Annexure- I

Himachal Pradesh University, Shimla
('A' Grade, NAAC Accredited)

Syllabus and Scheme of Examination

of

Ph.D. Course Work (Computer Science)

DEPARTMENT OF COMPUTER SCIENCE

Ph.D. Course Work (2024-25)

For Batches Admitted in November-December 2024 Onwards

Ph.D. Course Work (2024-2025) (Computer Science)

(For Batches Admitted in November -December 2024 Onwards)

The Ph.D. Course work will consist of **three courses** (12 credits):

I. Course 1: Research and Publication Ethics, RPE (common for all HPU's Ph.D. programs) with the credit weightage of 2*****.

II. Course 2: Research Methodology (Discipline-wise) with a credit weightage of 5. The course will consists of 5 modules/units

III. Course 3: Discipline-specific research oriented Elective course with a credit of 5. The course will consists of 5 modules/units.

***The course & scheme for Course-1: Research and Publication Ethics, (common for all HPU's Ph.D. programs) has been notified vide Notification No. 7-1/2024-HPU(Acad.) dated 3rd February, 2025. (Appended as annexure- A)**

Paper Code	Paper Title	Credits	Workload per Week	Exam Time (Hrs.)	External Marks	Max. Marks
Course 2: Research Methodology(Discipline-wise)						
CS-PhD-01	Research Methodology in Computer Science	5	5	3	100	100
Course 3: Discipline- specific Elective Subjects						
CS-PhD-E01	Algorithm Analysis & Design	5	5	3	100	100
CS-PhD-E02	Advanced Software Engineering	5	5	3	100	100
CS-PhD-E03	Advanced Database Concepts	5	5	3	100	100
CS-PhD-E04	Advanced Network Technologies	5	5	3	100	100
CS-PhD-E05	Parallel Processing Architectures	5	5	3	100	100
CS-PhD-E06	Advanced Computer Architecture	5	5	3	100	100

The students can opt for (all three courses) MOOCS/SWAYAM and other accredited online platforms courses, with prior approval of relevant bodies.

Evaluation scheme:

At the end of the course, a final written examination of 100 marks will be conducted.

a) Students with at least 75% attendance will be eligible for the final written examination.

b) The exam will be conducted for a three-hour duration.

c) The passing marks for PhD coursework will be 55% aggregate, with minimum 50% in each individual course (All three courses).

Note for paper setting:

There will be 11 questions covering all units. The first 10 questions of explanatory answers of 12 marks each will consist of one question from each unit with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11^{th} question will consist of 10 short answer type questions using Roman numerals (i, ii,iii…..x) each with 5 marks covering with all the units. The students will be required to attempt any 8 questions out of 10.

CS-PhD-01: Research Methodology in Computer Science L: 5 T: 0 P: 0

Course Objectives: This course is designed to equip students in computer science with the essential skills and knowledge needed to conduct rigorous and effective research. It covers various research methodologies, techniques, and ethical considerations relevant to the field.

Course Outcomes: By the end of this course, the student will be able to:

- CO1 Understand the fundamentals of research methodology, including types of research and problem formulation in computer science.
- CO2 Conduct a systematic literature review, critically analyze existing research, and identify research gaps.
- CO3 Design and plan research studies using appropriate methodologies, sampling techniques, and ethical considerations.
- CO4 Apply quantitative and qualitative data collection and analysis techniques using statistical and computational tools.
- CO5 Explore emerging research trends in computer science, including machine learning, big data analytics, and advanced data analysis techniques.
- CO6 Develop effective scientific writing skills, utilize citation styles, and use reference management and formatting tools for research documentation.

UNIT-I

Introduction to Research Methodology: Overview of research in computer science, Types of research: Basic, Applied, and Experimental, Research paradigms: Positivism, Interpretivism, and Pragmatism, Formulation of research problems and objectives.

UNIT-II

Literature Review: Purpose and importance of literature review in research, Conducting a systematic literature review, exploring grey literature, Critical analysis and synthesis of existing research, Identifying research gaps.

