Program Syllabus Booklet

**Doctor of Philosophy in Mathematics
(Ph.D Mathematics-189)**

Session: 2022-23

University College of Basic Science and Humanities

Guru Kashi University, Talwandi Sabo

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Program : Doctor of Philosophyin Mathematics (Ph. D Mathematics)
Program Code : 189
Program Outcomes (PO): The Program Outcomes for the Doctor of Philosophy in Mathematics (Ph. D Mathematics) are as follows:

PO	Statement
PO1	Accumulate mastery in fundamental knowledge and insight in Mathematics that enable them to work as mathematical professional.
PO2	Prepare to pursue research in various fields of their choice and earn capability to solve complex problems, by applying the acquired technical knowledge and tools and by identifying and correctly using data sources.
PO3	Furnish themselves with appropriate and accurate knowledge and earn capability in formulating & analyzing of mathematical models in real life application.
PO4	Inculcate teaching skills and subject proficiency during the course of study in such a potential way that scholar will able to stand and shine in various fields including Education, IT & industries etc.
PO5	Define, design and deliver a significant piece of research proposal that must be clear and concise. Demonstrate the necessary skills and knowledge in deeper understanding of their chosen research area. Understand the philosophy of research in mathematical sciences and appreciate the value of its development.
PO6	Develop the competitive spirits, nurture individual thinking and groom the scholars in order to enable them to meet with the scientific and technological challenges in the global arena.
PO7	Present mathematics in written form as well as orally, or the mathematics of others, with the aid of relevant presentation with the help of software like PowerPoint, LaTeX, MATLAB and other mathematical softwares as appropriate.
PO8	Construct and generate appropriate and original research, publishable articles in mathematics for research.
PO9	Inculcate professionally competent, environmentally and socially conscious, value imbibed and ethical scholars.
PO10	Achieve appropriate knowledge of Research work and research writing by these research methodology & ethics.

Program Specific Outcome (PSO): The Program Specific Outcome for the Ph. D Mathematics program (Ph.D Mathematics) are as follows:

PSO	Statements
PSO1	Provide a systematic understanding of the concepts and theories of mathematics and analyzing the situations and also understand the mathematical concepts and application in the field of Differential Equation /algebra / analysis, statistic and other fields.
PSO2	Apply knowledge of Mathematics in all fields of learning including higher research and extensions. Also provide a systematic understanding of the concepts behind theories and their computation techniques elaborately.
PSO3	Carryout the research by following ethics, highlighting intellectual work to be preserved in the library.

Course Work
Study Scheme
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	180101	Research Methodology	T	4	0	0	4	50	50	100
2		**Elective-I**								
3	180104	Research and Publication Ethics	T/P	1	0	2	2	50	50	100
4	189101	Recent Advances in Mathematics	T	4	0	0	4	50	50	100
5	381102	Seminar	P	NA	NA	NA	2	100	NA	100
	Total No. of Credits		14/15

Elective-I (Select one of the following subject)
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	180102	Computer Applications in Research	T/P	1	0	2	2	100	NA	100
2	180105	Statistical Methods	T	3	0	0	3	50	50	100
3	180106	Technical Writing, Communication Skills and Library and Information Services	T	3	0	0	3	50	50	100

Course Name: Research Methodology
Course Code: 180101
Semester: 1st

Credit:4

L T P
4 0 0

Course Outcomes:

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

CO	Statements
CO1	Develop understanding on various kinds of research, objectives of research, research process, research designs and sampling.
CO2	Generate basic knowledge on qualitative research techniques.
CO3	Fabricate adequate knowledge on measurement & scaling techniques as well as the quantitative data analysis.
CO4	Acquire the knowledge of Statistical packages such as SPSS/MATLAB and develop awareness of data analysis-and hypothesis testing procedures.

Course Content

1) Research
Objectives of Research, Research Types, Research Methodology, Research Process – Flow chart, description of various steps, Selection of research problem.

2) Research Design
Meaning, Objectives and Strategies of research, different research designs, important experimental designs, Completely randomized, Randomized block, Latin Square, Factorial Experimental Design.

