

# **MAHENDRA ARTS & SCIENCE COLLEGE**

**(Autonomous)**

**Affiliated to Periyar University, Salem.**

**Accredited by NAAC with 'A' Grade & Recognized u/s 2(f) and 12(B) of the UGC Act 1956**

**Kalippatti – 637 501, Namakkal (Dt), Tamil Nadu.**



## **DEPARTMENT OF CHEMISTRY**

### **COURSE OUTCOMES (COs)**

### **M.Sc. CHEMISTRY**

**PRINCIPAL**

**MAHENDRA ARTS & SCIENCE COLLEGE**

**(Autonomous)**

**Kalippatti (PO) - 637 501, Namakkal (DT)**

**For the students  
admitted in the  
Academic Year 2019-2020 onwards**

|                              |          |   |             |          |
|------------------------------|----------|---|-------------|----------|
| Programme Code: <b>PCH</b>   |          | <b>M.Sc. Chemistry</b>  |             |          |
| Course Code: <b>M19PCH01</b> |          | <b>CORE COURSE-I - STEREOCHEMISTRY AND REACTION MECHANISM</b> |             |          |
| Batch                        | Semester | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>I</b> | <b>5</b>  | <b>75</b>   | <b>4</b> |

### Objectives

This course focuses on the concepts of stereochemistry and organic reaction and their mechanism in organic chemistry.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Understand the stereo chemical orientation of molecules and its relation to reactivity.                               | K2                     |
| CO2              | Extract the basic electronic concept of organic chemistry and methods of determination of reaction mechanism.         | K1                     |
| CO3              | Gain the knowledge of aromaticity and electrophilic, nucleophilic substitution organic reactions and their mechanism. | K4                     |
| CO4              | Sketch the aliphatic and electrophilic, nucleophilic substitution organic reactions and their mechanism.              | K3                     |
| CO5              | Get fundamental idea of addition and elimination reactions and their mechanism in important organic reaction.         | K2                     |

|                              |          |  |             |          |
|------------------------------|----------|--|-------------|----------|
| Programme Code: <b>PCH</b>   |          | <b>M.Sc. Chemistry</b>                                   |             |          |
| Course Code: <b>M19PCH02</b> |          | <b>CORE COURSE-II - CHEMISTRY OF INORGANIC COMPOUNDS</b> |             |          |
| Batch                        | Semester | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>I</b> | <b>5</b>   | <b>75</b>   | <b>4</b> |

### Objectives

This course focuses on the knowledge about the bonding theory, bonding properties and inorganic compounds with Boron, Silicon, Phosphorous, Nitrogen, Sulphur, Noble gases and Halogen compounds.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Recognize the basics of atomic structure and chemical bonding.                              | K1                     |
| CO2              | Acquire knowledge on acid base concepts and non aqueous solvent.                            | K3                     |
| CO3              | Devise the properties and uses of Boron and silicon compounds.                              | K3                     |
| CO4              | Illustrate the properties and uses of Nitrogen, Phosphorous, Sulphur and halogens compounds | K4                     |
| CO5              | Get idea on the properties and uses of polyanions, clathrates and cage compounds.           | K2                     |

|                              |          |  |             |          |
|------------------------------|----------|--|-------------|----------|
| Programme Code: <b>PCH</b>   |          | <b>M.Sc. Chemistry</b>   |             |          |
| Course Code: <b>M19PCH03</b> |          | <b>CORE COURSE-III - CHEMICAL KINETICS AND QUANTUM CHEMISTRY</b> |             |          |
| Batch                        | Semester | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>I</b> | <b>5</b>   | <b>75</b>   | <b>4</b> |

### Objectives

The aim of this course is to expose the students to the knowledge in chemical kinetics and quantum chemistry.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Know about the topic of chemical kinetics and their applications. | K1                     |
| CO2              | Interpret the reaction concept in chemical kinetics               | K2                     |
| CO3              | Gain the idea of quantum chemistry                                | K2                     |
| CO4              | Apply quantum chemistry to physical models.                       | K3                     |
| CO5              | Appraise the quantum mechanics to atomic and molecular systems.   | K4                     |

|                               |          |   |             |          |
|-------------------------------|----------|---|-------------|----------|
| Programme Code: <b>PCH</b>    |          | <b>M.Sc. Chemistry</b>  |             |          |
| Course Code: <b>M19PCHP01</b> |          | <b>CORE PRACTICAL-I –PRACTICAL-I -<br/>INORGANIC QUALITATIVE ANALYSIS</b> |             |          |
| Batch                         | Semester | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>I</b> | <b>5</b>  | <b>75</b>   | <b>4</b> |