UNIT-III

Research Design and Planning: Experimental design, Survey design, Case study design, Mixed-methods research, Sample selection and size determination. Data Collection Methods: Quantitative data collection techniques (Surveys, experiments, observations), Qualitative data collection techniques (Interviews, focus groups, case studies), Ethical considerations in data collection.

UNIT-IV

Data Analysis Techniques: Quantitative data analysis using statistical tools (Descriptive Statistics, Inferential Statistics, Data Visualization, Statistical Software), Qualitative data analysis techniques (Thematic analysis, content analysis, grounded theory), Computer-assisted data analysis tools (Programming Languages and Libraries, Database Management Systems, Statistical Software, Data Visualization Tools). Emerging Trends in Computer Science Research and Advanced Data Analysis Techniques: Exploration of current research trends and hot topics, Overview of advanced data analysis techniques in computer science research, Introduction to machine learning for data analysis, Big data analytics and tools in computer science research (Hadoop, Apache Spark, NoSQL Databases, Apache Flink, Tableau).

UNIT-V

Significance of Report Writing: Different Steps in writing Report, Layout of the Research Report, Types of Reports, Mechanics of Writing a Research Report, Art of scientific writing- Steps to better writing, flow method, organization of material and style, Drawing figures, graphs, tables, footnotes etc. in a research paper, Use of internet in research activities.

Citation and Referencing: Importance of citation, Different citation styles- IEEE, ACM, APA, MLA, Chicago etc. Reference Management Software-Zotero, Mendeley, Software for paper formatting like LaTeX/Word processors.

References:

1. Creswell, J.W.(2014).Research Design:Qualitative,Quantitative, and Mixed Methods Approaches.
2. Wallwork, A(2016).English for Writing Research Papers.
3. Booth,W.C.,Colomb,G.G.,&Williams,J.M.(2008).The Craft of Research.
4. Silverman, D.(2016).Qualitative Research.

Note:

There will be 11 questions covering all units. The first 10 questions of explanatory answers of 12 marks each will consist of one question from each unit with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11^{th} question will consist of 10 short answer type questions using Roman numerals(i, ii,iii…..x) each with 5 marks covering with all the units. The students will be required to attempt any 8 questions out of 10.

CS-PhD-E01: Algorithm Analysis & Design **L: 5 T: 0 P: 0**

Course Objectives: This course provides a comprehensive understanding of fundamental algorithms and data structures essential for solving complex computational problems efficiently. As part of this course, students will be introduced to algorithm analysis, design techniques, data structures, sorting and searching algorithms, graph algorithms, and advanced algorithmic techniques. Students will learn how to analyze, design, and implement efficient algorithms to tackle real-world problems effectively.

Course Outcomes: By the end of this course, the student will be able to:

CO1	Analyze and design algorithms using asymptotic notations and fundamental data structures.
CO2	Implement various hashing techniques, including perfect hashing and cuckoo hashing, for efficient data retrieval.
CO3	Apply algorithmic design paradigms such as divide-and-conquer, dynamic programming, and greedy methods to solve computational problems.
CO4	Develop and analyze sorting and searching algorithms for optimizing data processing efficiency.
CO5	Solve graph-related problems using shortest path algorithms, spanning tree algorithms, and Steiner trees.
CO6	Comprehend NP-completeness concepts, polynomial time verification, and the complexity of NP-complete problems.

UNIT-I

Introduction: Algorithms, Analyzing Algorithms, Designing Algorithms, Asymptotic Notations. Data Structures: Elementary.
Data Structures, Hash Tables, Binary Search Trees, Red Black Trees, Skip lists, Binomial Heaps, Fibonacci Heaps, Perfect Hashing, Cuckoo Hashing.

UNIT-II

Design and Analysis Techniques: Divide-and-conquer, Dynamic Programming, Greedy Method, Amortized Analysis.

Sorting & Searching: Simple Sorting Algorithms, Radix Sorting, Heapsort, Quick sort, Linear and Binary search algorithms.

UNIT-III

Algorithms on Graphs: Elementary Graph Algorithms, Single Source Shortest Paths, All Pairs Shortest Paths, Minimum spanning trees, Steiner trees.

