Allied Mathematics – IV | 1 | 6 | 4 | 25 | 75 | 100 |
| | **Part- III Core Elective** | | | | | | |
| **18UCHE61** | **Applied Chemistry** | 1 | 4 | 4 | 25 | 75 | 100 |
| 18UCHE62 | Nanochemistry | | | | | | |
| 18UCHE63 | Fundamentals of Computer and Green Chemistry | | | | | | |
| | **Part-IV Skill Subject** | | | | | | |
| 18UCHS61 | Macromolecular Chemistry | 1 | 2 | 2 | 25 | 75 | 100 |
| | **Total** | **8** | **30** | **35** | **245** | **555** | **800** |

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**DEPARTMENT OF CHEMISTRY**
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| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part III** | **: Core** |
| **Semester** | **: I** | **Hours** | **: 04** |
| **Subject Code** | **: 18UCHC11** | **Credits** | **: 04** |

**Inorganic Chemistry-I**

**Course Outcome:**

**CO1: To understand the basic concept of structure of atom and chemical bonding**
**CO2: To gain the basic knowledge about periodic table and nuclear chemistry**
**CO3: To understand about hydrogen, water and Hydrogen peroxide**

**Unit-I**
**Structure of atom:**

An outline of constituents of atom (elementary idea) – Mosley's determination of atomic number – mass number. Quantum theory: Black body radiation – photo electric effect – Compton effect – Bohr model of atom: postulate and hydrogen spectrum – de Broglie's equations – Heizenberg's uncertainty principle – Quantum numbers – Pauli's exclusion principle – Aubau principle – Hund's rule – electronic configuration of atoms.

**Unit – II**
**Periodic table and atomic properties:**

Modern periodic table – salient features – classification and characterization of s, p, d and f blocks elements – periodicity – cause – atomic properties – atomic radii and ionic radii – their periodic trends – ionization energy – factors determining ionization energy – periodic trends – electron affinity – periodic trends – electron negativity - factors determining electro negativity and their periodic trends – application of electro negativities

**Unit-III**
**Chemical bonding**

Cause of chemical bonding – octet rule – ionic bond – covalent bond – valence bond approach- its limitations – Fajan's rule – VSEPR theory – application of VSEPR theory to find geometry of molecules – hybridization – $sp, sp^2, sp^3, sp^3d^2$ and ($BeF_2$,$BCl_3$,$CH_4$,$SF_6$,$H_20$)- Molecular Orbital theory – LCAO method – MO diagram for homo nuclear and hetero nuclear diatomic molecules – $H_2$, $He_2$, $Li_2$, $Be_2$,$C_2$, $N_2$,$O_2$, $F_2$,CO and HF – determination of magnetic property and bond order

**Unit IV**

**Nuclear Chemistry:**

a. Composition of nucleus – Packing fraction and stability of nucleus – binding energy and stability of nucleus.
b. Nuclear models: Nuclear shell model, nuclear liquid drop model.
c. Nuclear fission – controlled release of fission energy – Nuclear reactors – Thermal Reactors – Fast breeder reactors – Disposal of radioactive waste from nuclear reactors – plutonium bomb
d. Nuclear fusion – Nuclear fusion in sun's atmosphere, stellar energy-Hydrogen bomb
e. Radioactivity – definition – characteristics of Radiations – Radioactive tracer and their Applications – Carbon Dating.

**Unit V**

a) **Hydrogen:**

Position of hydrogen in periodic table – resemblance of hydrogen with alkali metals – resemblance with halogens – special position of hydrogen – resemblance with carbon – preparation – manufacture – pure hydrogen – ortho and para hydrogen – occluded hydrogen – uses – Isotopes of hydrogen – Isotopic effect – hydrides – classification – examples.

b) **Water:**

Hardness of water – types of hardness – removal of hardness – industrial implications of hardness in water – estimation by EDTA method – units of hardness of water

c) **Hydrogen peroxide:**

Manufacture – properties – structure and uses – estimation by permanagano metric and iodimetric method – strength of hydrogen peroxide

**Text Book:**

1. B.R. Puri, L.R.Sharma & K.C. Kalia, **Principles of Inorganic Chemistry** Milestone Publisher 31st edition, New Delhi (2011-12)