### **Course Outcomes**

On successful completion of the course students will be able to

1. Acquire knowledge about the mixture of cations.
2. Create awareness on eco-friendly approach in the analysis.
3. Analyze ions qualitatively even in the mixture.

|                               |          |   |             |          |
|-------------------------------|----------|---|-------------|----------|
| Programme Code: <b>PCH</b>    |          | <b>M.Sc. Chemistry</b>  |             |          |
| Course Code: <b>M19PCHP02</b> |          | <b>CORE PRACTICAL-II - PRACTICAL-II-<br/>PHYSICAL CHEMISTRY EXPERIMENTS-I</b> |             |          |
| Batch                         | Semester | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>I</b> | <b>5</b>  | <b>75</b>   | <b>3</b> |

### **Course outcomes**

On successful completion of the course students will be able to

1. Study the kinetics of some reactions.
2. Learn the technique of sketching phase diagram of some binary systems.
3. Develop practical skill in conductometric titration experiments.
4. Understand experimental knowledge on kinetics and electro chemistry.

|                              |           |  |             |          |
|------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>   |           | <b>M.Sc. Chemistry</b>                       |             |          |
| Course Code: <b>M19PCH04</b> |           | <b>CORE COURSE-IV - ORGANIC SPECTROSCOPY</b> |             |          |
| Batch                        | Semester  | Hours/Week                                   | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>II</b> | <b>5</b>                                     | <b>75</b>   | <b>4</b> |

### Objectives

This course focuses on the concepts of spectroscopy and dealt with the applications in the structural elucidation of compounds.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Quote the basic principles and application of UV-Visible, IR spectroscopy.  | K2                     |
| CO2              | Sketch the structure of organic compounds by $^1\text{H}$ NMR spectroscopy.   | K3                     |
| CO3              | Elucidate the structure of organic compounds by $^{13}\text{C}$ , $^{19}\text{F}$ , $^{31}\text{P}$ NMR spectroscopy. | K4                     |
| CO4              | Identify the basics of advanced NMR and EPR techniques.   | K2                     |
| CO5              | Acquire knowledge on the mass spectroscopy.   | K3                     |

|                              |           |  |             |          |
|------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>   |           | <b>M.Sc. Chemistry</b>                                 |             |          |
| Course Code: <b>M19PCH05</b> |           | <b>CORE COURSE-V - THERMODYNAMICS AND GROUP THEORY</b> |             |          |
| Batch                        | Semester  | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>II</b> | <b>5</b>   | <b>75</b>   | <b>4</b> |

### Objectives

The aim of this course is to expose the students with the knowledge in thermodynamics and group theory.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Know about the applications of statistical thermodynamic.   | K2                     |
| CO2              | Understand the Thermodynamics concept of ideal, real gases and gas mixtures and partial molar properties. | K1                     |
| CO3              | Study the various methods of Irreversible Thermodynamics.   | K2                     |
| CO4              | Relate the application of group theory to chemical system.  | K3                     |
| CO5              | Apply the group theory in various spectroscopic prediction and interpretation.                            | K4                     |



|                               |           |  |             |          |
|-------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>    |           | <b>M.Sc. Chemistry</b>   |             |          |
| Course Code: <b>M19PCHP03</b> |           | <b>CORE PRACTICAL - III - PRACTICAL-III -<br/>INORGANIC ESTIMATION AND PREPARATION</b> |             |          |
| Batch                         | Semester  | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>II</b> | <b>5</b>   | <b>75</b>   | <b>3</b> |

### **Course Outcomes**

On successful completion of the course students will be able to

1. Acquire the quantitative skills in volumetric analysis.
2. Estimate the amount of different metals in the given solutions.
3. Develop practical skill in the preparation of complexes.
4. Execute the idea about recrystallisation.

|                               |           |  |             |          |
|-------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>    |           | <b>M.Sc. Chemistry</b>   |             |          |
| Course Code: <b>M19PCHP04</b> |           | <b>CORE PRACTICAL-IV- PRACTICAL-IV-<br/>ORGANIC ESTIMATION AND PREPARATION</b> |             |          |
| Batch                         | Semester  | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>II</b> | <b>5</b>   | <b>75</b>   | <b>3</b> |

### **Course outcomes**

On the successful completion of the course, student will be able to

1. Know the fundamental strategies of organic estimation.
2. Estimate the amount of organic compound in the given solutions.
3. Learn the determination of physical constants of organic compounds.
4. Develop practical skill in the preparation of complexes.
5. Execute the idea about recrystallisation.