UNIT-IV

Advanced Algorithms: Matrix operations, String Matching- The naïve string matching algorithm, Rabin-Karp algorithm, Knuth-MorrisPratt algorithm.

UNIT-V

NP-Completeness: Polynomial time, Verification, NP-Completeness and reducibility, NP-Completeness proofs, NP-Complete problems.

References:

1. Cormen T.H., Leiserson C.E., Rivest R.L., Introduction to Algorithms, Prentice Hall India.
2. Horowitz E., Sahni S., Rajasekaran S., Computer Algorithms, Galgotia Publications.
3. Aho A.V., Hopcroft J.E.Ullman J.D.,The Design and Analysis of Computer Algorithms, Pearson Education Asia.
4. Knuth D.E.,The Art of Computer Programming Volume1(Fundamental Algorithms), Narosa Publishing House.

5. Knuth D.E.,The Art of Computer Programming Volume 3(Sorting and Searching), Addison- Wesley.

Note:

There will be 11 questions covering all units. The first 10 questions of explanatory answers of 12 marks each will consist of one question from each unit with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11^{th} question will consist of 10 short answer type questions using Roman numerals(i, ii,iii…..x) each with 5 marks covering with all the units. The students will be required to attempt any 8 questions out of 10.

CS-PhD-E02: Advanced Software Engineering **L: 5 T: 0 P: 0**

Course Objectives: This course delves into the principles and practices of software project management, software configuration management, software quality assurance, software reuse, and software re-engineering. Through theoretical study and case studies, students will gain insights into effective software project planning, configuration management, quality assurance techniques, and strategies for software re-engineering.

Course Outcomes: By the end of this course, the student will be able to:

- CO1 Understand software project management principles, including planning, metrics, and software economics.
- CO2 Apply software configuration management techniques for version control, change management, and release management.
- CO3 Implement software quality assurance practices and assess quality using various models and metrics.
- CO4 Utilize software testing methodologies, including defect tracking, test planning, and specialized testing techniques.
- CO5 Analyze software reuse techniques and component-based software engineering to enhance software development efficiency.
- CO6 Explore software re-engineering concepts, including restructuring, reverse engineering, and data migration.

UNIT-I

Software Project Management: Software Project Planning, Conventional Software Management, Evolution of Software Economics, Improvement of Software Economics, Project Metrics.

UNIT-II

Software Configuration Management: Configuration Management, Change Management, Version Management, Build and Release Management.

Software Quality: Introduction, Software Quality Assurance, Quality Models, Study of Quality Metrics.

UNIT-III

Software Testing: Introduction, Basics of Software Testing, Testing Principles, Testing Life Cycle, Phases of Testing, Defects, Defect Life Cycle, Defect Report, Test Plan(IEEE format), Importance of testing in software production cycle, Test organization, Structure of testing, Measurement tools, testing metrics: Type of metric – Project, Progress, Productivity, Metric plan, Goal Question metric model, Measurement in small & large system. Other Software Testing: GUI testing, Validation testing, Regression testing, Scenario testing, Specification based testing, Adhoc testing, Sanity testing, Smoke testing, Random Testing.

UNIT-IV

Software Reuse: Motivation, Inhibitors, Techniques - Component Based Software Engineering, Process Models, Reuse Metrics.

UNIT-V

Software Re-engineering: Introduction Re-engineering, Restructuring and Reverse Engineering, Re-engineering existing systems, Data Reengineering and migration, Software Reuse and Reengineering, Reengineering Metrics.

References:

1. Walker Royce,"Software project management", Pearson Education, ISBN:

9780201309584, 2004.
2. Robert S.Arnold,"Software Re-engineering", IEEE Computer Society.
3. R. Pressman,"Software Engineering:A Practitioner's Approach", McGraw Hill.
4. Pankaj Jalote,"An Integrated Approach to Software Engineering", Narosa Publishers, 1992.
5. Ghezzi,Carlo,"Fundamentals of Software Engineering", Prentice Hall India.
6. M.G. Limaye, " Software Testing Principles and Tools" TMG Hill Publication.