**References:**

1. Puri, Sharma & Kalia, **Principles of Inorganic Chemistry** Milestone publisher & distributor, New Delhi (2009)
2. R.D Madan S.Chand, **Modern Inorganic Chemistry** band Co.Ltd, New Delhi (2012)
3. JD.Lee, Wiley India, **Concise Inorganic Chemistry** 5th Edition, New Delhi (2009)

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**DEPARTMENT OF CHEMISTRY**
**(For those who joined in 2018-2019 and after)**

| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part III** | **: Core** |
| **Semester** | **: I & II** | **Hours** | **: 02** |
| **Subject Code** | **: 18UCHCP1** | **Credits** | **: -** |

## Inorganic Semi micro Qualitative analysis - Lab

**Course Outcomes**

**CO1: To know about the identification of anions.**
**CO2: To understand the basic idea of identification of lotions.**
**CO3: To have an idea about how to confirm the acid & basic radicals.**

**Duration of examination**: 3hrs

Analysis of a mixture containing two anions of which one is an interfering in semi-micro method two cations

**Anions:**

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

**Cations:** Lead, bismuth, copper, cadmium, antimony, iron (II and III), aluminium, Chromium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, Magnesium and ammonium.

**Distribution of marks**

**Max marks: 100**

| **Internal : 40 marks** | | | **External : 60 marks** | | |
|---|---|---|---|---|---|
| Laboratory Performance | : | 30 marks | Vivo voce | : | 10 marks |
| Observation note book | : | 10 marks | Record note book | : | 10 marks |
| | | | Four radicals with correct procedure | : | 40 marks |
| Total | : | 40 marks | Total | : | 60 marks |

**MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)**
**DEPARTMENT OF B.Sc CHEMISTRY**
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**Class : B.Sc (Chemistry)** **Part III : Allied**
**Semester : I** **Hours : 4**
**Subject Code :18UPHA11** **Credits : 4**

## ALLIED PHYSICS– I
## Mechanics, Properties of Matter and Relativity

**Course Outcomes:**

**CO1: To understand the basics concepts of physics in everyday life.**
**CO2: To differentiate the three states of matter.**
**CO3: To understand all the phenomena are relative in nature.**
**CO4: To develop the skill in the area of properties of Matter.**

**Unit: I**

Basic forces in nature – Central forces – Conservative – Non conservative force - Friction – Work – Work done by the variation force – Energy – Expression for kinetic energy – Expression for potential energy – Power – Newton's laws of motion – Collision – elastic and Inelastic collision.

**Unit: II**

Kepler's laws of planetary motion- Newton's laws of gravitation – Mass and density of Earth – Boy's method for G – Compound pendulum - Expression for period - Experiment to find "g" - Variation of g with latitude, altitude and depth – Artificial Satellites.

**Unit: III**

Elasticity – Different moduli of Elasticity-Poisson's ratio – Bending of beams – Expression for bending moment – determination of Young's modulus by uniform and non uniform bending – Torsion – expression for couple per unit twist – Work done in twisting – Rigidity modulus by torsion pendulum.

**Unit: IV**

Viscosity - Derivation of Poiseuille's formula (analytical method) - Poiseuille's method for determining coefficient of viscosity of a liquid – Equation of continuity - Bernoulli's thorem – derivation – Applications of Bernoulli's thorem (Venturimeter and Pitot tube).

**Unit: V**

Frames of reference – Inertial frames and non- Inertial frames -Galilean transformations – Michelson- Morley experiment – Interpretation of results – Postulates of special theory of Relativity – Lorentz transformation equations – Length contraction – Time dilation – Addition of velocities– Variation of mass with velocity – Mass –energy equation

**Text Book:**

1. R.Murugesan **Mechanics, Properties of Matter and Sound**, Madurai first edition, June2016. [B.Sc. Ancillary Physics]

    a. Unit – I : Page No 1-9, 11-15
    b. Unit – II : Page No 46 – 58
    c. Unit – III : Page No64 – 77
    d. Unit – IV : Page No 83 – 93

