

**ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)  
CUDDALORE-1**



**PG & RESEARCH DEPARTMENT OF CHEMISTRY**

**M.Phil - SYLLABUS 2020-2021**

**M.Phil. CHEMISTRY**

**CURRICULUM DESIGN TEMPLATE FROM 2021- 2022**

| <b>PG AND RESEARCH DEPARTMENT OF CHEMISTRY</b> |             |                    |                        |               |                        |                              |                      |            |              |
|--|-------------|--------------------|------------------------|---------------|------------------------|------------------------------|----------------------|------------|--------------|
| <b>CURRICULUM TEMPLATE</b>                     |             |                    |                        |               |                        |                              |                      |            |              |
| <b>M.Phil. Chemistry</b>                       |             |                    |                        |               |                        |                              |                      |            |              |
| <b>SEMESTER – I</b>                            |             |                    |                        |               |                        |                              |                      |            |              |
| <b>S.No</b>                                    | <b>Part</b> |                    | <b>Hours/<br/>Week</b> | <b>Credit</b> | <b>Course<br/>Code</b> | <b>Course Title</b>          | <b>Maximum Marks</b> |            |              |
|  |             |                    |                        |               |                        |                              | <b>CIA</b>           | <b>ESE</b> | <b>TOTAL</b> |
| 1  | III         | Core<br>Theory - 1 | 7                      | 5             | MPCH101                | Research Methodology         | 25                   | 75         | 100          |
| 2  | III         | Core<br>Theory - 2 | 7                      | 5             | MPCH102                | Advanced Chemistry           | 25                   | 75         | 100          |
| 3  | III         | Core<br>Theory - 3 | 7                      | 5             |                        | Elective Paper (Guide Paper) | 25                   | 75         | 100          |
| 4  | III         | Library            | 12                     | -             |                        | Science-6 (Library)+6(Lab)   | -                    | -          | -            |
| <b>Semester Total</b>                          |             |                    | <b>33</b>              | <b>15</b>     |                        |                              | <b>75</b>            | <b>225</b> | <b>300</b>   |
| <b>SEMESTER – II</b>                           |             |                    |                        |               |                        |                              |                      |            |              |
| <b>S.No</b>                                    | <b>Part</b> |                    | <b>Hours/<br/>Week</b> | <b>Credit</b> | <b>Course<br/>Code</b> | <b>Course Title</b>          | <b>Maximum Marks</b> |            |              |
|  |             |                    |                        |               |                        |                              | <b>CIA</b>           | <b>ESE</b> | <b>TOTAL</b> |
| 5  | III         | Core<br>Theory - 1 |                        | 21            | JCH201                 | Dissertation and Viva Voce   | 100                  | 100        | 200          |
| <b>Semester Total</b>                          |             |                    |                        | <b>21</b>     |                        |                              | <b>100</b>           | <b>100</b> | <b>200</b>   |
| <b>Total Credits</b>                           |             |                    |                        | <b>36</b>     |                        |                              |                      |            |              |

## Syllabus

|              |                             |            |
|--------------|-----------------------------|------------|
| M.Phil (CH)  | <b>RESEARCH METHODOLOGY</b> | MPCH101    |
| SEMESTER - I |                             | HRS/WK – 7 |
| CORE – I     |                             | CREDIT- 5  |

### Objective:

To impart knowledge on research methodology. To gain an in depth knowledge in statistical analysis.