3) Methods of Data Collection
Types of data collection and classification, Observation method, Interview Method, Collection of data through Questionnaires, Schedules.

4) Processing and Analysis of Data:
Editing, Coding, Classification of data

Statistical measures and their significance: Central tendencies, Variation, Skewness, Kurtosis.

Correlation and Regression, Multiple Regression, Time Series Analysis,

Parametric tests (t, z and F), Chi Square test.

Analysis of Variance, One - way ANOVA

Factor Analysis, Centroid Method.

Computer simulations using MATLAB/SPSS

5) Probability Distributions

Binomial , Poisson , Exponential , Normal distributions,Frequency distribution,   Cumulative Frequency distribution, Relative Frequency distribution.

6) Sampling Methods:

Different methods of Sampling : Probability Sampling methods , Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling.

Non Probability Sampling methods, Sample size.

7) Testing of Hypotheses:

Testing of Hypotheses concerning Mean(s), Testing of Hypotheses concerning Proportion (s), Testing of Hypotheses concerning Variance(s)

8) Report Writing and Presentation:

Types of reports, Report Format – Cover page, Introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation.

Reference Books:

1. Montgomery, Douglas C. (2007). *Design and Analysis of Experiments*, Wiley India.

2. Montgomery, Douglas C. & Runger, George C. (2016). *Applied Statistics & Probability for Engineers,* Wiley India.

3. Kothari C.K. (2004). *Research Methodology- Methods and Techniques* .New Age International, New Delhi.

4. Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjan M. (2006). *Management Research Methodology; Integration of Principles, Methods and Techniques.* Pearson Education, New Delhi.

5. Chawla,D. and Sondhi ,N. (2016). *Research Methodology Concepts and Cases*, Vikas Publishing House Pvt Ltd,New Delhi.

6. Panneerselvam, R. (2014). *Research Methodology.* PHI, New Delhi.

7. Cooper, D.R., Schindler,P.S. (2007). *Business Research Methods*. Tata McGraw Hill

8. Gupta S P. (2010). *Statistical Methods*. Sultan Chand & Sons, Delhi.

9. Ronald E. Walpole. (2011). *Probability and Statistics for Engineers and Scientists*. International Edition, Prentice Hill.

10. Pulak Chakrawarty (2016) *Quantitative Techniques for Management and Economics.* Himalaya Publishing House.

11. P.C.Tripathi. (2007). *A Text Book of Research Methodology in Social Sciences*. Sultan Chand & Sons.

12. Bhattacharyya D.K. (2013). Research Methods, Sage Publications.

The mapping of PO/PSO/CO attainment is as follows

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	1	2	1	3	2	2	3
CO2	3	3	2	3	2	2	1	1	1	2	2	2	3
CO3	2	2	2	2	3	1	-	3	-	3	2	2	2
CO4	3	2	2	3	3	1	-	-	1	2	2	2	2
Average	2.8	2.5	2	2.5	2.5	1.5	1	2	1	2.5	2	2	2.5

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Computer Applications in Research

Course Code: 180102

Semester: 1st

Credit:2

L T P

1 0 2

Course Outcomes:

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

CO	Statements
CO1	Work effectively with a range of current, standard, Office Productivity software applications used in research.
CO2	Apply a variety of advanced spreadsheet, operating system and word processing functions, SPSS Tool.
CO3	Implement MATLAB tools for building applications and interfaces to carry out data analysis and presentations.
CO4	Identify the plagiarism using various Anti-Plagiarism Software. Implement Reference Management Software for standard referencing styles like IEEE, MLA, APA etc.

Course Content

Common for all branches except Hindi, Punjabi, English, History and Religious Study.

Unit 1

Generating Charts/Graphs in Microsoft Excel, Power Point Presentation, Web search, Use of Internet and www. Using search likeGoogle etc.

Unit 2:

SPSS concepts and its use for Statistical Analysis.

Unit 3:

MatLab and its use for Statistical Analysis.

9

Unit 4:

Introduction to the use of LaTeX, Mendeley, Anti-Plagiarism Softwares.