2. R. Murugesan **Mechanics and Relativity, Properties of matter**, practical physics, Madurai, first edition , august 2006 [B.Sc Major Physics].
    a. Unit –V: Page No 17-22, 30-32, 36-46, 48-56
    Unit – I : Page No: 109, 90, 91

**Reference Books:**

**1.** S.L. Kakani, C.Hemarajani, S.Kakani**, Mechanics**, III edition ,Viva Books Ltd,New Delhi,2011.

**2.** Haliday Resnic, Jearl Walker, **Principles of Physics**, 9th Edition , Wiley India Pvt. Ltd, New Delhi,2012.

**3.** D.S.Mathur, **Mechanics**, S.Chand and Co., New Delhi,2008

**4.** Brijlal and N.Subramanyam, **Properties of matter**, S.Chand and Co., New Delhi,2004

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**Class : B.Sc (Chemistry)** **Part III : Allied**
**Semester : I& II** **Hours : 02**
**Subject Code :18UPHAP1** **Credits : -**

## ALLIED PHYSICS PRACTICAL - I

**Course Outcomes:**

**CO1: To create the practical knowledge in basic physics experiments.**
**CO2: To understand the bending of beam, compound pendulum and torsion pendulum.**
**CO3: To understand current conduction in electrical circuits.**
**CO4: To create skill in doing the experiment individually.**

### LIST OF EXPERIMENTS

### Any 14 Experiments:

1. Non –Uniform bending – Optic lever
2. Uniform bending - (Pin & Microscope)
3. Compound Pendulum - Determination “g”
4. Torsion Pendulum –Determination of M.I
5. Thermal conductivity of Bad conductor - Lee’s disc
6. Melde’s String – Frequency of tunning fork
7. Sonometer - Verification of laws
8. Calibration of low range Voltmeter – Potentiometer
9. Calibration of Ammeter – Potentiometer
10. Resistance and resistivity – Potentiometer
11. Comparison of Capacitances – Spot Galvanometer method.
12. Comparison of emf’s - Spot Galvanometer method.
13. Carey Foster Bridge – Resistance & resistivity of a wire.
14. Spectrometer – Refractive indexof a Prism
15. Torsion Pendulum -Determination of Rigidity modulus
16. Co-efficient of Viscosity – Stoke’s method.

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| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part IV** | **: Skill** |
| **Semester** | **: I** | **Hours** | **: 02** |
| **Subject Code** | **: 18UCHS11** | **Credits** | **: 02** |

## SUGAR TECHNOLOGY

**Course Outcomes**

**CO1 To understand the essentials of sugar industries in India, Extraction of juice concentration-separation of crystals and testing and estimation of sugar.**
**CO2 To about how to sugar recovered from molasses.**
**CO3 To develop a knowledge in the manufacture of sucrube from Beat-root.**

**Unit I**

Sugar industry in India-Sugar cane and sugar beet-manufacture of canesugar.

**Unit II**

Extraction of juice-concentration-separation of crystals-recovery of glucose from molasses-defection.

**Unit III**

Sulphitation and carbonation process- Double sulphitation process-double carbonation Process.

**Unit IV**

Testing and estimation of sugar

**Unit V**

Preparation of begasse-use of begasse for the manufacture of paper and electricity-preparation of alcohol from molasses-preparation of absolute alcohol-manufacture of wine,beer,methylated spirit – power alcohol-estimination of number of hydroxyl groups.

Visit to a industry and submission of report.For industrial visit/Assignment = 5 Marks (Internal)

**Text Book:**

BK Sharma, **Industrial chemistry including chemical engineering** - Goel publishing house- 13th Revised and enlarged edition, New Delhi (2009)

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| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part IV** | **: Skill** |
| **Semester** | **: I** | **Hours** | **: 02** |
| **Subject Code** | **: 18UCHS12** | **Credits** | **: 02** |

## PERFUME CHEMISTRY

**Course Outcomes**

**CO1: To acquire a knowledge in the role of vehicle, fricative, Esters for the synthesis of perfumes.**
**CO2: To know about the role of alcohols, ketenes', and Ionone's in the manufacture of perfumes.**
**CO3: To understand about the nature perfumes.**