Note:

There will be 11 questions covering all units. The first 10 questions of explanatory answers of 12 marks each will consist of one question from each unit with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11^{th} question will consist of 10 short answer type questions using Roman numerals(i, ii,iii……x) each with 5 marks covering with all the units. The students will be required to attempt any 8 questions out of 10.

CS-PhD-E03: Advanced Database Concepts **L: 5 T: 0 P: 0**

Course Objectives: The goal of this course is to teach the database analysis and design techniques, covering various methodologies for designing databases at conceptual, logical, and physical levels. The course aims to impart knowledge on the concepts related to normalization theory, distributed databases concepts, object- oriented database management systems, data warehousing, and data mining. Course also offers an understanding of how databases are administered in diverse settings, with a specific emphasis on the security protocols integrated within database management systems.

Course Outcomes: By the end of this course, the student will be able to:

- CO1 Understand database design methodologies, including ER modeling, normalization, and conceptual, logical, and physical design.
- CO2 Analyze distributed database concepts, query processing, data allocation, fragmentation, and optimization techniques.
- CO3 Explore object-oriented database management systems, object identity, inheritance, polymorphism, and schema evolution.
- CO4 Gain knowledge of data warehousing concepts, OLAP, multidimensional modeling, and data preprocessing techniques.
- CO5 Apply data mining techniques such as clustering, classification, association rules, and outlier analysis.
- CO6 Implement data mining algorithms, including k-means clustering, decision trees, and Apriori for pattern discovery.

UNIT-I

Data Base Analysis and Design Techniques: Database Design Methodologies: Conceptual, Logical, Physical Designs, ER Modeling: Specialization, Generalization, Aggregation, Normalization Theory.

UNIT-II

Distributed Databases Concepts: Functions and Architecture of a DDBMS, Data Allocation, Fragmentation, Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Characterization of Query Processing, Layers of Query Processing, Query Decomposition and Data Localization: Query Decomposition, Localization of Distributed Data Optimization of Distributed Queries Query Optimization, Centralized Query Optimization, Join Ordering in Fragment Queries, Distributed Query Optimization Algorithms.

UNIT-III

Object Oriented DBMSS Concepts and Design: Abstraction, Encapsulation, object Identity, Methods, Classification and Inheritance, Overloading, Overriding, Polymorphism, Complex Objects, storing objects in Relational Databases, Pointer swizzling techniques, Persistence schemes, versions and schema evolution, Object Relational Databases and Nested Relational model.

UNIT-IV

Data Warehousing: Introduction, Decision Support, Creating and Maintaining a Warehouse, OLAP, Multidimensional Data Model, Data Warehouse Architecture, OLAP and Data Cubes, Operations on Cubes, Data Preprocessing, Need for Pre-processing, Multidimensional Data Model, Study of Data pre-processing, Need for Pre-processing, Simulating and maintaining a Warehouse, Analysis of Data pre-processing.

UNIT-V

Data Mining: Introduction, Data Mining Functionalities, Clustering - k means algorithm, Classification - Decision Tree, Bayesian Classifiers, Outlier Analysis, Association Rules - Apriori Algorithm, Introduction to Text Mining, Implementing Clustering - k means algorithm, Analysis of Decision tree.

References:

1. Thomas Conolly, Carolyn Begg, "Database Systems", Pearson Education,Third Edition.
2. Navathe and Ellmassri, "Fundamentals of Database Systems", Pearson Education, Fourth Edition.

Note:

There will be 11 questions covering all units. The first 10 questions of explanatory answers of 12 marks each will consist of one question from each unit with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11^{th} question will consist of 10 short answer type questions using Roman numerals(i, ii,iii…..x) each with 5 marks covering with all the units. The students will be required to attempt any 8 questions out of 10.

CS-PhD-E04: Advanced Network Technologies **L: 5 T: 0 P: 0**

Course Objectives: The key objective is to acquire a foundational understanding of data link layer protocols, network design issues and transport layer protocols. As part of this course, students will be introduced to flow control, error control, MAC protocols, IEEE standards, routing algorithms, authentication, email security, security attacks, prevention techniques, IP security, and wireless LANs.