Reference Books:-

1. Kogent Solutions Inc. (2008). *Office 2007 in Simple Steps*. Wiley Publishers.

2. Jain, S. (2010). *MS-Office 2007 Training Guide*. BPB Publications.

3. Bansal, R. K. Goyel , A. K, Sharma, M. K. (2016). *MATLAB and its applications in Engg*. Second Edition, Pearson Education, Delhi.

4. Sabine Handan & Brian S. Everitt. (2004). *A Handbook of Statistical Analysis using SPSS*. Chapman & Hall / CRC Publication, USA.

The mapping of PO/PSO/CO attainment is as follows

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	2	3	3	3	1	3	2	2	2	2	2	3
CO2	2	2	3	3	2	-	2	1	2	2	2	2	3
CO3	1	2	2	2	3	1	2	-	3	2	3	2	2
CO4	1	2	2	3	3	-	3	-	2	2	3	2	2
Average	**1.5**	**2**	**2.5**	**2.8**	**2.8**	**1**	**2.5**	**1.5**	**2.3**	**2**	**2.5**	**2**	**2.5**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

GURU KASHI UNIVERSITY
PUNJAB - INDIA

Course Name: Statistical Methods

Course Code: 180105

Semester: 1st

Credit:3

L T P

3 0 0

Course Outcomes:

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

CO	Statements
CO1	Designed, carried out and presented an original work of research at the leading edge of the statistics discipline.
CO2	Understand the basic theoretical and applied principles of statistics with adequate preparation to pursue a PhD or enter the job force as an applied statistician.
CO3	Summarize a technical report and/or statistical analysis and interpret results; also, show the ability for broader implication of application in the statistical field.
CO4	Gain proficiency in using statistical software for data analysis. Pass the Comprehensive written exams based on a summary of required coursework.

Course Content
Unit I

Probability distribution: uniform, binomial, Poisson, geometric, hyper geometric, negative binomial, multinomial, normal, exponential, Cauchy, Gamma, Beta, Weibull, log normal, logistic and Pareto. Compound and truncated distributions.

Unit II

Central and non-central z, t and F. Bivariate normal. Distribution of quadratic forms and r-th order statistic.

Unit III

Random experiments. Moments. Correlation and regression.

Unit IV

Fitting of: binomial, Poisson, normal, hyper geometric and negative binomial. Truncated binomial and Poisson. Log normal.

Reference Books:

1. Goon, A.M.. Gupta, M.K. and Dasgupta, B.: Fundamentals of Statistics, Vol. I and II

2. Gupta and Kapoor : Fundamentals of Statistics, Sultan Chand and Sons.

3. Croxton, F.E. and Cowden, D.F.: Applied General Statistics.

4. Ansari and Chaudhari: Applied Statistics

5. Yule, G.U. and Kendall, M.G.: An Introduction to the Theory of Statistics.

6. Garrett, H.E.: Statistics in Psychology and Education.

7. Grant, E.L.: Statistical Quality Control.

8. Sukhatme, P.V. and Sukhatme, B.V.: Sampling Theory of Surveys with Applications.

The mapping of PO/PSO/CO attainment is as follows

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	1	1	1	3	2	2	3	2	2	2	3	2
CO2	-	-	2	1	3	2	1	3	2	2	2	2	3
CO3	-	-	-	-	3	2	-	3	1	2	1	2	3
CO4	-	-	-	-	2	2	-	2	-	2	2	1	2
Average	**1**	**1**	**1.5**	**1**	**2.8**	**2**	**1.5**	**2.8**	**1.7**	**2**	**1.8**	**2**	**2.5**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Technical Writing, Communication Skills and Library and Information Services

Course Code: 180106

Semester: 1st

Credit:3   **L T P**
                                                                                                                  3 0 0

Course Outcomes:

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

CO	Statements
CO1	Understand the professional writing by studying management communication contexts and genres, researching contemporary business topics, analyzing quantifiable data discovered by researching, and constructing finished professional workplace documents.
CO2	Recognize, explain, and use the formal elements of specific genres of organizational communication: white papers, recommendation and analytical reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents.
CO3	Understand the ethical, international, social, and professional constraints of audience, style, and content for writing situations a) Among managers or co-workers and colleagues of an organization, and b) between organizations, or between an organization and the public.
CO4	Learn how to apply technical information and knowledge in practical documents for a variety of a) Professional audiences (including peers and colleagues or management) and b) public audiences. Develop a professional work habits, including those necessary for effective collaboration and cooperation with other students, instructors and Service Learning contact representatives.