**Unit I**

Introduction – Esters, Alcohols, Ketones, Ionones, Aldehyde

**Unit II**

Diphenyl Compounds – Production of natural perfumes – flower perfumes

**Unit III**

Jasmine – Lily, Orange blossom, - Rose – fruit flavours

**Unit IV**

Artificial flavours – Natural Flavours – Distinction between these two. Preparation and uses of vanillin and coumarin

**Unit V**

Banana Compounds – Grape Compounds, apple compounds and pine apple compounds ( Demonstration of Jasmine Perfume)

Visit to a industry and submission of report. For industrial visit/Assignment = 5 Marks (Internal)

**Text Book:**

BK Sharma, **Industrial chemistry including chemical engineering** - Goel publishing house- 13th Revised and enlarged edition, New Delhi (2009)

**MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)**
**DEPARTMENT OF B.Sc CHEMISTRY**
**(For those who joined in 2018-2019 and after)**

| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part IV** | **: Mandatory** |
| **Semester** | **: I** | **Hours** | **: 02** |
| **Sub code** | **:18UEVG11** | **Credits** | **: 02** |

## ENVIRONMENTAL STUDIES

| **COURSE OUTCOMES** | | |
|---|---|---|
| **CO1:**To gain knowledge on the importance of environmental education and ecosystem. | | |
| **CO2:**To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution | | |
| **CO3**: To understand the various energy sources, exploitation and need of alternate energy resources. Disaster management To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence | | |
| **CO4:** To make the student to understand the various pollution problems control mechanisms. | | |
| UNIT I | **:** | **Environment and Earth:** Environment – Meaning – Definition - Components of Environment – Types of Environment. Interference of man with the Environment. Need for Environmental Education. Earth – Formation and Evolution of Earth– Structure of Earth and its components – Atmosphere, Lithosphere, Hydrosphere and Biosphere.<br>**Natural Resources:** Renewable Resources and Non-Renewable Resources. Natural Resources and Associated Problems. Use and Exploitation of Forest, Water, Mineral, Food, Land and Energy Resources. |
| UNIT II | **:** | **Ecology and Ecosystems:** Ecology – Meaning - Definition – Scope – Objectives – Subdivisions of Ecology.<br>**Ecosystem**–Concept - Structure - Functions – Energy Flow – Food Chain and Food Web – Examples of Ecosystems (Forest, Grassland, Desert, Aquatic). |
| UNIT III | **:** | **Biodiversity:** Definition – Biodiversity at Global, National and Local Level. Values of Biodiversity – Threats to Biodiversity – Conservation of Biodiversity.<br>**Biodiversity of India:** Biogeographical Distribution – Hotspots of Indian Biodiversity – National Biodiversity Conservation Board and Its functions. Endangered and Endemic Species of India |
| UNIT IV | **:** | **Pollution Issues:** Definition – Causes – Effects and Control Measures of Air, Water, Soil, Marine, Noise, Thermal and Nuclear Pollutions.<br>**Global Issues:** Global Warming and Ozone Layer Depletion. Future plans of Global Environmental Protection Organisations. |
| UNIT V | **:** | **Sustainable Development:**Key aspects of Sustainable Development – Strategies for Sustainable Development - Agriculture – Organic farming – Irrigation – Water Harvesting – Water Recycling – Cyber Waste and Management.<br>**Disaster Management:**Meaning – Types of Disasters - Flood and Drought – Earth quake and Tsunami – Landslides and Avalanches – Cyclones and Hurricanes – Preventions and Consequences. Management of Disasters - |

**Text Book:**

Study Material for **Environmental Studies**, Mannar Thirumalai Naicker College, Pasumalai, Madurai – 625 004.

**Reference Books:**

1. Study Material for **Environmental Studies**, Publications Division, Madurai Kamaraj University, Madurai – 625 021.
2. R.C. Sharma and Gurbir Sangha,**Environmental Studies**, Kalyani Publishers, 1, Mahalakshmi Street, T.Nagar, Chennai – 600 017.
3. Radha,**Environmental Studiesfor Undergraduate Courses of all Branches of Higher Education, (Based on UGC Syllabus),** Prasanna Publishers & Distributors, Old No. 20, Krishnappa Street, (Near Santhosh Mahal), Chepak, Chennai – 600 005.
4. S.N.Tripathy and Sunakar Panda,**Fundamentals of Environmental Studies**, Vrinda Publications (P) Ltd. B-5, Ashish Complex, (opp. To Ahicon Public School), MayurVihar, Phase-1, Delhi– 110 091.
5. G.Rajah,**Environmental Studies** for All UG Courses, (Based on UGC Syllabus), Margham Publications, 24, Rameswaram Road, T.Nagar, Chennai – 600 017.