Course Outcomes: By the end of this course, the student will be able to:

- CO1 Understand data link layer protocols, framing techniques, flow control, error control, and MAC protocols.
- CO2 Analyze network and transport layer design issues, including routing, congestion control, and internetworking.
- CO3 Demonstrate knowledge of network security concepts, authentication methods, and email security.
- CO4 Understand IP security architecture, authentication headers, and secure data transmission.
- CO5 Explore cryptographic algorithms, block cipher design, and key management techniques.
- CO6 Evaluate wireless LAN standards, security protocols, and emerging wireless communication technologies.

UNIT-I

Data Link Layer: Framing techniques, Flow control, Error Control, data link protocols, MAC protocols and IEEE standards.

UNIT-II

Network & Transport layer design Issues: Routing algorithms, Congestion control algorithms, Internetworking, Services and elements of Transport protocols.
Network Security: Authentication & E mail Security, Security attacks and their preventions.

UNIT-III

IP Security: IP security overview, IP Security Architecture, Authentication Header Encapsulating Security Pay load.

UNIT-IV

Crypto Graphic Algorithms (Block Cipher): RC2, GOST, CAST, BLOW FISH, SAFEER, RC5, NEWDES, CRAB, Theory of Block Cipher design. Key Management: Key lengths, Generating Keys, Transferring, Verification, Updating, Storing, Backup, Compromised, Destroying Keys, Public key Management.

UNIT-V

Wireless LANs: Introduction, Benefits, WLANs Configurations and Standards, Security, IEEE 802.11, Wireless LAN Standard, Blue tooth.

References:

1. B.A. Forouzan,"Data Communication & Networking", McGrawHill.
2. A.S. Tanenbaum,"Computer Networks", Prentice Hall India.
3. WilliamStallings,"Data & Computer Communication", McMillan Publishing Co.
4. Black,"Data Networks", Prentice Hall India, 1988.
5. Fred Halsall,"Data Communications", Pearson Education.

Note:

There will be 11 questions covering all units. The first 10 questions of explanatory answers of 12 marks each will consist of one question from each unit with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11^{th} question will consist of 10 short answer type questions using Roman numerals(i, ii,iii…..x) each with 5 marks covering with all the units. The students will be required to attempt any 8 questions out of 10.

CS-PhD-E05: Parallel Processing Architectures **L: 5 T: 0 P: 0**

Course Objectives: This course offers an introduction to parallel processing, covering fundamental concepts, architectures, and programming techniques. Course delves into Flynn's classification, SIMD (Single Instruction, Multiple Data) and MIMD (Multiple Instruction, Multiple Data) operations, shared memory versus message passing multiprocessors, distributed shared memory systems, and hybrid multiprocessors. Through theoretical study and case studies, students will gain a comprehensive understanding of parallel processing principles and applications.

Course Outcomes: By the end of this course, the student will be able to:

- CO1 Understand the fundamentals of parallel processing, including Flynn's classification and multiprocessor architectures.
- CO2 Analyze shared memory multiprocessors, cache coherence protocols, and memory management techniques.
- CO3 Explore interconnection networks, switching techniques, and routing mechanisms for efficient data transfer.
- CO4 Examine message-passing architectures, grid computing, and cluster-based parallel processing.
- CO5 Learn multiprocessor scheduling techniques, load balancing, and content-aware resource allocation.
- CO6 Investigate emerging parallel computing architectures, cloud computing, and optimization strategies for scalability and efficiency.

UNIT-I

Introduction to Parallel Processing: Flynn's classification, SIMD and MIMD operations, Shared Memory vs. message passing multiprocessors, distributed shared memory, Hybrid multiprocessors.

UNIT-II

Shared Memory Multiprocessors: SMP and CC-NUMA architectures, Cache coherence protocols, Consistency protocols, Data pre-fetching, CCNUMA memory management, SGI 4700 multiprocessor, Network Processors.