Theory: Technical Writing-Various forms of technical writing-theses, technical papers, reviews, electronic communication etc; qualities of technical writing; parts of research communications-title page, content page, authorship, preface, introduction, review of literature, materials and methods, experimental results, documentation; photographs and drawings with suitable captions; pagination; citations; writing of abstracts; précis; synopsis; editing and proof reading. Communication Skills-defining communication; types of communication- verbal and non-verbal; assertive communication; assertive 445 communication; using language for effective communication; techniques of dyadic communication- message pacing and message chunking, self disclosure, mirroring, expressing conversational intent; paraphrasing; vocabulary building-word roots, prefixes, Greek and Latin roots. Practical: Editing and Proof reading technical articles; using language tools for effective writing; listening to audio-video conversations aimed at testing the comprehension of the students; oral presentations on a given topic related to agriculture; evaluation of body language and communication skills based on group discussions and interviews; role plays and pronunciation exercises; using eye contact and visual clues for effective listening skills; word stress application and voice modulation; soft skills; rhetoric skills; self-assessment exercises. Introduction to Library and its services; Five laws of library science; type of documents; classification and cataloguing; organization of documents; sources of information-primary, secondary and tertiary; current awareness and SDI services; tracing information from reference sources; library survey; preparation of bibliography; use of Online Public Access Catalogue; use of CD-ROM databases and other computerized library services, CeRA, J-Gate; use of Internet including search engines and its resources; e-resources and access methods.

The mapping of PO/PSO/CO attainment is as follows

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	1	1	1	2	2	2	3	2	2	2	3	2
CO2	-	-	1	1	2	2	1	3	2	2	2	2	3
CO3	-	-	-	-	3	2	-	2	1	2	1	2	3
CO4	-	-	-	-	2	2	-	2	-	2	2	1	2
Average	**1**	**1**	**1**	**1**	**2.5**	**2**	**1.5**	**2.5**	**1.7**	**2**	**1.8**	**2**	**2.5**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

Course Name: Research and Publication Ethics
Course Code: 180104
Semester: 1st

Credit: 2

L T P
2 0 0

Course Outcomes:

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

CO	Statements
CO1	Accumulate knowledge, general competence, and analytical skills in Research Methodology and Research & Publication Ethics.
CO2	Guide and mentor students in presenting plagiarism tools for a valid and ethical research report.
CO3	Accustom with Indexing and citation databases, open access publications, research metrics (citations, h index, Impact Factor etc.).
CO4	Acquaint with the fundamental knowledge of basics of ethics, research integrity, and publication ethics. Hands-on sessions are designed to identify research misconduct and predatory publications.

Course Content

THEORY

- **RPE 01: PHILOSOPHY AND ETHICS (3 hrs.)**

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

- **RPE 02: SCIENTIFICCONDUCT (5hrs.)**
  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

- **RPE 03: PUBLICATION ETHICS (7 hrs.)**

  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

PRACTICE
- **RPE 04: OPEN ACCESS PUBLISHING (4 hrs.)**
  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 Suggester, etc.

- **RPE 05: PUBLICATION MISCONDUCT (4hrs.)**

A. Group Discussions (2 hrs.)
  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 (2 hrs.)
Use of plagiarism software like Turnitin,Urkund and other open source software tools

- **RPE 06: DATABASES AND RESEARCH METRICS (7hrs.)**

A. Databases (4 hrs.)
  1. Indexing databases
  2. Citation databases: Web of Science, Scopusetc.

B. Research Metrics (3 hrs.)
  1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
  2. Metrics: h-index, g-index, i10 index, altmetrics.