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**(For those who joined in 2018-2019 and after)**

| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part III** | **: Core** |
| **Semester** | **: II** | **Hours** | **: 04** |
| **Subject Code** | **: 18UCHC21** | **Credits** | **: 04** |

**Organic Chemistry-I**

**Course Outcomes**

**CO1 To have the basic idea of carbohydrates, dyes and alcohols**
**CO2 To understand about the organic compounds and its classification and stereo isomerism.**
**CO3 To learn about preparation and uses of ethers, thin alcohols & thin ethers.**

**Unit – I**

a) Carbohydrates : Definition – classification – monosaccharides – properties and uses of glucose and fructose – configuration of glucose and fructose – Haworth structure – conversion of glucose to fructose and vice versa
b) Disaccharides: Preparation, properties, constitution and configuration of sucrose.
c) Poly saccharides: A general study of starch and cellulose – uses of cellulose in industries

**Unit II**

Dyes: Definition – theory of colour and constitution – classification of dyes according to structure and their mode of applications.

(i) Azo dyes: Preparation and uses of methyl orange, congo-red and bismark brown

(ii) Triphenyl methane dyes: preparation and uses of malachite green, rosaniline and crystal violet

(iii) Phthalein dyes: Preparation and uses of phenolphthalein, fluorescein and eosin

(iv) Vat dyes: preparation and uses of Indigo

**Unit III**

a. Organic compounds and classification – Alkanes – Nomenclature - General methods of preparation and Chemical properties.
b. Alkenes – Nomenclature – General methods of preparation – chemical properties – Electrophilic additions – Addition of hydrogen halide – Markownikov's rule – Antimarkovinkov's addition – Addition of $H_2SO_4$,$H_2O$, Halogen – Hydroboration – oxidation – ozonolysis – hydroxylation – polymerisation.

**Unit IV**

a) Alcohols: Preparation by hydroboration; reduction of carbonyl compounds, acids and esters, by using Grignard reagents. Reaction with metals. Mechanism and reactivity towards HX, dehydration – rearrangement. Ascending and descending the alcohol series – estimation of number of hydroxyl groups.

b) Ethers: Mechanism of Williamson's synthesis, mechanism of cleavage by HX, estimation of methoxy group by Zeisel method. Application of crown ethers.

c) Thioalcohols and thioethers: Preparation and properties of sulphonal and mustdard gas.

**Unit – V**

**Stereo isomerisms**

a) Geometrical isomerism: Definition – geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes – determination of configuration of geometric isomers – E, Z notations – stereo chemistry of addition of bromine to double bond

b) Optical isomerism:

(i) Optical activity – specific rotation – definition of optical isomerism – elements of symmetry

(ii) Optical isomerism of compounds containing asymmetric carbon atom – racemistation and resolution of racemic mixtures – Walden inversion – asymmetric synthesis – chirality – specifications of absolute configuration by R and S notations.

iii) Optical activity of compounds without asymmetric carbon atoms, allenes, spiranes and bi phenyl compounds.

**Text Book:**

P.L Soni, Text Book of **Organic Chemistry** New Delhi (2008)

**References:**

1. B.S Bahl and Arun Bahl S.Chand, **Advanced Organic Chemistry** Co Ltd, New Delhi (2012)
2. B-Mehta and M.Mehta, **Organic Chemistry** E.E Edition, New Delhi (2010)
3. P.L Soni and H.M Chawla, **Organic Chemistry**, 29th Edition, Sultan Chand and sons, New Delhi, (2007)

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| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part III** | **: Core** |
| **Semester** | **: I & II** | **Hours** | **: 02** |
| **Subject Code** | **: 18UCHCP1** | **Credits** | **: 02** |

## Inorganic Semi micro Qualitative analysis – Lab

**Course Outcomes**

**CO1 To know about the identification of anions.**
**CO2 To understand the basic idea of identification of lotions.**
**CO3 To have an idea about how to confirm the acid & basic radicals**

**Duration of examination**: 3hrs

Analysis of a mixture containing two anions of which one is an interfering ion semi-micro method two cations

**Anions:**

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

**Cations:** Lead, bismuth, copper, cadmium, antimony, iron (II and III), aluminium, Chromium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, Magnesium and ammonium.

