

**BROAD FORMAT OF SYLLABUS OF M.PHIL AND Ph.D PROGRAM  
G. M. UNIVERSITY, SAMBALPUR**

**M.Phil Program**

**Semester-I**

Paper No.	Title of Paper	Maximum Marks	Credits assigned
611	Recent Trends in the Subject	80+20=100	4 Credits
612	Research Methodology-I	80+20=100	4 Credits
613	Research Methodology-II	80+20=100	4 Credits
614	Teaching Assignment	100	4 Credits
	Total	400	16 Credits

**Semester-II**

Paper No:	Title of Paper	Maximum Marks	Credits assigned
621	Dissertation (Report/ Presentation/ Viva-Voce)	150+25+25=200	8 Credits

**Ph.D Program**

**Semester-I**

Paper No.	Title of Paper	Maximum Marks	Credits assigned
711	Recent Trends in the Subject	80+20=100	4 Credits
712	Research Methodology-I	80+20=100	4 Credits
713	Research Methodology-II	80+20=100	4 Credits
714	Dissertation or Review Writing/Presentation/ Viva-Voce	150+25+25=200	8 Credits
	Total	500	20 Credits

## Recent Trends in the Subject

### Paper-611/711

**Objective:** The objective of the course is to give an idea in the area Approximation Theory, Symmetry, Number Theory and Fractional Calculus.

#### Unit-I

**Approximation Theory:** Function Spaces, Convex and Strictly Convex Norms, Uniform Convergence, Interpolation, Approximation by Algebraic Polynomials: Uniform Approximation by Algebraic Polynomials, the First Weierstrass Theorem, the Bernstein Polynomials, Module of Continuity, the Bohman-Korovkin Theorem. Approximation by Trigonometric Polynomials: The second Weierstrass Theorem, the Chebyshev Polynomials

#### Unit-II

**SYMMETRY:** Orthogonal Matrices and Rotations, Symmetry of Plane figures, The Group of Motions of the plane, Finite Groups of Motions, Finite subgroups of the Rotation Group.

#### Unit-III

**Number Theory:** Partition function and its generating function, Euler theorem for partition, Congruence properties of partition functions, Rogers Ramanujan Identities, Introduction to basic hyper geometric series,  $q$ - binomial theorem, Heine's transformation and Gaussian Polynomial. Bilateral series and its applications, Theta Functions

#### Unit-IV

**Fractional Calculus:** Commences of History background and introduction, Fractional derivatives and integrals: Riemann-Liouville Fractional derivative; Caputo and Grunwald-Letnikov Derivative; Composition with integer-order derivatives and fractional order derivatives; Left and Right fractional derivative; properties of fractional derivative with some examples, Riesz Derivative, Riemann-Liouville fractional integral, Hadamard fractional integral.

Books Prescribed:

1. M J D Powell, Approximation theory and methods, 1981 (CUP, reprinted 1988)
2. Igor Podlubny, Fractional Differential Equations, Mathematics in Science and Engineering, Vol. 198, Academic Press
3. Bruce C. Berndt, Number Theory in the Spirit of Ramanujan, AMS (Chapter-I, II)
4. G. E. Andrews, The Theory of Partitions, Addison Wesley 1979. (Chapter-I, II, III)  
Bruce C. Berndt, Ramanujan's Notebooks Vol III, Springer, New York 1991. (Chapter-I, Entry-17-32)
5. Gasper and Rahman, Basic hypergeometric Series, Cambridge University Press 1990 (Chapter-I)
6. M. Artin, Algebra,

#### Reference Books:

1. Gasper and Rahman, Basic hypergeometric Series, Cambridge University Press 1990.
2. G.E Andrews, R. Askey and Ranjan Roy, Special functions, Cambridge University press 2000.

## **PAPER-612/712**

### **RESEARCH METHODOLOGY-I**

#### Unit-I

##### **SCOPE, PHILOSOPHY AND ETHICS OF RESEARCH AND ETHICS**

- i) Introduction and Scope
- ii) Introduction to philosophy: definition, nature and scope, concept, branches
- iii) Ethics: definition, moral philosophy, nature of moral judgments and reactions, Research ethics, Institutional ethics committee.
- iv) Ethics with respect to science and research
- v) Intellectual honesty and research integrity

#### Unit-II

##### **SCIENTIFIC CONDUCT**

- i) Research problem: Identification, Selection, Formulation of research objectives
- ii) Research design: Components, Types and Importance
- iii) Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
- iv) Redundant publications: duplicate and overlapping publications, salami slicing
- v) Selective reporting and misrepresentation of data

#### Unit-III

##### **TECHNICAL WRITING**

- i) Literature search technique, using SCOPUS, Google Scholar, PUBMED, Web of science, Indian Citation Index, and RG
- ii) Types of technical documents; Full length research paper, Short/Brief communications, Letters to editor, Book chapter, Review, Conference report, Project proposal Components of a full length research paper; , Rationale of the paper, Aims and objectives, Hypothesis building, Work plan, Materials and methodology, Results and discussion, Conflict of interest statement,
- iii) Components of a research proposal; Project summary Key words, Origin of the proposal, Major objectives Methodology, Instrument facility available in the PI's department, Overview of status of Research and Development in the subject, Importance of the proposed project in the context of current status.
- iv) Styles of referencing; APA, MLA, Oxford, Harvard, Chicago, Annotated bibliography, Tools for citing and referencing, Grammarly, Endnote etc, How to cite and how to do referencing

#### Unit-IV

#### **PUBLICATION ETHICS**

- i) Publication ethics: definition, introduction and importance
- ii) Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
- iii) Conflicts of interest
- iv) Publication misconduct: definition, concept, problems that lead to unethical behavior  
and vice versa, types
- v) Violation of publication ethics, Subject specific ethical issues, FFP, authorship,
- vi) Identification of publication misconduct, complaints and appeals
- vii) Predatory publishers and journals
- viii) Plagiarism-Pitfall
- ix) Use of plagiarism software like Turnitin, Urkund and other open source software tools, . Complaints and appeals: examples and fraud from India and abroad