Reference Books:-

1. Bird,A.(2006).*Philosophyofscience.*Routledge.

2. MacIntyre,Alasdair (1967)*AShortHistory ofEthics.*London.

3. P.Chaddah,(2018)EthicsinCompetitiveResearch:Donotgetscooped;donotgetplagiarized, ISBN:978-9387480865

4. 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.

5. Resnik, D. B. (2011). *What is ethics in research & why is it important*. National Institute of

Environmental Health Sciences, 1-10. Retrieved from httos://www.nieiys.nih.
ov/research/resources/bioethics/whatis/index.cfm

6. Beall, J. (2012). *Predatory publishers are corrupting open access. Nature*, 489(7415), 179—179. https://doi.org/10.1038/489179a

7. Indian National Science Academy (INSA), *Ethics in Science Education, Research and Governance* (2019),ISBN: 978-81-939482-1-7.http://www.insaindiares.in/pdf/EthicsBook.pdf

The mapping of PO/PSO/CO attainment is as follows

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	1	1	1	3	2	1	3	2	2	2	3	2
CO2	-	-	1	1	3	2	1	3	2	2	2	2	3
CO3	-	-	-	-	3	1	-	3	1	2	1	2	3
CO4	-	-	-	-	2	1	-	2	-	2	2	1	2
Average	**1**	**1**	**1**	**1**	**2.8**	**1**	**1.5**	**2.8**	**1.7**	**2**	**1.8**	**2**	**2.5**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation

<div align="center">

Course Name: Recent Advances in Mathematics

Course Code: A189101

Semester: 1st

</div>

Credit: 4   **L   T   P**
                                                                 4   0   0

Course Outcomes:

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

CO	Statements
CO1	Analyze surfaces and curves in two /three dimension space and able to Comprehend the Euler equations, the Bessel equation and Regular singular points at infinity. Evaluate solutions of the Homogenious equation with constant co-efficient and applications of Paffin's and Picard's methods etc.
CO2	Represent periodic functions using Fourier series, get an idea of power series method to solve differential equations, will be familiar with Legendre equation and Legendre polynomial, express a periodic function by Fourier series and a non-periodic function by Fourier transform, to analyze the displacements of one dimensional wave and distribution of one dimensional heat equation
CO3	Predict the behavior of a given physical system based on the analysis of its mathematical model and capable to solve that, formulate simple stochastic process models in the time domain and provide qualitative and quantitative analyses of such models.

GKCO4	Gather basic knowledge about stochastic processes in the time domain and will acquired more detailed knowledge about Markov processes with a discrete state space, including Markov chains, Poisson processes and birth and death processes. Also accumulate the knowledge about queueing systems and Brownian motion, in addition to mastering the fundamental principles of simulation of stochastic processes and the construction of Markov chain Monte Carlo (MCMC) algorithms.

Course Content

Unit I:

Differential Equations, Types of Differential Equations in more than two variables, Simultaneous Differential equations, Paffin Differential forms and Boundary value Problems. Uniqueness and Existence of Differential Equations, Application of Differential Equations, Simulation technique. Numerical analysis: curve fitting, interpolation and their solving methods.

Unit II:

Introduction to Mathematical modelling, Solving techniques, classification. Application ofMathematical modelling through various mathematical techniques like mathematical Programming, Numerical Analysis, Probability & Statistical Model and so on. Application of Mathematicscalculus in daily life. Introduction to Matrix, Eigen value&Eigen vector of characteristic equation.

Unit III:

Fourier Series: Expansion in an arbitrary period- Half range expansion. Wave lets- The Haar wavelets- A wavelets expansion- General construction of wavelets and multi resolution analysis-Shannon wavelets. Fourier integral formula- Fourier transform- Inverse Theorem for complex Fourier transform- Fourier sine and cosine transform- Inversion formulaeConvolution theorem for Fourier transform- Parseval's Identity- Finite Fourier sine and cosine Transform- Inversion formulae- Application of integral equations and boundary value problem.