**Distribution of marks**

**Max marks: 100**

**Internal : 40 marks** **External : 60 marks**

| | | | | | |
|---|---|---|---|---|---|
| Laboratory Performance | : | 30 marks | Vivo voce | : | 10 marks |
| Observation note book | : | 10 marks | Record note book | : | 10 marks |
| | | | Four radicals with correct procedure | : | 40 marks |
| Total | : | 40 marks | Total | : | 60 marks |

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**Class : B.Sc (Chemistry)** **Part III : Allied**
**Semester : II** **Hours : 4**
**Subject Code :18UPHA21** **Credits : 3**

## ALLIED PHYSICS– II
## Thermal Physics and Sound

**Course Outcomes:**

**CO1: To create the knowledge in heat conduction.**
**CO2: To understand the thermal physics concepts.**
**CO3: To understand production and propagation of sound.**
**CO4: To develop the skill in the area of Thermal Physics and Sound.**

**Unit – I:**

Radiation – Stefan's law – Determination of Stefan's constant by filament heating method – Solar constant – Water flow Pyroheliometer – Temperature of the sun – Solar spectrum – Energy distribution in black body spectrum – Planck's law(no derivation) .

**Unit – II:**

Kinetic theory of gases – Mean free path – Transport phenomena – Expression for the coefficient of Diffusion, viscocity and thermal conductivity – Degree of freedom – Boltzman's law of equipartition of energy – calculation of $\gamma$ for mono atomic and diatomic gases.

**Unit – III:**

Thermodynamics – Zeroth law (statement only) - First, second and third laws of thermodynamics (statement only) – Entropy – change of entropy in Carnot's cycle – Change of entropy in conversion of ice into stream – Joule Kelvin effect – super conductivity.

**Unit – IV:**

Simple harmonic motion – Composition of two S.H.M's in a straight line - Composition of two S.H.M'sof equal time periods at right angles – stationary waves –Properties of stationary waves – Melde's experiment for the frequency of electrically maintained tuning fork (transverse and longitudinal modes).

**Unit – V:**

Acoustics of buildings – Requirements of good auditorium – Ultrasonics – Production – piezo electric method – Detection – Kundt's tube and piezo electric properties and application – Determination of velocity of ultrasonic waves in a liquid (ultrasonic diffracton).

**Text Books:**

1. R. Murugesan, **Thermal Physics**, Chennai, First Edition, June 2012. [B.Sc., Ancillary Physics]
   Unit – I: 5.1 – 5.10.
   Unit – II: 6.1 – 6.7, 6.9 – 6.11.
   Unit – III: 7.5 – 7.7, 8.1, 8.5.

2. R. Murugesan, Mechnics, Properties of Matter and Sound, Thermal Physics, Practical – I, Chennai, First Edition, July, 2016.

   Unit – IV: 6.1- 6.3,6.7 – 6.9.
   Unit – V: 6.11 - 6.12.

**Reference Books:**


1. Brijlal and N. Subramanyam, **Heat and Thermodynamics**, S.Chand and Co, New Delhi, 2004.
2. Ubald Raj and Jose Robin, **Ancillary physics**, Vol.II, Indra Publications, Bhopal,2002.
3. D.Halidary, Resnick and J.Walker, **Fundamental of Physics**, 6th Edition, New Delhi, 2012.
4. R. Murugesan, **Heat and Thermodynamics**, S. Chand and Co, New Delhi, 2004.
5. Brijlal and N.Subramanyam, **A text book of Sound**, II Revised Edition,Vikas publishing Pvt. Ltd, New Delhi,1995.