### COURSE OUTCOMES (COs)

**CO1:** Scholars learn the meaning, objective and problems in Research.

**CO2:** Scholars acquire the basic principles of experimental designs.

**CO3:** Scholars get to know about Data collection methods for documentation and presentation.

**CO4:** Scholars learn data analysis, types and sources of errors and determination of control errors.

**CO5:** Scholars learn essentials of a scientific report.

### Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

| SEMESTER I                | COURSE CODE:<br>MPCH101   |     |     |     |     | COURSE TITLE:<br>RESEARCH METHODOLOGY |      |      |      |      |      |      |             | HOURS:<br>7           | CREDITS:<br>5 |
|---------------------------|---------------------------|-----|-----|-----|-----|---------------------------------------|------|------|------|------|------|------|-------------|-----------------------|---------------|
| COURSE<br>OUTCOMES        | PROGRAMME<br>OUTCOMES(PO) |     |     |     |     | PROGRAMME SPECIFIC<br>OUTCOMES(PSO)   |      |      |      |      |      |      |             | MEAN SCORE OF<br>CO'S |               |
|                           | PO1                       | PO2 | PO3 | PO4 | PO5 | PSO1                                  | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8        |                       |               |
| <b>CO1</b>                | 3                         | 4   | 3   | 4   | 3   | 4                                     | 4    | 4    | 4    | 4    | 4    | 4    | 3           | <b>3.69</b>           |               |
| <b>CO2</b>                | 3                         | 3   | 3   | 3   | 3   | 3                                     | 3    | 3    | 4    | 3    | 3    | 4    | 4           | <b>3.23</b>           |               |
| <b>CO3</b>                | 3                         | 3   | 4   | 3   | 3   | 3                                     | 3    | 4    | 4    | 4    | 4    | 4    | 4           | <b>3.53</b>           |               |
| <b>CO4</b>                | 3                         | 3   | 3   | 3   | 3   | 3                                     | 3    | 4    | 4    | 3    | 4    | 4    | 4           | <b>3.38</b>           |               |
| <b>CO5</b>                | 3                         | 3   | 3   | 4   | 3   | 3                                     | 3    | 3    | 3    | 4    | 4    | 4    | 4           | <b>3.38</b>           |               |
| <b>Mean Overall Score</b> |                           |     |     |     |     |                                       |      |      |      |      |      |      | <b>3.44</b> |                       |               |

**Result: The Score of this Course is 3.44 (High)**

| Association | 1%-20%       | 21%-40%        | 41%-60%        | 61%-80%        | 81%-100%       |
|-------------|--------------|----------------|----------------|----------------|----------------|
| Scale       | 1            | 2              | 3              | 4              | 5              |
| Interval    | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating      | Very Poor    | Poor           | Moderate       | High           | Very High      |

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

### **UNIT-1 RESEARCH METHODOLOGY**

[12 Hrs]

Meaning of research – the objective of research – motivation of research – approaches, and significance – methods versus methodology – research in scientific methods – research process – criteria for good research – problem encounters by research in India – funding agencies.

### **UNIT – II: RESEARCH DESIGN**

[12 Hrs]

Research problem: selecting the problem – the necessity of defining the problem – techniques involved in defining the problem – research design – needs and features of good design – different research design – basic principles of experimental designs.

### **UNIT – III: DATA COLLECTION AND DOCUMENTATION**

[12 Hrs]

Data collection methods – data types – processing and presentation of data- techniques of ordering data – the meaning of primary and secondary data – the uses of computers in research – the library and internet – uses of search engines – virtual libraries – common software for documentation and presentation.

### **UNIT – IV: DATA AND ERROR ANALYSIS**

[12 Hrs]

Statistical analysis of data – standard deviation – the correlation – comparison of sets of data – chi-squared analysis for data – characteristics of probability distribution – binomial, Poisson and normal distribution – the principle of least square fittings – curve fitting – a measurement of errors – types and sources of errors – determination of control errors.

### **UNIT – V: RESEARCH COMMUNICATION**

[12 Hrs]

Meaning of research report – logical format for writing and paper – essential of a scientific report: abstract- introduction, review of the literature – materials and methods and discussion – write up steps in drafting report – effective illustrations: tables and figures – reference styles: Harvard and Vancouver systems.

#### **Text Books:**

1. Research Methodology, methods, and techniques-C.R.Kothari-Wishwa Prakasam publications, II Edition.
2. Research: An Introduction-Robert Ross-Harper and Row Publications.
3. Research methodology-P.Saravanel-Kitlab Mahal, Sixth edition.
4. A Hand-Book of Methodology of Research-Rajammal P.A.Devadass-Vidyalaya press.
5. N.Subramanian, Introduction to Computer.

#### **Reference Books:**

1. G.W.Secdecor and W.Cocharan, Statistical methods oxford and IBH, New Delhi.
2. Santosh Gupta, Research methodology methods, and statistical techniques.
3. S.P.Gupta, Statistical Methods-
4. Scientific social surveys and research-P.Young-Asia publishers, Bombay.
5. How to write and publish a scientific paper –R.A. Day Cambridge University Press.
6. Thesis and assignment writing-Anderson-Wiley Eastern Ltd.

|              |                    |            |
|--------------|--------------------|------------|
| M.Phil (CH)  | ADVANCED CHEMISTRY | MPCH102    |
| SEMESTER – I |                    | HRS/WK – 7 |
| CORE – II    |                    | CREDIT- 5  |

**Objective:**

To study the applications of spectroscopy and to apply it in practice. To provide hands on experience in instrumental methods.