|                              |            |  |             |          |
|------------------------------|------------|--|-------------|----------|
| Programme Code: <b>PCH</b>   |            | <b>M.Sc. Chemistry</b>                                       |             |          |
| Course Code: <b>M19PCH06</b> |            | <b>CORE COURSE-VI - ORGANIC SYNTHESIS AND REARRANGEMENTS</b> |             |          |
| Batch                        | Semester   | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>III</b> | <b>5</b>   | <b>75</b>   | <b>4</b> |

### Objectives

This course focuses on the concepts of various types of reactions, rearrangements and their synthetic utility in organic chemistry.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Understand the concepts of heterocyclic chemistry  | K1                     |
| CO2              | Learn the basic knowledge in formation of carbon-carbon single bonds and C-C $\pi$ bonds | K2                     |
| CO3              | Recognize the basic knowledge in oxidation and reduction reactions                       | K1                     |
| CO4              | Connect the details of organic synthesis by disconnection approach.                      | K4                     |
| CO5              | Use the details of rearrangement and organic synthesis in organic reactions.             | K3                     |

|                              |            |   |             |          |
|------------------------------|------------|---|-------------|----------|
| Programme Code: <b>PCH</b>   |            | <b>M.Sc. Chemistry</b>                            |             |          |
| Course Code: <b>M19PCH07</b> |            | <b>CORE COURSE-VII - ORGANOMETALLIC CHEMISTRY</b> |             |          |
| Batch                        | Semester   | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>III</b> | <b>5</b>  | <b>75</b>   | <b>4</b> |

### Objectives

This course makes student to know the concepts, theories, mechanism and application of organometallic compound.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Learn the basic concepts of Organometallic chemistry on metal carbonyls and nitrosyl complexes | K2                     |
| CO2              | Gain knowledge on Metal – alkyl, alkylidene, alkylidyne complexes.                             | K1                     |
| CO3              | Summarize the metal - Alkene and alkyne complexes  | K2                     |
| CO4              | Illustrate Cyclopentadienyl and arene complexes and their importance.                          | K4                     |
| CO5              | Relate the applications of Organometallic compounds in homogeneous catalytic reactions         | K3                     |

|                              |            |   |             |          |
|------------------------------|------------|---|-------------|----------|
| Programme Code: <b>PCH</b>   |            | <b>M.Sc. Chemistry</b>  |             |          |
| Course Code: <b>M19PCH08</b> |            | <b>CORE COURSE-VIII - ELECTROCHEMISTRY AND PHOTOCHEMISTRY</b> |             |          |
| Batch                        | Semester   | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>III</b> | <b>5</b>  | <b>75</b>   | <b>4</b> |

### Objectives

The aim of this course is to expose the students to understand the electrochemistry and photochemistry and its application.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Know about the concept of Ionics and Electrical double layer.  | K2                     |
| CO2              | Understand the concepts of Electrode kinetics and their applications.  | K2                     |
| CO3              | Study the various storage devices Batteries, Fuel cells and corrosion related to real world problems.                        | K4                     |
| CO4              | Relate the Photochemistry Laws and applied in Photochemical processes.   | K3                     |
| CO5              | Learn the basic principles of Photochemical Reactions and Radio chemistry and its applications to solar energy applications. | K1                     |

|                               |            |   |             |          |
|-------------------------------|------------|---|-------------|----------|
| Programme Code: <b>PCH</b>    |            | <b>M.Sc. Chemistry</b>                                      |             |          |
| Course Code: <b>M19PCHP05</b> |            | <b>CORE PRACTICAL-V- PRACTICAL-V -<br/>ORGANIC ANALYSIS</b> |             |          |
| Batch                         | Semester   | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>III</b> | <b>5</b>  | <b>75</b>   | <b>3</b> |

### **Course Outcomes**

On successful completion of the course students will be able to

1. Understand the separation techniques and systematic analysis of organic mixtures.
2. Distinguish between aromatic – aliphatic and saturated – unsaturated compounds.
3. Learn the determination methods of physical constants of organic compound.

|                               |            |   |             |          |
|-------------------------------|------------|---|-------------|----------|
| Programme Code: <b>PCH</b>    |            | <b>M.Sc. Chemistry</b>  |             |          |
| Course Code: <b>M19PCHP06</b> |            | <b>CORE PRACTICAL-VI- PRACTICAL-VI-<br/>PHYSICAL CHEMISTRY EXPERIMENTS – II</b> |             |          |
| Batch                         | Semester   | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>III</b> | <b>5</b>  | <b>75</b>   | <b>3</b> |