Unit IV:

Linear/Non-Linear Programming: Various Linear and nonlinear optimization algorithms, Lagrangian method and K-T conditions etc. Markov chains: Transition probability matrix of a Markov chain – First step Analysis – Functional of Random walks and successive runs – classification of states – Basic Limit Theorem of Markov Chain, Continuous time Markov Chains : Poisson distribution and Poisson process – Distributions associated with Poisson process – Pure Birth Process – Pure Death process – Birth and Death Process – Limiting behavior of Birth and Death Process – Birth and Death Process with absorbing states. Operational Research Modeling: Definition and scope of Operational Research, Different types of models, Replacement models and sequencing theory, inventory problems and their analytical

structure. Simple deterministic and stochastic models of inventory control, Basic characteristics of queueing system, different performance measures. Steady state solution of Markovian queueing models and with limited waiting space.

Reference Books:

1. L. W. Beinke and R. J. Wilson.(2004). *Algebric Graph Theory.* Cambridge University Press.
2. George Bachman, Lawrence Narici and Edward Beakenstein. (2000). *Fourier and Wavelet Analysis.* Springer-Verlag, New York.

3. Richard L. Wheeden and Antoni Zygmund. (1977). *Measure and integral*. Marcel Dekker Inc., New York.

4. Balmohan V. Limaye. (1982). *Functional Analysis*, New Age International (P) Ltd. New Delhi.
5. David Roxbee Cox& David Victor Hinkley (1982). *Theoretical statistics*.Chapman and Hall.

6. Shao Jun. (2003). *Mathematical Statistics*. 2nd Edition, Springer.

7. Lehmann, E.L. (1990). *Testing statistical hypothesis*. 2nd Ed. New York: Wiley.

The mapping of PO/PSO/CO attainment is as follows

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	2	2	1	2	3	3	3	3
CO2	3	3	2	2	3	2	2	-	2	3	3	2	2
CO3	3	3	2	2	3	1	2	-	3	3	2	2	3
CO4	3	3	2	2	3	1	-	-	1	3	2	2	2
Average	**3**	**3**	**2**	**2**	**3**	**1.5**	**2**	**1**	**2**	**3**	**2.5**	**2.3**	**2.5**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Seminar

Course Code:189102

Semester: 1st

Credits: 02

L T P
0 0 0

Course Outcomes:
On completion of this course, the successful students will be able to:

CO	Statements
CO1	Develop a clear idea on various kinds of research topics, its objectives, research processes, research designs, sampling techniques and finally computation of results by using statistical tools.
CO2	Filter and select relevant useful information regarding research and compute hypothetical testing regarding analysis of results.
CO3	Apply appropriate knowledge of mathematical theory and compute appropriate and relevant results.
CO4	Prepare the power point presentation of the specific topic with appropriate statistical and mathematical computation tools.

Course Content

Students will be given a topic related to recent trends in advance mathematics, they will submit a report consisting of salient features about the topic. They will also prepare and submit PPT and deliver a seminar on the topic.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	2	1	2	1	1	-	2	2	3	2	2
CO2	2	1	2	1	2	-	-	-	1	2	2	3	2
CO3	2	1	1	-	1	-	1	-	-	1	3	2	-

CO4	1	-	-	-	1	-	-	1	-	1	3	1	-
Average	**2**	**1.5**	**1.3**	**1**	**1.5**	**1**	**2**	**1**	**1**	**1.5**	**2.6**	**2**	**2**

The correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Total Number of Course	06
Number of Theory Course	04
Number of Practical Course	03
Total Number of Credits	**14/15**
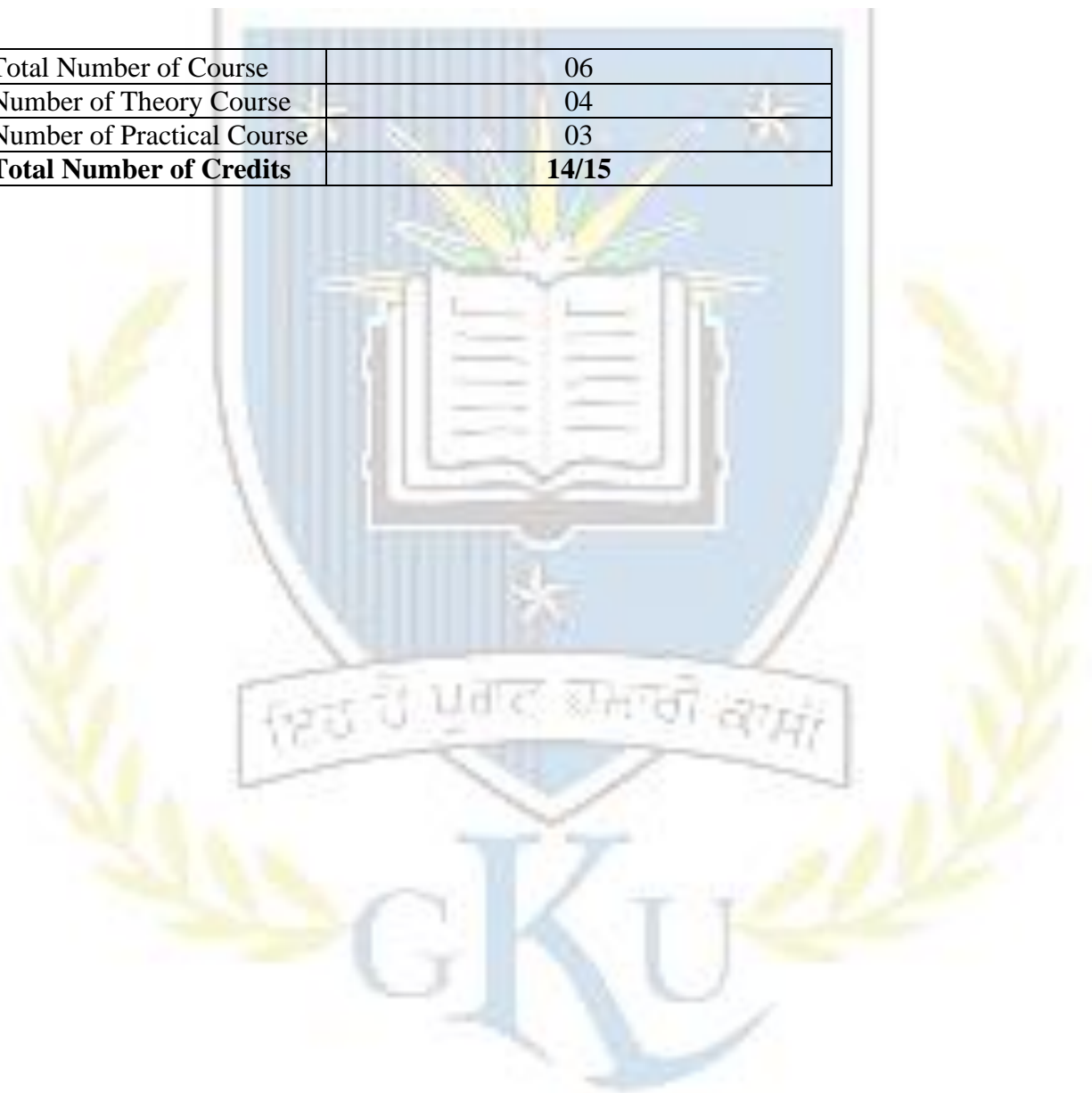
ACADEMIC INSTURCTIONS

Attendance Requirements

A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

Assessment of a course

Each course shall be assessed out of 100 marks. The distribution of these 100 marks is given in subsequent sub sections (as applicable).

		Internal (50)				External (50)	Total
Components	**Attendance**	**Assignment**		**MST 1**	**MST2**	**ETE**	
		A1	A2				
Weightage	10	10	10	30	30	50	
Average Weightage	10	10		30		50	100

Passing Criteria

The students have to pass both in internal and external examinations. The minimum passing marks to clear in examination is 40% of the total marks.