

**COURSES OF STUDIES**  
**FOR**  
**PRE-Ph.D Examination**  
(With effect from 2021-22)  
**MATERIAL SCIENCE**  
(Semester system)



**DEPARTMENT OF MATERIAL SCIENCE**

**Maharaja Sriram Chandra BhanjaDeo University**

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**Takatpur, Baripada-757003**

### **Programme Outcomes:**

- Making aware the students about the various research domains of Material Science.
- Building research aptitude among students regarding the various methodologies that are essential for carrying out cutting edge research.
- Familiarizing students with various data acquisition, interpolation and presentation techniques.
- To make students appreciate the intricacies of field studies that are essential for data validation and problem defining as well as solving in Material Science.
- Enabling students to develop logic in building hypothesis about natural processes and manifestations.
- Enabling students to develop scientific acumen and sound discipline in carrying out field cum laboratory studies.
- To develop scientific knowledge with respect to preparation of scientific reports, project proposals, dissertations, field reports, research articles etc.
- To develop and build discipline and respect for fellow researchers in gathering knowledge and strategy from them.

### **PROGRAMME SPECIFIC OUTCOME**

The Pre-Ph.D in Material Science is designed to specifically achieve a few targets such as:

- Sound critical thinking of students based on scientific logic
- Enablement of students with theoretical and field and laboratory skills.
- Motivate themselves and develop an interest in planning and implementation of research.
- Expertise of students with equipment handling for sample acquisition, storage, analysis and error correction.
- Expertise of students with natural process characterization and interpretation.
- Development of the teaching-learning process within the students.
- Development of scientific for scientific innovation.
- Substantial aptitude of students towards research ethics

## Curricular structure

### Semester-I

<b>Course Code</b>	<b>Course Title</b>	<b>Credit</b>	<b>Marks</b>
MS801	Research Methodology-I	05	50
MS802	Research Methodology-II	05	50
MS803	Research Review (to be evaluated through seminar & presentation)	10	100
Grand Total		20	200

## Semester-I

PAPER CODE: MS-801

### PAPER-I: Research Methodology-I

#### **PAPER OBJECTIVE:**

This course is designed based on the objective to develop creative & critical thinking, problem formulating & solving skill among the students.

**Unit I:** What is research? Why to peruse research? Defining the Research problem: objectives, approaches, planning or design, process / methods of research; literature survey. Basics of Research, Fundamental questions like definition of research, logical and systematized applications of the fundamentals of science and scientific techniques, necessity of research in science. Importance of research, generalizations of new theories, outlet for new ideas and insights.

**Unit II:** Identification of Material Science research problem, formulating work plan, Dos and Don'ts for selecting a research problem. Importance of problem in National and International scenario, how to conduct research survey (books, journals, electronic search engines like Google, SCOPUS, Wikipedia Research-gate, IGCP Project Data Base, etc.). Research Methodology and techniques used in the field and laboratory for Material Science, Dissemination of research results through conferences, workshops, data production, report writing and publication of research paper.

#### **Unit III:**

Research Methodology is an art of scientific investigations, Material Science related questions and new insights of a Material related event or phenomenon (For Example, Corrosion, Renewable energy like solar, wind etc, Smart electronic material, Failure analysis of metallic structure like turbine, railway tracks etc). Planning, Selection, Formulation and Execution of research project, Thrust area of the project, Objectives of the project and the Course of action (work plan), Conceptual and Empirical literature review. Status of research on international and national level

**Unit IV:** Data generation and analysis. Fundamentals of scientific Writing and relevant software, Research Ethics, Intellectual Property Rights (IPR) and Plagiarism

## **PAPER OUTCOME:**

At the completion of the course the students will be enabled to appreciate;

- ✓ The intricacies of the subject with respect to developing/finalizing scientific problems, conducting scientific experiments and analyzing the collected data in solving those outlines problems. The budding researchers will also be able to appreciate the works of the foregoing researchers as well as the **ethics that should be inherited by a researcher.**
- ✓ **Skill development for employment in R&D sector of industry as well as academia.**

## **Reference Books:**

1. Research Methodology For Scientific Research by K. Prathapan.
2. HANDBOOK OF RESEARCH METHODOLOGY, Edition: 1, Publisher: Educreation, ISBN: 978-1-5457-0340-3

## **Semester-I**

### **PAPER CODE: MS-802**

### **PAPER-II: Research Methodology-II: Scientific report writing**

## **PAPER OBJECTIVE:**

This paper is designed based on the objective to making students learn how to write projects, manuscript, scientific reports, patents, and thesis independently so as make them comparative and compatible with global research community.

**Unit I: Project writing:** What is a Project? Why to peruse a project? Importance of having funded projects. How to write a Project? How to make a presentation of a project? Generation of data for project. Project report writing. Answering to the reviewers queries.

**Unit II: manuscript writing:** What is manuscript? How to write a manuscript? Manuscript preparation; (Introduction, Literature gap, Statement of the research problem, experiment executed, data evaluation, results and discussion, conclusion) Evaluation of the status of the manuscript, Plagiarism checking, referencing, communicating to journals, answering to the reviewers queries.

**Unit III: Patent Writing:** Definition of a patent, when can we file a patent, patent writing, claims, scientific proofs.

**Unit IV: Thesis writing:** What is a thesis? Importance of thesis, types of thesis, contents in a thesis, writing thesis, and defending a thesis.

**PAPER OUTCOME:**

- ✓ At the completion of the course the students will be enabled to appreciate the intricacies of the subject with respect to various scientific report writing. In specific they will not only be able to independently write project, manuscript, patent, and thesis but also defend it by scientific facts and arguments.
- ✓ **Skill development for employment in R&D sector of industry as well as academia.**

**Reference Books:**

1. Class notes, lectures, and PPT.

**Semester-I**

**PAPER CODE: MS-803**

**PAPER-III: Research review**

**PAPER OBJECTIVE:**

To know in depth exploration of a topic of special interest and to explain, apply relevant theories and laws in the chosen area.

**PAPER OUTCOME:**

At the end of this course, the students would be able to:

1. Interpret theories and doctrines, and give recommendations where appropriate
2. Acquire knowledge on the chosen topic and apply the knowledge, experience, and skills learned.
3. Produce a thesis of publishable quality.
4. Effectively present and defend research orally.
5. **Employability in any of the academic, Industrial and Research Organizations.**