### **Course outcomes**

On successful completion of the course students will be able to

1. Develop practical skill in conductometric and potentiometric titrations.
2. Understand experimental knowledge on kinetics and electro chemistry.
3. Learn the determination methods of physical constants of substances.

|                              |           |  |             |          |
|------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>   |           | <b>M.Sc. Chemistry</b>   |             |          |
| Course Code: <b>M19PCH09</b> |           | <b>CORE COURSE-IX - PERICYCLIC REACTION AND NATURAL PRODUCTS</b> |             |          |
| Batch                        | Semester  | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>IV</b> | <b>5</b>   | <b>75</b>   | <b>4</b> |

### Objectives

The aim of this course is to expose the students to understand pericyclic reactions and natural products.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Know the Conservation of orbital symmetry and Types, principles of Pericyclic reactions | K1                     |
| CO2              | Categorize the electrocyclic reactions and sigmatropic rearrangements.                  | K4                     |
| CO3              | Isolate and classify the synthesis of Terpenes  | K3                     |
| CO4              | Identify the functional groups and analyse the structures of Steroids                   | K2                     |
| CO5              | Sketch out the synthesis of Alkaloids   | K3                     |



|                              |           |  |             |          |
|------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>   |           | <b>M.Sc. Chemistry</b>                                   |             |          |
| Course Code: <b>M19PCH10</b> |           | <b>CORE COURSE-X - SOLID STATE AND NUCLEAR CHEMISTRY</b> |             |          |
| Batch                        | Semester  | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>IV</b> | <b>5</b>   | <b>75</b>   | <b>4</b> |

### Objectives

The aim of this course is to expose the students to understand solid state and nuclear chemistry.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Study the solid state chemistry of inorganic compounds.                                     | K2                     |
| CO2              | Summarize the types and close packing of atoms of solids and important inorganic compounds. | K2                     |
| CO3              | Get knowledge about the theories, properties and defect of solid.                           | K1                     |
| CO4              | Devise the nuclear structure and radioactive nuclei.  | K4                     |
| CO5              | Learn the different type of nuclear reactions and their application                         | K3                     |

|                              |           |  |             |          |
|------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>   |           | <b>M.Sc. Chemistry</b>                           |             |          |
| Course Code: <b>M19PCH11</b> |           | <b>CORE COURSE-XI - RESEARCH<br/>METHODOLOGY</b> |             |          |
| Batch                        | Semester  | Hours/Week                                       | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>IV</b> | <b>5</b>   | <b>75</b>   | <b>4</b> |

### Objectives

On completion of this course student shall know the importance of research, methodology of writing thesis and journal articles and errors involved in chemical analysis.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Understand the meaning of research.                                 | K2                     |
| CO2              | Acquire knowledge about errors involved in chemical analysis.       | K1                     |
| CO3              | Analyze about sampling techniques.                                  | K2                     |
| CO4              | Relate ideas regarding research and thesis writing.                 | K4                     |
| CO5              | Develop knowledge about the use of tools and softwares in research. | K3                     |

|                               |           |  |             |          |
|-------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>    |           | <b>M.Sc. Chemistry</b>   |             |          |
| Course Code: <b>M19PCHP07</b> |           | <b>CORE PRACTICAL-VII- PRACTICAL-VII -<br/>ORGANIC AND INORGANIC PREPARATION</b> |             |          |
| Batch                         | Semester  | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>IV</b> | <b>5</b>   | <b>75</b>   | <b>3</b> |

### **Course outcomes**

On successful completion of the course students will be able to

1. Develop practical skill in the preparation of organic and inorganic compounds.
2. Understand the preparation methods of organic and inorganic compounds.
3. Execute the idea about recrystallisation.

|                               |           |                         |             |          |
|-------------------------------|-----------|-------------------------|-------------|----------|
| Programme Code: <b>PCH</b>    |           | <b>M.Sc. Chemistry</b>  |             |          |
| Course Code: <b>M19PCHPR1</b> |           | <b>PROJECT- PROJECT</b> |             |          |
| Batch                         | Semester  | Hours/Week              | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>IV</b> | <b>5</b>                | <b>75</b>   | <b>3</b> |

### **Course Outcomes**

On successful completion of the course students will be able to

1. Learn research methodologies along with literature survey.
2. Get skills on developing new materials through new synthetic routes.
3. Characterize the material using different techniques.