UNIT-III

Interconnection Networks: Static and Dynamic networks, switching techniques, Routers, Internet techniques.

UNIT-IV

Message Passing Architectures: Message passing paradigms, Grid architecture, Workstation clusters, User level software.

Scheduling: Multiprocessor Programming Technique, Scheduling and mapping, Internet web servers, P2P, Content aware load balancing.

UNIT-V

Emerging parallel computing architectures- Warehouse-scale computers, cloud computing, domain-specific architectures

Optimization strategies: load-balancing, scalability, locality/communication, memory optimization.

References:

1. Michael J.Quinn,"Parallel Computing:Theory and Practice", Tata McGraw-Hill.
2. C. Xavier and S.S. Iyenger, "Introduction to Parallel Algorithms",Wiley Interscience Publication.
3. Wilkinision,"Parallel Programming", Prentice Hall India.
4. J. L. Hennessy and D. Patterson, "Computer Architecture: A Quantitative Approach",

Morgan Kaufmann Publishers.

5. P. Pacheco, M. Malensek, An Introduction to Parallel Programming, Morgan Kaufmann Publishers, 2022.

Note:

There will be 11 questions covering all units. The first 10 questions of explanatory answers of 12 marks each will consist of one question from each unit with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11^{th} question will consist of 10 short answer type questions using Roman numerals(i, ii,iii…..x) each with 5 marks covering with all the units. The students will be required to attempt any 8 questions out of 10.

CS-PhD-E06: Advanced Computer Architecture **L:5 T:0 P:0**

Course Objectives: This course provides an exploration of parallelism within Uniprocessor systems and various parallel computer structures. It covers trends in parallel processing, basic Uni-processor architecture, parallel processing mechanisms, pipeline computers, array computers, and multiprocessor systems. Through theoretical study and practical examples, students will gain a comprehensive understanding of parallelism concepts and their applications in both Uni-processor and multiprocessor systems.

Course Outcomes: By the end of this course, the student will be able to:

CO1	Understand the fundamentals of parallelism in uni-processor systems and different parallel computer structures.
CO2	Analyze architectural classification schemes, parallel processing techniques, and pipelining principles.
CO3	Explore SIMD array processors, their interconnection networks, and communication mechanisms.
CO4	Examine multiprocessor architectures, including loosely and tightly coupled systems.
CO5	Learn about interconnection networks such as shared buses, crossbar switches, and multiport memories.
CO6	Investigate advanced cache mechanisms, memory consistency models, and security vulnerabilities in modern architectures.

UNIT-I

Parallelism in Uni-processor Systems: Trends in parallel processing, Basic Uni-processor Architecture, Parallel Processing Mechanism.
Parallel Computer Structures: Pipeline Computers, Array Computers, Multiprocessor Systems.

UNIT-II

Architectural Classification Schemes: Multiplicity of Instruction-Data Streams, Serial versus Parallel Processing, Parallelism versus Pipelining.
Pipelining: An overlapped Parallelism, Principles of Linear Pipelining, Classification of Pipeline Processors, Superscalar Pipeline Design, Super pipelined Design.

UNIT-III

Structures for Array Processors: SIMD Array Processors, SIMD Computer Organizations, Inter-PE Communications.
SIMD Interconnection Networks: Static versus Dynamic Networks, Mesh Connected Illiac Network, Cube Interconnection Networks.

UNIT-IV

Multiprocessor Architectures: Functional Structures: Loosely Coupled Multiprocessors, Tightly Coupled Multiprocessors.
Interconnection Networks: Time Shared for Common Buses, Crossbar Switch and Multiport memories.

UNIT-V

Advanced caches and prefetching, Cache coherence and memory consistency for many-core systems, TLBs, and virtual memory,
Architecture security: Timing channel attacks, transient execution attacks, and row-hammer attacks

References:

1. Faye A. Briggs, "Computer Architecture and Parallel Processing", McGraw-Hill International Editions.

2. JohnD.Carpinelli,"Computer Systems Organization & Architecture", Addison Wesley.

Note:

There will be 11 questions covering all units. The first 10 questions of explanatory answers of 12 marks each will consist of one question from each unit with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11^{th} question will consist of 10 short answer type questions using Roman numerals(i, ii,iii…..x) each with 5 marks covering with all the units. The students will be required to attempt any 8 questions out of 10.