**COURSE OUTCOMES (COs)**

**CO1:** Scholars learn the instrumental methods of GC- HPLC, CV, Polarography and Amperometry.

**CO2:** Scholars understand the Principles and applications in structural elucidation.

**CO3:** Scholars learn the Applications of UV-Visible, IR, NMR in Organic molecules.

**CO4:** Scholars learn the Applications of UV-Visible, IR, NMR, Mossbauer and ESR spectrometry in the determination of structures of inorganic molecules.

**CO5:** Scholars learn the concept of point groups and retro synthesis.

**Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes**

| SEMESTER I         | COURSE CODE:<br>MPCH102   |     |     |     |     | COURSE TITLE:<br>ADVANCED CHEMISTRY |      |      |      |      |      |      |      | HOURS:<br>7           | CREDITS:<br>5 |
|--------------------|---------------------------|-----|-----|-----|-----|-------------------------------------|------|------|------|------|------|------|------|-----------------------|---------------|
| COURSE<br>OUTCOMES | PROGRAMME<br>OUTCOMES(PO) |     |     |     |     | PROGRAMME SPECIFIC<br>OUTCOMES(PSO) |      |      |      |      |      |      |      | MEAN SCORE OF<br>CO'S |               |
|                    | PO1                       | PO2 | PO3 | PO4 | PO5 | PSO1                                | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 |                       |               |
| CO1                | 4                         | 4   | 3   | 4   | 3   | 4                                   | 4    | 4    | 4    | 4    | 4    | 4    | 3    | 3.76                  |               |
| CO2                | 4                         | 3   | 3   | 3   | 3   | 3                                   | 3    | 3    | 4    | 3    | 3    | 4    | 4    | 3.30                  |               |
| CO3                | 3                         | 3   | 4   | 3   | 3   | 3                                   | 3    | 4    | 4    | 4    | 4    | 4    | 4    | 3.53                  |               |
| CO4                | 4                         | 3   | 3   | 3   | 3   | 3                                   | 3    | 4    | 4    | 3    | 4    | 4    | 4    | 3.46                  |               |
| CO5                | 3                         | 3   | 3   | 4   | 3   | 3                                   | 3    | 3    | 3    | 4    | 4    | 4    | 4    | 3.38                  |               |
| Mean Overall Score |                           |     |     |     |     |                                     |      |      |      |      |      |      |      | 3.48                  |               |

**Result: The Score of this Course is 3.48 (High)**

|             |              |                |                |                |                |
|-------------|--------------|----------------|----------------|----------------|----------------|
| Association | 1%-20%       | 21%-40%        | 41%-60%        | 61%-80%        | 81%-100%       |
| Scale       | 1            | 2              | 3              | 4              | 5              |
| Interval    | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating      | Very Poor    | Poor           | Moderate       | High           | Very High      |

This Course is having **High** association with Programme Outcome and Programme Specific Outcome.

**UNIT – I: INSTRUMENTAL METHODS OF ANALYSIS****[12 Hrs]**

Atomic absorption and emission spectroscopy, chromatography: GC - HPLC, electroanalytical methods: coulometry cyclic voltammetry, polarography, amperometry, and ion-selective electrodes.

**UNIT – II: SPECTROSCOPY****[12 Hrs]**

Principles and applications in structural elucidation

Rotational – diatomic molecules – isotopic substitution and rotational constants. Vibrational – diatomic molecules – linear triatomic molecules – specific frequencies of functional groups in polyatomic molecules. Electronic – singlet and triplet states – np\* and pp\*transitions – application to conjugated double bonds and conjugated carbonyls – Woodward-Fieser rules – charge transfer spectra. nuclear magnetic resonance – basic principle – chemical shift – spin-spin interaction and coupling constant. Mass spectroscopy – parent peak, base peak – metastable peak – McLafferty rearrangement.

**UNIT – III****[12 Hrs]**

Applications of UV-Visible, IR, NMR – COSY, NOESY, HMBC, HSQC and mass spectrometry in the determination of structures of organic molecules.

**UNIT – IV****[12 Hrs]**

Applications of UV-Visible, IR, NMR, Mossbauer and ESR spectrometry in the determination of structures of inorganic molecules – a variation of optical activity with wavelength – optical rotatory dispersion and circular dichroism curves and their application in determining the configuration and conformation of different inorganic compounds and conformational analysis.