|                               |          |                                  |             |          |
|-------------------------------|----------|----------------------------------|-------------|----------|
| Programme Code: <b>PCH</b>    |          | <b>M.Sc. Chemistry</b>           |             |          |
| Course Code: <b>M19PCHE01</b> |          | <b>ELECTIVE-I- DYE CHEMISTRY</b> |             |          |
| Batch                         | Semester | Hours/Week                       | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>I</b> | <b>5</b>                         | <b>75</b>   | <b>4</b> |

### Objectives

On completion of this course student could understand theories of colour and constitution, differentiate the types of dyes and know the process and mechanism of dying process.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Understand basic concepts dye chemistry   | K2                     |
| CO2              | Classify acid and basic dyes based on structure and mechanism   | K3                     |
| CO3              | Acquire knowledge about mordant, azo and vat Dyes   | K1                     |
| CO4              | Examine the synthesis and applications to various types of dyes - azo, di & triphenyl methane, phthalein dyes | K3                     |
| CO5              | List out the applications of dyes in different areas  | K4                     |

|                               |          |                                       |             |          |
|-------------------------------|----------|---------------------------------------|-------------|----------|
| Programme Code: <b>PCH</b>    |          | <b>M.Sc. Chemistry</b>                |             |          |
| Course Code: <b>M19PCHE02</b> |          | <b>ELECTIVE-I - POLYMER CHEMISTRY</b> |             |          |
| Batch                         | Semester | Hours/Week                            | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>I</b> | <b>5</b>                              | <b>75</b>   | <b>4</b> |

### Objectives

At the end of this course student can understand the kinetics of polymerization and know the importance of polymer, technology and the applications of polymers.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Classify the types of polymers and recognize the basic concepts | K2                     |
| CO2              | Illustrate the mechanisms of polymerization                     | K2                     |
| CO3              | Calculate the molecular weight of polymers by various methods   | K3                     |
| CO4              | Understand the different polymer processing techniques          | K2                     |
| CO5              | List the commercial polymers in different areas                 | K3                     |

|                               |          |                                     |             |          |
|-------------------------------|----------|-------------------------------------|-------------|----------|
| Programme Code: <b>PCH</b>    |          | <b>M.Sc. Chemistry</b>              |             |          |
| Course Code: <b>M19PCHE03</b> |          | <b>ELECTIVE-I - GREEN CHEMISTRY</b> |             |          |
| Batch                         | Semester | Hours/Week                          | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>I</b> | <b>5</b>                            | <b>75</b>   | <b>4</b> |

### Objectives

This course can give idea about basic principles and importance of green chemistry and its application.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Understand basic principles and tools of green chemistry         | K2                     |
| CO2              | Discuss microwave mediated organic synthesis                     | K2                     |
| CO3              | Analyze the synthetic applications of ionic liquids              | K4                     |
| CO4              | Relate supported catalysts and bio-catalysts for Green chemistry | K3                     |
| CO5              | Acquire knowledge of modified bio catalysts                      | K1                     |

|                               |          |  |             |          |
|-------------------------------|----------|--|-------------|----------|
| Programme Code: <b>PCH</b>    |          | <b>M.Sc. Chemistry</b>                                     |             |          |
| Course Code: <b>M19PCHE04</b> |          | <b>ELECTIVE - I - BIOORGANIC &amp; MEDICINAL CHEMISTRY</b> |             |          |
| Batch                         | Semester | Hours/Week   | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>I</b> | <b>4</b>   | <b>60</b>   | <b>4</b> |

### Objectives

After completion of this course student can know the key role of various elements in the living systems and learn about how enzymes and coenzymes work.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Understand the organic chemistry of biomolecules like amino acids, and protein                                   | K2                     |
| CO2              | Acquire basic knowledge about the structure and functions of certain metallo enzymes.                            | K1                     |
| CO3              | Explain the synthesis of nucleic acids and proteins  | K2                     |
| CO4              | Contribute insight into the small molecules binding and transport mechanism involving living system              | K3                     |
| CO5              | Describe the mechanism of binding interactions of metal complexes with biomolecules and metal based drug action. | K3                     |



|                               |           |  |             |          |
|-------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>    |           | <b>M.Sc. Chemistry</b>                 |             |          |
| Course Code: <b>M19PCHE05</b> |           | <b>ELECTIVE - II - WATER CHEMISTRY</b> |             |          |
| Batch                         | Semester  | Hours/Week                             | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>II</b> | <b>4</b>                               | <b>60</b>   | <b>4</b> |