HIMACHAL PRADESH UNIVERSITY
(NAAC ACCREDITED "A" GRADE UNIVERSITY)
OFFICE OF THE DEAN OF STUDIES
SHIMLA-171005

No. 1-60/2024-HPU(DS)- Dated: Shimla-5, the 10th February, 2025

NOTIFICATION

The Hon'ble Vice Chancellor is pleased to approve the HPU Guidelines for the PhD Course Work (2024-2025) as follows:

1. PhD Course Work will consist of Three courses (12 credits)
   I. Course-1: Research and Publication Ethics, RPE (common for all HPU's PhD programs) with a Credit weightage of 2. *
   II. Course-2: Research Methodology (Discipline-wise) with a Credit weightage of 5. The course will consist of five modules/units.
   III. Course-3: Discipline-specific research-oriented Elective course with a credit weightage of 5. The course will consist of five modules/units.
2. PhD coursework classes will be held in the afternoon session.
3. Evaluation Scheme: At the end of the course, a final written examination of 100 Marks will be conducted.
   a. Students with at least 75% attendance will be eligible for the final written examination.
   b. The exam will be conducted for a three-hour duration.
4. Note for Paper Setting (course 2-3) *: There will be 11 questions covering all the units. The first 10 questions of explanatory answers (1, 2, 3, ...10) of 12 marks each will consist of one question from each unit, with internal choice provided, meaning there will be two questions from each unit (5X2=10). The students will be required to attempt one question from each unit. The 11th question will consist of 10 short answer type questions using Roman numerals (i, ii, iii, ... x) each with 5 marks, covering all the units. The students will be required to attempt any eight questions out of ten.

Notes

a. *The course & scheme for Course-1: Research and Publication Ethics has been notified vide Notification No. 7-1/2024-HPU(Acad.) dated 3rd February, 2025.
b. These Guidelines will be applicable from the session 2024-25 onwards (beginning from the batch admitted in November-December 2024.
c. These guidelines are issued w.r.t. Notification No. 7-1/2024-HPU(Acad.) dated 3rd February, 2025.
d. The students can opt for MOOCs/SWAYAM and other accredited online platforms courses, with prior approval of relevant bodies.

Dean of Studies

Endst. No.: Even Dated: Shimla-5, the 10th February, 2025

Copy for Information and necessary action to: -

1. All the Deans of Faculties, HPU, Shimla-5.
2. All the Chairpersons/Directors of the Teaching Departments/Institutes, HP University, Shimla-5.
3. Guard file

Dean of Studies

No. 7-1/2024-HPU (Acad)
NAAC Accredited "A" Grade University,
Himachal Pradesh University, Summer-Hill, Shimla-5.
Academic Branch

Dated: 03 FEB 2025

NOTIFICATION

On the recommendation of the Deans Committee in its meeting held on 02-12-2024, the Standing Committee of Academic Council vide item No. 3 in its meeting held on 15-01-2025 approved the following:

The Research and Publication Ethics Course of 2 credits (as per Annexure) will be common for all HPU'S PhD programs. Department/Centre/Institute shall develop and approve two more courses of 5 credits each part of Ph.D course work. Thus, there will be a total of three courses in all PhD coursework of HPU applicable from the session 2024-25 onwards (beginning from the batch admitted (Directly) in November 2024, as under:

1. **Research and Publication Ethics (common for all HPU's PhD programs) with a credit weightage of 2.**
2. **Research Methodology (Discipline-wise) with a Credit weightage of 5. The course will consist of five modules/units.**
3. **Discipline-specific research-oriented Elective course with a Credit weightage of 5. The course will consist of five modules/units.**

The student can opt for (all three courses) MOOCs/SWAYAM and other accredited online platforms courses, with prior approval of BoS.

All departments must prepare & approve the syllabi accordingly at the earliest from relevant bodies.