**UNIT – V****[12 Hrs]**

Symmetry elements – point groups – optical activity – its origin – atomic and conformation asymmetry – a variation of optical activity with wavelength. Retrosynthesis – synthons – synthetic equivalents – GI – target molecules – retrosynthesis of molecules (cubane, ciprofloxacin)

**Text Books:**

1. H.H.Willand, L.L. Merrit and J.A.Dean, Instrumental Methods of Analysis-D.Ven. Nostrand& Co.
2. H.A. Strobel, Chemical Instrumentation, Addition-Wesley publishing & Co.
3. R.S.Drago, Physical Methods in Inorganic Chemistry
4. R.S.Drago, Physical Methods in Chemistry.

**Reference Books:**

1. C.N.Banwell, Fundamentals of Molecular Spectroscopy, 1996, McGraw Hill.
2. William Kemp, Organic Spectroscopy, Macmillan Ltd, 1994.
3. R.M.Silverstein, G.C.Basler, and T.C.Morril Spectrometric Identification of Organic Compounds, - John Wiley-1997.
4. Stuart Warren -Designing Organic Synthesis

## **Question paper pattern for M.Phil**

### **THEORY EXAMINATION**

#### **Internal Examination (25 marks)**

|                           |                 |
|---------------------------|-----------------|
| Two Internal Examinations | 15 marks        |
| Assignment / Seminar      | 10 marks        |
| <b>Total</b>              | <b>25 marks</b> |

#### **External Examination (75 marks)**

##### **Question Pattern**

##### **M. Phil. CHEMISTRY**

**Time: 3 Hours**

**Max. Marks: 75**

Section A ( $5 \times 6 = 30$  marks)

**ANSWER ALL FIVE QUESTIONS**

Internal Choice (Either or Pattern)

Section B ( $3 \times 15 = 45$  marks)

**ANSWER ANY THREE QUESTIONS**

Out of Six Questions (Open Choice)

**TOTAL (30+45=75)**

**NOTE: Equal weightage will be given for all units.**

|                      |  |                   |
|----------------------|--|-------------------|
| <b>M.Phil (CH)</b>   | <b>DISSERTATION AND VIVA-VOCE<br/>For the students admitted in the year 2009</b> | <b>JCH201</b>     |
| <b>SEMESTER – II</b> |  |                   |
| <b>PROJECT</b>       |  | <b>CREDIT- 21</b> |

**Objective:**

The main objective of the project is to expose the students to research and industrial atmosphere and to get a broad idea to develop project.

**COURSE OUTCOMES (COs)**

**CO1:** Ability to perform critical thinking, reasoning and creative thinking.

**CO2:** Ability to use the technology.

**CO3:** Ability to visualize the problems and provide solutions.

**CO4:** Ability to test technical skills.

**CO5:** Ability to work both independently and in groups on development of projects.

**Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes**

| <b>SEMESTER II</b>        | <b>COURSE CODE:</b>           |            |            |            |            | <b>COURSE TITLE:<br/>DISSERTATION AND VIVA-VOCE</b> |             |             |             |             |             |             |             | <b>CREDITS:<br/>21</b>    |
|---------------------------|-------------------------------|------------|------------|------------|------------|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------------------|
| <b>COURSE OUTCOMES</b>    | <b>PROGRAMME OUTCOMES(PO)</b> |            |            |            |            | <b>PROGRAMME SPECIFIC OUTCOMES(PSO)</b>             |             |             |             |             |             |             |             | <b>MEAN SCORE OF CO'S</b> |
|                           | <b>PO1</b>                    | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PSO1</b>   | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> | <b>PSO6</b> | <b>PSO7</b> | <b>PSO8</b> |                           |
| <b>CO1</b>                | 5                             | 4          | 5          | 5          | 4          | 4   | 4           | 4           | 4           | 3           | 4           | 4           | 4           | <b>4.10</b>               |
| <b>CO2</b>                | 5                             | 4          | 5          | 5          | 4          | 4   | 4           | 4           | 5           | 3           | 4           | 4           | 4           | <b>4.20</b>               |
| <b>CO3</b>                | 5                             | 5          | 5          | 5          | 5          | 5   | 5           | 4           | 5           | 3           | 4           | 4           | 4           | <b>4.50</b>               |
| <b>CO4</b>                | 5                             | 5          | 5          | 5          | 5          | 5   | 5           | 4           | 5           | 3           | 4           | 4           | 4           | <b>4.50</b>               |
| <b>CO5</b>                | 5                             | 5          | 5          | 5          | 5          | 5   | 5           | 4           | 5           | 3           | 4           | 4           | 4           | <b>4.50</b>               |
| <b>Mean Overall Score</b> |                               |            |            |            |            |   |             |             |             |             |             |             |             | <b>4.36</b>               |