### Objectives

Enable the students to have knowledge on physic – chemical properties and the evaluation technique for sewage.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Understand Physical and chemical characteristics of water                  | K1                     |
| CO2              | Discuss drinking water specification with physical and chemical parameters | K2                     |
| CO3              | Identify physical and chemical treatment of waste water.                   | K3                     |
| CO4              | Devise industrial waste water treatment process                            | K4                     |
| CO5              | Develop water treatment plant layouts.                                     | K3                     |

|                               |           |                                    |             |          |
|-------------------------------|-----------|------------------------------------|-------------|----------|
| Programme Code: <b>PCH</b>    |           | <b>M.Sc. Chemistry</b>             |             |          |
| Course Code: <b>M19PCHE06</b> |           | <b>ELECTIVE-II- NANO CHEMISTRY</b> |             |          |
| Batch                         | Semester  | Hours/Week                         | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>II</b> | <b>4</b>                           | <b>60</b>   | <b>4</b> |

### Objectives

At the end of the course student learn the synthesis and characterization of nanomaterials and get familiar with nanotechnology and nanodevices.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Acquire knowledge about nano chemistry.                                       | K1                     |
| CO2              | Discuss synthesis of nano materials by using nanofabrication method           | K2                     |
| CO3              | Discuss on various techniques available for characterizing the nano materials | K2                     |
| CO4              | Illustrate carbon clusters and nanostructures                                 | K2                     |
| CO5              | Appraise the role of nanotechnology and nano devices                          | K4                     |

|                               |           |  |             |          |
|-------------------------------|-----------|--|-------------|----------|
| Programme Code: <b>PCH</b>    |           | <b>M.Sc. Chemistry</b>                 |             |          |
| Course Code: <b>M19PCHE07</b> |           | <b>ELECTIVE-III- APPLIED CATALYSIS</b> |             |          |
| Batch                         | Semester  | Hours/Week                             | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>II</b> | <b>4</b>                               | <b>60</b>   | <b>4</b> |

### Objectives

This course provides knowledge in homogenous and heterogeneous catalysis and the completion of this course helps to learn Surface catalysis and mechanism of surface reactions.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Understand basic concepts of acid-base catalysis and enzyme catalysis.                         | K2                     |
| CO2              | Analyze the benefits of PTC and industrial processes with PTC                                  | K4                     |
| CO3              | Demonstrate Micellar catalysis and effects on thermal and photochemical reactions              | K3                     |
| CO4              | Identify the electrocatalysis and list out industrial application                              | K1                     |
| CO5              | Explain surface catalysis & surface structures for single crystal surface of metals and solids | K4                     |

|                               |           |   |             |          |
|-------------------------------|-----------|---|-------------|----------|
| Programme Code: <b>PCH</b>    |           | <b>M.Sc. Chemistry</b>                              |             |          |
| Course Code: <b>M19PCHE08</b> |           | <b>ELECTIVE-II- COMPUTATIONAL QUANTUM CHEMISTRY</b> |             |          |
| Batch                         | Semester  | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>II</b> | <b>4</b>  | <b>60</b>   | <b>4</b> |

### Objectives

On accomplishment of this course students can understand the quantum mechanics necessary for the description of atoms and molecules and their chemical reaction.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Acquire knowledge about computational chemistry principles and tools.             | K1                     |
| CO2              | State molecular mechanics and its application                                     | K3                     |
| CO3              | Understand semi empirical methods and abinitio methods and property calculations. | K2                     |
| CO4              | Discuss basics sets of computational chemistry                                    | K2                     |
| CO5              | Simplify intrinsic property calculations using computational methods              | K3                     |

|                               |            |  |             |          |
|-------------------------------|------------|--|-------------|----------|
| Programme Code: <b>PCH</b>    |            | <b>M.Sc. Chemistry</b>                 |             |          |
| Course Code: <b>M19PCHE09</b> |            | <b>ELECTIVE-III- TEXTILE CHEMISTRY</b> |             |          |
| Batch                         | Semester   | Hours/Week                             | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>III</b> | <b>5</b>                               | <b>75</b>   | <b>4</b> |