3.2.25
Deputy Registrar (Acad)
H.P. University, Shimla-5.
Dated: 03 FEB 2025

Endst. No. Even.
Copy for information and further necessary action:

1. The Dean of Studies, H.P. University, Shimla-5.
2. All the Deans, H.P. University, Shimla-5.
3. The Chairmen/Chairpersons/Directors of the Teaching Department, H.P. University, Shimla-5.
4. Guard file.

3.2.25
Deputy Registrar (Acad)

Annexure

Research and Publication Ethics
Course Code: RPE-PhD
(Common for all PhD students)

Credit weightage: 2
Max. Marks: 50

Course description

This course has a total of 6 units focusing on the basics of philosophy of science and ethics, research integrity, and publication ethics. Hands-on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open-access publications, research metrics (citations, h-index, Impact Factor, etc.), and plagiarism tools will be discussed in this course.

Objectives

a. Promote the importance of research integrity.
b. Discuss the principles of publication ethics.
c. Educate on identifying research misconduct and predatory publishing.
d. Discuss indexing and citation databases.
e. Provide information on open-access publications and research metrics.
f. Introduce various plagiarism detection tools.

Evaluation

Continuous assessment will be conducted through tutorials, assignments, quizzes, and group discussions. At the end of the course, a final written examination of 50 Marks will be conducted.

1. Students who have at least 75% attendance in classes will be considered eligible for the final written examination.
2. The exam will be conducted for a three-hour duration.

Note for Paper Setting

There will be 7 questions covering all the units. The first six questions (1, 2, 3, 4, 5 & 6) of 6 marks each will consist of one question from each unit, with internal choice provided, meaning there will be two questions from each unit. The 7th question will consist of 10 short answer type questions using Roman numerals (i, ii, iii,... x) each with 2 marks. There will be at least one question from each unit, and students will be required to attempt any seven questions out of ten.

Unit 01: Philosophy and Ethics

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgments and reactions

Unit 02: Scientific Conduct

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

Unit 03: Publication Ethics

1. Publication ethics: definition, introduction, and importance
2. Best practices/standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals

7. Predatory publishers and journals

Unit 04: Open Access Publishing

1. Open-access publications and initiatives
2. SHERPA/ROMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/journal suggestion tools viz.JANE, Elsevier Journal Finder, Springer Journal, etc.

Unit 05: Publication Misconduct

A. Group Discussions

1. Subject-specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools

Use of plagiarism software like Turnitin, Urkund, and other open-source software tools

Unit 06: Databases and Research Metrics

A. Databases

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, i10 index, altmetrics

Suggested Readings

- Beall, J. (2012). Predatory publishers are corrupting open access. *Nature*, Vol. 489(7415), 179. https://doi.org/10.1038/489 I 79a.
- Bird, A. (2006). *Philosophy of Science*. Routledge.
- Bretag, Tracey (2016). *The Handbook of Academic Integrity*. Springer.
- Chaddah , P. (2018). *Ethics in Competitive Research: Do not get scooped; do not get Plagiarized.* ISBN:978- 9387480865.
- Grudniewicz, Agnes, D. Moher, Kelly D. Cobey+32 authors (2019). Predatory journals: no definition, no defense. *Nature*, Vol. 576.
- Indian National Science Academy (2019). *Ethics in Science Education, Research and Governance* (2019). ISBN:978-81-939482-l- 7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf
- Israel, Mark, Iain Hay (2006). *Research Ethics for Social Scientists*. London.
- Lang, James M. (2013). *Cheating Lessons: Learning from Academic Dishonesty*. Harvard University Press.
- MacIntyre, Alasdair (1967). *A Short History of Ethics*. London.
- National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research*. Third Edition. National Academies Press.
- Resnik, D. B. (2011). *What is ethics in research & why is it important*. National Institute of Environmental Health Sciences, 1-10. https://www.niehs.nih.gov/research/resources/bioethics/whatis /index.cfrn
- Whitley Jr., Bernard E. & Patricia Keith-Spiegel (2001). *Academic Dishonesty: An Educator's Guide*. Psychology Press.