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**Semester : I& II** **Hours : 02**
**Subject Code : 18UPHAP1** **Credits : 01**

## ALLIED PHYSICS PRACTICAL – I

**Course Outcomes:**

**CO1: To create the practical knowledge in basic physics experiments.**
**CO2: To understand the bending of beam, compound pendulum and torsion pendulum.**
**CO3: To understand current conduction in electrical circuits.**
**CO4:To create skill in doing the experiment individually.**

### LIST OF EXPERIMENTS

### Any 14 Experiments:

1. Non –Uniform bending – Optic lever
2. Uniform bending - (Pin & Microscope)
3. Compound Pendulum - Determination “g”
4. Torsion Pendulum –Determination of M.I
5. Thermal conductivity of Bad conductor - Lee’s disc
6. Melde’s String – Frequency of tunning fork
7. Sonometer - Verification of laws
8. Calibration of low range Voltmeter – Potentiometer
9. Calibration of Ammeter – Potentiometer
10. Resistance and resistivity – Potentiometer
11. Comparison of Capacitances – Spot Galvanometer method.
12. Comparison of emf’s - Spot Galvanometer method.
13. Carey Foster Bridge – Resistance & resistivity of a wire.
14. Spectrometer – Refractive indexof a Prism
15. Torsion Pendulum -Determination of Rigidity modulus
16. Co-efficient of Viscosity – Stoke’s method.

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| **Class** | **: B.Sc (Chemistry)** | **Part IV** | **: Skill** |
| **Semester** | **: II** | **Hours** | **: 02** |
| **Subject Code** | **: 18UCHS21** | **Credits** | **: 02** |

## LEATHER TECHNOLOGY

**Course Outcomes**

**CO1 To acquire skill in semi-micro inorganic qualitative analysis**
**CO2 To have a knowledge in beam house process and history of tanning industry in India.**
**CO3 To have an idea about the vegetable tanning, synthetic tanning and chrome tanning.**

**Unit I**

History of tanning industry in India-conventional tanning process-animal skin – Structure and Composition

**Unit II**

Manufacture of leather, preparation of hides for tanning,use of various inorganic and organic chemicals for tanning process.

**Unit III**

Beam house process - soaking liming-deliming, deharing and bating.

**Unit IV**

Vegetable tanning-type of tanning for soles-belting and heavy leather – vegetable tans –

catechol - pyrogalloltans

**Unit V**

Vegetable tanning -synthetic tanning chrome tanning, oil tanning, finishing the leather-pollution problems caused by tanneries and its control. Treatment of tannery effluents by primary, secondary and tertiary processes-use of reverse osmosis system for the treatment of polluted water.

Visit to a industry and submission of report. For industrial visit/Assignment = 5 marks(Internal)

**Text Book:**

1. BK Sharma**, Industrial chemistry including chemical engineering**, Goel Publishing house - 13th Revised and enlarged edition, New Delhi (2009)

**Reference Books:**

1. F.N.Howes, **Vegetable Tanning materials**, Butterworth London (1953)
2. K.H.Gustavson, **Chemistry of Tanning of processes**, Academic press, New York (1950)
3. K.T.Sarkar, **Theory and Practice of Leather Manufacturing**, Indian Leather Technology Association.
4. S.S.Dutta, **Principles of Leather Manufacturing**, Indian Leather Technology Association.
5. A.C.Orthmann, **Tanning processes**, Foreign Publication.

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| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part IV** | **: Skill** |
| **Semester** | **: II** | **Hours** | **: 02** |
| **Subject Code** | **: 18UCHS22** | **Credits** | **: 02** |

## PAPER AND PULP TECHNOLOGY

**Course Outcomes**

**CO1: To learn about introduction and manufacture of pulp and raw materials used for the preparation of pulp.**
**CO2: To have an idea of manufacture of paper and its uses.**
**CO3: To know about the various paper industries in India.**

**Unit I**

Introduction-manufacture of pulp, various raw materials used for the preparation of pulp.

**Unit II**

Preparation of kraft pulp, sulphite pulp, soda pulp and rag pulp.

**Unit III**

Various process: beating, refining, filling, sizing and colouring.

**Unit IV**

Manufacture of paper-calendaring uses.