### Objectives

This course provides knowledge in Fibre, chemical structure, production, properties and uses of the synthetic fibres and Dyeing of wool and silk.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>                                 | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Understand basic concepts of Fibre in textile.      | K1                     |
| CO2              | Analyze the synthetic fibres.                       | K3                     |
| CO3              | Validate of Impurities in raw materials of textile. | K3                     |
| CO4              | Classify dyes and their importance in textiles.     | K2                     |
| CO5              | Explain the concepts of Dyeing of fibres            | K4                     |

|                               |            |                                       |             |          |
|-------------------------------|------------|---------------------------------------|-------------|----------|
| Programme Code: <b>PCH</b>    |            | <b>M.Sc. Chemistry</b>                |             |          |
| Course Code: <b>M19PCHE10</b> |            | <b>ELECTIVE-III- MATERIAL SCIENCE</b> |             |          |
| Batch                         | Semester   | Hours/Week                            | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>III</b> | <b>5</b>                              | <b>75</b>   | <b>4</b> |

### Objectives

This course gives an insight into the fascinating area of advanced material tools and characterization techniques for smart materials.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Acquire knowledge about smart materials and nano materials.                                | K1                     |
| CO2              | Discuss different techniques for characterization of materials.                            | K2                     |
| CO3              | Demonstrate mechanical and thermal properties of metallic, ceramic and polymeric materials | K3                     |
| CO4              | Understand the concept of energy band diagram for materials                                | K1                     |
| CO5              | Illustrate optical and magnetic properties of metallic and ceramic materials               | K4                     |

|                              |            |   |             |          |
|------------------------------|------------|---|-------------|----------|
| Programme Code: <b>PCH</b>   |            | <b>M.Sc. Chemistry</b>                  |             |          |
| Course Code: <b>M19PCH11</b> |            | <b>ELECTIVE-III - NUCLEAR CHEMISTRY</b> |             |          |
| Batch                        | Semester   | Hours/Week                              | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>III</b> | <b>5</b>                                | <b>75</b>   | <b>4</b> |

### Objectives

This course makes the student is knowledgeable in nuclear chemistry and familiarize the students with nuclear and radioisotopes techniques.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Understand basic concept of nuclear chemistry   | K2                     |
| CO2              | Acquire knowledge about nuclear reaction and nuclear theory                                     | K1                     |
| CO3              | Describe the components of nuclear reactors   | K2                     |
| CO4              | Develop knowledge about chemical effects induced in matter by absorption of ionizing radiations | K3                     |
| CO5              | Discuss the application of radio isotopes in various fields.                                    | K2                     |

|                               |            |   |             |          |
|-------------------------------|------------|---|-------------|----------|
| Programme Code: <b>PCH</b>    |            | <b>M.Sc. Chemistry</b>                                |             |          |
| Course Code: <b>M19PCHE12</b> |            | <b>ELECTIVE-III- CHEMISTRY OF INDUSTRIAL PRODUCTS</b> |             |          |
| Batch                         | Semester   | Hours/Week  | Total Hours | Credits  |
| <b>2019 - 2020</b>            | <b>III</b> | <b>5</b>  | <b>75</b>   | <b>4</b> |

### Objectives

This course gives idea in industrial products like Cement, Glass, Pigments, Dyes, Plastic, Fibres and Cosmetics.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| CO1              | Extract Industrial products like cement and glass and their manufacturing processes and their properties. | K2                     |
| CO2              | Learn about dyes, pigments and paints and their preparation and uses.                                     | K4                     |
| CO3              | Understand the types and processing of plastics and fibres and their utility.                             | K3                     |
| CO4              | Describe the preparation and uses of fertilizers in the agricultural sector.                              | K1                     |
| CO5              | Correlate the chemistry of cosmetics used on day today life.  | K4                     |



|                              |           |                              |             |          |
|------------------------------|-----------|------------------------------|-------------|----------|
| Programme Code: <b>PCH</b>   |           | <b>M.Sc. Chemistry</b>       |             |          |
| Course Code: <b>M19ECH01</b> |           | <b>EDC- HEALTH CHEMISTRY</b> |             |          |
| Batch                        | Semester  | Hours/Week                   | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>II</b> | <b>5</b>                     | <b>75</b>   | <b>4</b> |

### Objectives

This course provides knowledge in Food, Carbohydrates, Protein and vitamins, blood, enzymes, hormones and Toxicants in food and common diseases.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Sketch the importance of basic nutrients and maintenance of good health and classification of carbohydrates, proteins and vitamins | K2                     |
| CO2              | Relate knowledge on drugs and their mode of action   | K4                     |
| CO3              | Compare the functions of body fluids and blood   | K2                     |
| CO4              | Describe the enzymes and hormones  | K2                     |
| CO5              | Recognize the various Toxicants in food and common diseases.   | K1                     |

|                              |           |                            |             |          |
|------------------------------|-----------|----------------------------|-------------|----------|
| Programme Code: <b>PCH</b>   |           | <b>M.Sc. Chemistry</b>     |             |          |
| Course Code: <b>M19ECH02</b> |           | <b>EDC- DRUG DISCOVERY</b> |             |          |
| Batch                        | Semester  | Hours/Week                 | Total Hours | Credits  |
| <b>2019 - 2020</b>           | <b>II</b> | <b>5</b>                   | <b>75</b>   | <b>4</b> |

### Objectives

This course gives knowledge in drug discovery, drugs derived from Natural Products, Prodrug Design and source of drugs.