**Result: The Score of this Course is 4.36 (Very High)**

| <b>Association</b> | <b>1%-20%</b>             | <b>21%-40%</b>              | <b>41%-60%</b>              | <b>61%-80%</b>              | <b>81%-100%</b>             |
|--------------------|---------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| <b>Scale</b>       | <b>1</b>                  | <b>2</b>                    | <b>3</b>                    | <b>4</b>                    | <b>5</b>                    |
| <b>Interval</b>    | <b>0&lt;=rating&lt;=1</b> | <b>1.1&lt;=rating&lt;=2</b> | <b>2.1&lt;=rating&lt;=3</b> | <b>3.1&lt;=rating&lt;=4</b> | <b>4.1&lt;=rating&lt;=5</b> |
| <b>Rating</b>      | <b>Very Poor</b>          | <b>Poor</b>                 | <b>Moderate</b>             | <b>High</b>                 | <b>Very High</b>            |

This Course is having **Very High** association with Programme Outcome and Programme Specific Outcome.



## **FORMAT FOR PREPARING THE PROJECT DISSERTATION REPORT**

### Arrangement of Contents

1. Title Page
2. Bonafide Certificate
3. Acknowledgement
4. Table of contents
5. Abstract
6. Chapters of the Report
7. References
8. Appendices, if any

Appendices should be named as APPENDIX - A  
APPENDIX - B

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### **BINDING SPECIFICATION**

Report should be bound using flexible cover of thick white art paper. The Spine for the bound volume should be of black of 2cms width. The Cover should be printed in block letters.

### **MARGIN SPECIFICATION**

|        |               |
|--------|---------------|
| Top    | : 1.25 inches |
| Bottom | : 1.25 inches |
| Left   | : 1.50 inches |
| Right  | : 1.25 inches |

### **PAGE NUMBERING**

All page numbers should be typed without punctuation on the bottom-center position of the page. The Preliminary pages (table of contents and abstract) should be numbered in lowercase roman literals. Pages of main text, starting with chapter-1, should be consecutively numbered using Arabic numerals.

**TITLE PAGE**

**<TITLE OF THE PROJECT>**

A DISSERTATION REPORT SUBMITTED TO  
ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)  
IN PARTIAL FULFILLMENT  
OF THE REQUIREMENT FOR THE AWARD OF  
THE DEGREE OF

**MASTER OF PHILOSOPHY  
IN  
CHEMISTRY**

BY

**<NAME OF THE STUDENT>  
(REGISTER NO: X00XXX00)**

Under the Guidance of

**<NAME OF THE RESEARCH GUIDE>  
<Designation & Department>**



**PG & RESEARCH DEPARTMENT OF CHEMISTRY  
ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)  
CUDDALORE – 607001**

**<MONTH & YEAR>**

## CERTIFICATE

**<NAME OF THE RESEARCH GUIDE>**

**<Designation>**

PG & Research Department of Chemistry,  
St. Joseph's College of Arts & Science (Autonomous),  
Cuddalore – 607001.

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## **CERTIFICATE**

This is to certify that this Project Dissertation report entitled, “**<TITLE OF THE PROJECT DISSERTATION>**” is a bonafide record of work done by **<NAME OF THE STUDENT>**, (**<ROLL NUMBER>**) under my supervision and submitted to **ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS), CUDDALORE – 1**, Affiliated to **ANNAMALAI UNIVERSITY, ANNAMALAI NAGAR** in partial fulfillment for the award of the Degree of **MASTER OF PHILOSOPHY IN CHEMISTRY**.

**Head of the Department**

**Research Guide**

**Principal**

Submitted for the Viva-Voce Examination held on \_\_\_\_\_

Examiners:

1.

2.

## **SCHEME OF EVALUATION**

### **DISSERTATION AND VIVA-VOCE**

#### **Continuous Internal Assessment (CIA) (100 marks)**

Based on the Periodical Evaluation of Record, Reviews and Experiments, Assessed by the Research Guide.

#### **External Examination (100 marks)**

Based on the evaluation of the Project Dissertation Report submitted and the Viva-Voce examination, Assessed by the External Examiner.