**Unit V**

Various paper industries in India-clean technologies in agro based industries -ecological problems of Indian pulp and paper industry.

Visit to a industry and submission of report.For industrial visit/Assignment = 5Marks (Internal)

**Text Book:**

BK Sharma, **Industrial chemistry including chemical engineering**, Goel publishing house- 13th Revised and enlarged edition, New Delhi ( 2009)

**Reference Books:**

1. R.G.MacDonold, **Pulp and Paper manufacture**, McGraw Hill (1969)
2. J.P.Casey, **Pulp and Paper Chemistry Technology**, Wiley interscience (1983)
3. P.Bajpai and P.K.Bajpai, **Biotechnology in the Pulp and paper industry**, PIRA international (1998)

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**DEPARTMENT OF B.Sc CHEMISTRY**
**(For those who joined in 2018-2019 and after)**

| | | | |
|---|---|---|---|
| **Class** | **: B.Sc (Chemistry)** | **Part IV** | **: Mandatory** |
| **Semester** | **: II** | **Hours** | **: 02** |
| **Sub code** | **:18UVLG21** | **Credits** | **: 02** |

## VALUE EDUCATION

| **COURSE OUTCOMES** | | |
|---|---|---|
| **CO1:**Clarifying the meaning and concept of value - value education. | | |
| **CO2:**To inspire **students** to develop their personality and social **values** based on the principles of human **values.** | | |
| **CO3**: Developing sense of Love, Peace and Brotherhood at Local, national and international levels. | | |
| **CO4:**To enable the students to understand the social realities and to inculcate an essential value system towards building a health society | | |
| UNIT I | **:** | **Values and The Individual:** Values – Meaning – Definition – Importance – Classification of Values, Value Education – Meaning – Need for Value Education. Values and the Individual – Self-Discipline – Meaning – Tips to Improve Self-Discipline. Self-Confidence – Meaning - Tips to Improve Self-Confidence. Empathy – Meaning – Role of Empathy in motivating Values. Compassion – Role of Compassion in motivating Values. Forgiveness – Meaning - Role of Forgiveness in motivating Values. Honesty – Meaning – Role of Honesty in motivating Values. Courage – Meaning – Role of Courage in motivating Values. |
| UNIT II | **:** | **Religions and Communal Harmony:** Religions – Meaning **–** Major Religions in India - Hinduism – Values in Hinduism. Christianity – Values in Christianity. Islam – Values in Islam. Buddhism – Values in Buddhism. Jainism – Values in Jainism. Sikhism – Values in Sikhism. Need for Religious Harmony in India. Caste System in India – Need for Communal Harmony in India. Social Justice – Meaning – Factors Responsible for Social Justice. |
| UNIT III | **:** | **Society and Social Issues:** Society – Meaning – Values in Indian Society. Democracy – Meaning – Values in Indian Democracy. Secularism – Meaning – Values in Indian Secularism. Socialism – meaning – Values in Socialism. Social Issues – Alcoholism – Drugs – Poverty – Unemployment. |

| | | |
|---|---|---|
| UNIT IV | : | **Human Rights and Marginalised People:** Human Rights – Meaning – Problem of Violation of Human Rights in India – Authorities available under the Protection of Human Rights Act in India. Marginalised People like Women, Children, Dalits, Minorities, Physically Challenged – Concept – Rights – Challenges. Transgender – Meaning – Issues. |
| UNIT V | : | **Social Institutions in Value Formation:** Social Institutions – Meaning – Important Social Institutions. Family – Meaning – Role of Families in Value Formation. Role of Press & Mass Media in Value Formation – Role of Social Activists – Meaning Contribution to Society – Challenges. |

**Text Book:**

Text Module for **Value Education**, Mannar Thirumalai Naicker College, Pasumalai, Madurai – 625 004

**Reference Books:**

1. Text Module for **Value Education**, Publications Division, Madurai Kamaraj University, Madurai – 625 021.
2. N.S.Raghunathan, **Value Education**, Margham Publications, 24, Rameswaram Road, T.Ngar, Chennai – 600 017.
3. Dr.P.Saravanan, and P.Andichamy, **Value Education**, Merit India Publications, (Educational Publishers), 5, Pudumandapam, Madurai-625001.