### Course Outcomes

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

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| CO1              | Understand basic concepts of drug discovery and Structural effects on drug action.                                   | K2                     |
| CO2              | Analyze drug design approaches.  | K4                     |
| CO3              | Discover enzymes as Targets of Drug design and Rational Design of Enzyme Inhibitors.                                 | K3                     |
| CO4              | Correlate the Receptor Theory, Receptor Complexes and allosteric Modulators for Receptors as Targets of Drug Design. | K4                     |
| CO5              | Explain Prodrug Design and list its application.   | K4                     |

|                       |          |                                |             |         |
|-----------------------|----------|--------------------------------|-------------|---------|
| Programme Code: PCH   |          | M.Sc. Chemistry                |             |         |
| Course Code: M19ECH03 |          | EDC - CHEMICAL INSTRUMENTATION |             |         |
| Batch                 | Semester | Hours/Week                     | Total Hours | Credits |
| 2019 - 2020           | II       | 5                              | 75          | 4       |


### Objectives

This course provides knowledge in signal measurement, operational amplifiers, digital electronics and optical absorption spectrometry and concept of Signal-to-Noise Optimization

### Course Outcomes

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

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Describe the nature and choice of measurement methods  | K2              |
| CO2       | Illustrate the Variables that control the measurements | K4              |
| CO3       | Sketch the limits of detection and amplification       | K3              |
| CO4       | Recognize the concept of operational amplifiers        | K1              |
| CO5       | Explain the control of spectrometers instrumentation.  | K2              |

  
**Head of the Department**  
**HOD, Department of Chemistry,**  
**MAHENDRA ARTS & SCIENCE COLLEGE**  
**Kalippatti (PO.), Namakkal (DT)**

  
**Principal**  
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**MAHENDRA ARTS & SCIENCE COLLEGE**  
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**Kalippatti (PO) - 637 501, Namakkal (DT)**

  
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# MAHENDRA ARTS & SCIENCE COLLEGE (Autonomous)

Affiliated to Periyar University, Salem.

Accredited by NAAC with 'A' Grade & Recognized u/s 2(f) and 12(B) of the UGC Act 1956  
Kalippatti – 637 501, Namakkal (Dt), Tamil Nadu.

## DEPARTMENT OF CHEMISTRY

### PROGRAMME OUTCOMES (POs) OF M.Sc. CHEMISTRY

Academic year 2020-2021

- PO1:** Graduates are prepared to be creators of new knowledge leading to innovation and entrepreneurship employable in various sectors such as private, government, and research organizations.
- PO2:** Graduates are trained to evolve new technologies in their discipline.
- PO3:** Graduates are groomed to engage in lifelong learning process by exploring their knowledge independently.
- PO4:** Graduates are framed to design and conduct experiments /demos/create models to analyze and interpret data.
- PO5:** Graduates ought to have the ability of effectively communicating the findings of Chemical sciences; incorporating with existing knowledge.

**Head of the Department**

**HOD, Department of Chemistry,**

**MAHENDRA ARTS & SCIENCE COLLEGE**

**Kalippatti (PO.), Namakkal (Dt)**

**Principal**

**PRINCIPAL**

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## DEPARTMENT OF CHEMISTRY

### PROGRAMME SPECIFIC OUTCOMES (PSOs) OF M.Sc. CHEMISTRY

Academic year 2020-2021

- PSO 1:** Graduates can develop Human Values and Social Responsibilities in the context of learning Chemistry
- PSO 2:** Graduates will able to approach positively towards Environment and Ecology from the Chemistry perspective
- PSO 3:** Graduates can develop extension of Chemistry in the social context for solving social issues
- PSO 4:** Graduates can develop entrepreneurial Skills to start their own industries / business in core chemistry and applied chemistry fields
- PSO 5:** Graduates will able to develop analytical and experimental skills leads the students capable of doing higher-level research works in the emerging fields of chemistry.

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